VNIVERSITAT Ď ĐVALÈNCIA

COURSE DATA

Data Subject	
Code	33085
Name	Meteorology and climatology
Cycle	Grade
ECTS Credits	4.5
Academic year	2023 - 2024

Study (s)			
Degree	**Center**	**Acad. year**	**Period**
1104 - Degree in Environmental Sciences	Faculty of Biological Sciences	2	First term

Subject-matter		
Degree	**Subject-matter**	**Character**
1104 - Degree in Environmental Sciences	123 - Meteorology and climatology	Obligatory

Coordination	
Name	**Department**
ESTELLES LEAL, VICTOR	345 - Earth Physics and Thermodynamics

SUMMARY

Introduction

The subject **Meteorology and Climatology** is taught, as a compulsory subject, in the first quarter of the second year of the **Degree in Environmental Sciences**.

Meteorology and **Climatology** are key disciplines in the training of future graduates in **Environmental Sciences**. The course develops a basic theme area that is a great help in planning, understanding, analyzing and solving problems related to phenomena and natural processes and anthropogenic actions that shape and affect the Environment. The subject of **Meteorology and Climatology** relates on the one hand, with some specific matters of first-year courses such as Physics, Chemistry and Geology, mainly. In fact, these subjects along with Mathematics, are essential for its better understanding and use. On the other hand, in subsequent courses, **Meteorology and Climatology** provides a knowledge base and is related to other subjects such as Soil Science and Continental and Marine Hydrology, Contamination Assessment, Geographic Information Systems and Fundamentals of Environmental Engineering, among

others

- *General Objectives*

The general objectives of the **Meteorology and Climatology** course, as a subject of general education and complementary to other subjects of the Grade include:

(i)   Enhance the capacity of analysis and synthesis of the students

(ii)   Develop the ability to access and evaluate information sources, taking their reliability into account

(iii) Exercise the ability to interpret both qualitative and quantitative weather and climate information

(iv) Develop the ability to integrate and make connections between theoretical and practical knowledge

(v) Encourage independent work of students in terms of information search and data processing

(vi) Hand in reports and memoranda both orally and in writing

(vii)Promote teamwork

- *Specific Objectives*

(i)   Acquire an overview of the atmosphere and the processes occurring in it and their relationships with the other components of the climate system

(ii)   Understand the concepts of climate and climate system and the mechanisms and processes that shape them

(iii) Analyze and explore the various parameters that define weather and climate, their role played in the climate system and their measurement and observation techniques. Acquire knowledge of their typical values as well as of their associated errors and uncertainties

(iv) Know the basic aspects concerning the interaction of radiation with the atmosphere and the radiation balance of the Earth – Atmosphere System

(v) Analyze and interpret the basic meteorological and climatological processes. Know the characteristics of the most significant weather phenomena at different scales, from local to synoptic and global, and understand their dynamic and thermodynamic fundamental aspects

(vi) Know the basics of thermodynamics of the atmosphere necessary for understanding the processes associated with cloud formation and precipitation

(vii)Understand the processes related to atmospheric dynamics

(viii) Understand the role of atmospheric and oceanic circulation in shaping global climat

(ix) Know the origins of climate variability and its relation to climate change

(x) Know how to assess the anthropogenic effect on climate

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

It is essential that in this subject students have the basic knowledge provided by the other Mathematics and Physics courses, the latter as well as basic knowledge for the measurement of meteorological parameters. It is also desirable that the students know spreadsheet programs and conventional statistical analysis such as Excel or OpenOffice .

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1104 - Degree in Environmental Sciences

- Conocer las características de los diferentes climas.

- Analizar e interpretar procesos meteorológicos.

- Comprender y manejar diferentes escalas espaciales y temporales en la interpretación de los sistemas naturales.

- Conocer los principales impactos humanos sobre los sistemas naturales.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

- Carrying out practical work involving problem solving, data analysis and critical interpretation
- Solving problems involving the acquisition of qualitative and quantitative data in the laboratory or the field, data analysis and interpretation in a theoretical context
- Knowledge of the different climate types and of their main characteristics
- Analysis and interpretation of the main meteorological processes
- Knowledge of the components and processes of the climate system and of its features at different spatial and temporal scales
- Knowledge of the major human impacts on the climate system

DESCRIPTION OF CONTENTS

1. The Earth System. Meteorological and climatic magnitudes.

Introduction: weather and climate. Composition and structure of the atmosphere. Solar radiation and its spatial and temporal variation. Radiative processes in the atmosphere. Insolation and temperature. Evaporation and humidity of the air. Atmospheric pressure.

2. Meteorology

Thermodynamic processes and atmospheric stability. Mists and clouds. Winds. Planetary circulation. Weather systems.

3. Climatology

Climate zones and classifications. Climate change. Climate models

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	28,00	100
Laboratory practices	15,00	100
Tutorials	2,00	100
Development of group work	10,00	0
Study and independent work	13,00	0
Readings supplementary material	2,50	0
Preparation of evaluation activities	26,00	0
Preparing lectures	13,00	0
Preparation of practical classes and problem	3,00	0
TOTAL	112,50	

TEACHING METHODOLOGY

The subject consists of several parts, with different and distinct methodology. For each part a specific development and methodology follows:

• *Theoretical-Practical Lectures*

Two classes a week, of theoretical - practical content (theory and conceptual exercises and problems), in varying proportions depending on the subject, according to the schedule developed in section 6 above **Description of the Contents** that is divided into three Units

• **Unit I Introduction of Basic Concepts. Meteorological and climatological variables** (**Items 1 to 11**, 11 hours)

• **Unit II. Meteorology** (**Items 12 to 19**, 8 hours)

• **Unit III. Climatology** (**Items 20 to 26**, 7 hours)

In these lectures, the lecturerimparts the theoretical topicsleaning on materials (books, notes, slides, figures and diagrams) to be provided to students through the *Aula Virtual*. This material is only for guidance and at no time should be seen as the only material to be used by the student. In each of the theoretical topics, practical exercises will be developedthat help students to understand the matter explained. In many cases, the theoretical topics will beintroducedindicating the content scope, hoping that the student complete the details of the matter in their individual study.

In these classes, the teacher presents the theoretical basis of materials (books, notes, slides, figures and diagrams) that are provided to students through the Virtual Classroom.

• *Laboratory Classes (Practicals)*

Four laboratory sessions are taught in small subgroups, with a teacher assigned to each subgroup. In the sessions, students in pairs, perform the four practicals that are described in section 6 on **Description of Contents**(**Lab I** to **Lab IV**). For each practical, each pair of students must submit a report for the collection of experimental data and their treatment (errors, graphs, mathematical fittings and correlations), the results obtained and the conclusions reached. Emphasis is placed on the use of data processing software, for which suitable computer equipment is provided in the laboratory. Attendance to this activity is compulsory for the student.

• *Supervised Working Tasks*

We propose a scientific visit to the **Territorial Delegation of AEMet in the Valencian Community** to understand how a complete Meteorological Center works. In the visit, the students will have the opportunityto see the instrumentation, measurements and observations of the weather station, the assimilation of data from meteorological stations in the region, the operation of the numerical prediction model and the meteorological warning systems *PreviMet*and of wildfire risks*PreviFoc*. The students will be proposed to carry out some practical work related to the contents of the visit. Attendance to this activity is compulsory for the students.

• *Tutorials*

The student can clarify or solvedoubts on any matter of the course in Tutoring hours of the lecturer or by email (*virtual tutoring*) if the query can be resolved reasonably well by this system.

EVALUATION

The evaluation of the subject is made taking into account its various different parts which are separately evaluated according to the criteria detailed below:

• **Assessment of the Theoretical and Practical Knowledge**: The evaluation of this part of the course will be based on a written exam

• **Evaluation of the Laboratory**: The laboratory work is evaluated based on the laboratory reports (and oral presentations) made by the students for each of the practicals performed during the course. **It is compulsory to carry out all the laboratory practicals**

• **Assessment of Supervised Work**: This work is evaluated based on the reports made by the students. **To be evaluated, it is required to attend this class-scientific visit.**

The evaluation of the subject will be made with the following criteria:

(i)   **60 points**: theoretical and practical knowledge through the written final exam

(ii)   **30 points**: work performed in the laboratory through evaluation of laboratory reports and eventual questionnaires

(iii)   **10 points**: supervised work through the assessment of reports and exercises proposed in the lectures

The final mark will be obtained from the sum of the scores of the preceding paragraphs, provided in paragraph (i) obtain a minimum of **25** points and in (ii) a minimum of **12** points. The final score needed to pass the course will be **50** points.

In order to apply for advancement of the examination session of this subject, students should be awaere that mandatory activities outlined in the teaching guide should have previously been carried out. See also section on *Teaching methodology, laboratory classes (Practicals), and supervised working tasks.*

REFERENCES

Basic

- Manuel Ledesma Jimeno (2011): Principios de Meteorología y Climatología. Paraninfo
  - María Carmen Casas Castillo y Marta Alarcón Jordán (1999): Meteorología y Clima. Volumen 79 de Politext Series, Ediciones UPC, S.L.
  - Hartmann, D.L. (1994): Global Physical Climatology. Academic Press
  - J.M. Wallace & P. Hobbs (2006): Atmospheric Science. An Introductory Survey. Academic Press, 2nd Edition
  - I. Zúñiga, E. Crespo. Meteorología y Climatología, Ed. UNED, 2021.
  - J.M. Cuadrat y M.F. Pita. Climatología,
  Eds. Cátedra, 2006.

- I. Sendiña y V. Pérez, Fundamentos de Meteorología, Eds. USC, 2006.
- M. Lazaridis, First principles of Meteorology and Air Pollution, Ed. Springer, 2011.

Additional

- María Fernanda Pita y José María Cuadrat (2006): Climatología. Ediciones Cátedra
  - Javier Martín Vide (2005): Los Mapas del Tiempo. Editorial Davinci, Mataró
  - Javier Martín Vide (1991): Fundamentos de Climatología Analítica. Editorial Síntesis. Madrid
  - Felipe Fernández García (1995): Manual de Climatología Aplicada. Editorial Síntesis. Madrid