VNIVERSITAT DE VALÈNCIA

# Course Guide
# 41055 Restoration of the environment and analysis of climatic alterations

## COURSE DATA

### DATA SUBJECT

**Code:** 41055
**Name:** Restoration of the environment and analysis of climatic alterations
**Cycle:** Master's Degree
**ECTS Credits:** 10
**Academic year:** 2026-27

### STUDY (S)

| Degree | Center | Acad. year | Period |
|---|---|---|---|
| 2001 - Master's Degree in Environmental and Territorial Management Techniques | Facultat de Geografia i Història | 1 | Second quarter |

### SUBJECT-MATTER

| Degree | Subject-matter | Character |
|---|---|---|
| 2001 - Master's Degree in Environmental and Territorial Management Techniques | Methods and techniques for the analysis of the physical environment | ELECTIVES |

### COORDINATION

ESTRELA NAVARRO MARIA JOSE

## SUMMARY

Traditionally, especially in recent decades of great technological arrogance, the management of natural systems has been dominated by an economistic vision, which has prioritised the conception of nature as a resource, using it above all as a source of energy and matter (springs, rivers) or valorising it as a public space (beaches, rivers). It is precisely this abusive use of natural systems that has led to the alteration of practically the entire territory, leaving few virgin spaces. To this must be added forest fires and the great vulnerability of plant communities in this Mediterranean area, especially in the current context of climate change. Increasingly serious environmental problems are leading to greater environmental awareness. This is why the administration is promoting restoration actions, often on an experimental basis, of various natural systems.

Cartographic representation is the precise basis on which to verify analyses and evaluations in environmental and territorial management. The great technological development experienced by cartography in recent decades, together with the scientific and technological progress of environmental issues, makes it necessary to have an adequate knowledge of the various thematic cartographies produced and used in environmental management. Environmental information is complex and diverse, it comes from very different sources and has very different thematic, spatial and temporal components. For this reason, knowledge and handling of Geographic Information Systems is essential as a fundamental tool for storing,

integrating and managing the large amount of environmental information currently available.

The course is structured in 8 parts, each of which is taught by specialist lecturers in the subject.

The first four are devoted to working on the techniques used in the analysis of climatic extremes, from both hydrological (floods) and meteorological (torrential rainfall) perspectives, without forgetting the fundamental part of the role of seawater and the sources of global models for climate change projections, with a focus on local-scale processes.

Themes 5 and 6 focus on the field of hydrology analysing forms and processes in watercourses, intense anthropic action and river restoration. In this part, special emphasis is placed on practical application through the use of hydraulic and hydrological models, essential tools for investigating how networks function, for planning and designing improvements in water infrastructure systems and for predicting water cycle processes.

In the last topics, on the one hand, forest fires are dealt with by introducing general concepts (impact and recurrence of fire), the management of burnt areas and restoration strategies. On the other hand, the interaction between erosion processes and vegetation as a basis for the ecological restoration of slopes and vegetation cover.

All of these are fundamental issues in the current context of climate change.

## PREVIOUS KNOWLEDGE

### RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

### OTHER REQUIREMENTS

None

## COMPETENCES / LEARNING OUTCOMES

### 2001 - Master's Degree in Environmental and Territorial Management Techniques

Análisis del medio físico de una manera integrada, interrelacionando sus componentes a partir del trabajo de campo y manejo de elementos cartográficos y toma de datos.

Capacidad de analizar y caracterizar los procesos naturales y de degradación y evaluar las posibilidades de restauración medioambiental.

Capacidad de analizar y caracterizar riesgos

medioambientales, su prevención, predicción y gestión.

Capacidad de organización, planificación y gestión de la información ambiental y territorial

Manejo de Sistemas de Información Geográfica aplicados a los problemas medioambientales y territoriales

Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.

Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.

Students should demonstrate self-directed learning skills for continued academic growth.

Students should possess and understand foundational knowledge that enables original thinking and research in the field.

Técnicas de análisis cuantitativo

Técnicas de Teledetección espacial

## DESCRIPTION OF CONTENTS

### 1. Climate change modelling and local scale adaptations

The available global modelling sources for climate change projection to future scenarios and the technique to obtain a climate change projection correctly adapted to local scale processes and realities are addressed. This issue is particularly important in a context of increasing demand for local and regional plans for future adaptation to climate change by public administrations, as global model outputs cannot be used directly.

### 2. Recent warming in the Mediterranean Sea

The analysis of recent trends in SST in the Mediterranean Sea is based on the analysis of time series of satellite thermal images.

## 3. Techniques for the analysis of extreme weather events

Meteorological analysis of extreme events and their relationship with sea temperature. Genetic factors of heavy precipitation. Sea water temperature (SST) and its relationship with heavy precipitation. Analysis of air mass trajectories.

## 4. Hydrological event analysis techniques

Selection, characterisation and analysis of hydrologically significant rainfall events. Analysis of rainfall-flow conversion processes and generation of surface runoff. Water balances and runoff thresholds. Hydrological analysis of floods: hydrographs, basin connectivity, response times and peak flows.

## 5. Hydrological and hydraulic models

Both theoretical and practical-applied work is carried out on the use of hydraulic models in river environments. Hydraulic simulation is a key element in the management of watercourses that includes both flood risk prevention and ecological restoration, key objectives of the course. We will work with some of the most widely used models (HEC-RAS, MIKE, IBER, GUAD2D and HYDRUS) and we will analyse the suitability of using each one.

## 6. Alteration and restoration of river systems

An analysis is made of the anthropic actions that directly (channels) and indirectly (basin) affect river systems and the responses or adjustment processes that occur after these impacts. Subsequently, the basic principles and main techniques of river restoration are defined, which are finally applied to a case study as a practical exercise developed by the students in small working groups.

## 7. Regeneration and management of burnt areas

Block I. Fire as a modeller of the Mediterranean landscape: impacts of fire. Fire recurrence and

degradation. Thresholds and vulnerability of plant communities.
Block II. Natural regeneration. Resilience and regeneration of species and communities. Successional dynamics. Functional traits of vegetation: resprouting and germinating species. The case of the great fire of Ayora 1979.
Block III. Management of burnt areas. The traditional approach versus new alternatives. Restoration strategies. Temporary approach: urgent, short and medium term measures. POSTFIRE tool.

## 8. Restoration of slopes and vegetation cover

We will see what knowledge restoration ecology brings to ecological restoration. We will study the interactions between soil water erosion and vegetation in arid and semi-arid areas and their application to the restoration of eroded slopes (both natural and artificial) and vegetation cover. We will address the problem of the functional state of Mediterranean forests in a context of climate change and apply scientific knowledge as a basis for their restoration.

# WORKLOAD

### PRESENCIAL ACTIVITIES

| Activity | Hours |
|---|---|
| Tutorials | 2,00 |
| Theory | 6,00 |
| Other activities | 6,00 |
| Computer classroom practice | 48,00 |
| **Total hours** | **62,00** |

### NON PRESENCIAL ACTIVITIES

| Activity | Hours |
|---|---|
| Attendance at other activities | 0,00 |
| Individual or group project | 50,50 |
| Independent study and work | 10,00 |
| Preparation of lessons | 92,50 |
| Preparation for assessment activities | 0,00 |
| Resolution of case studies | 35,00 |
| **Total hours** | **188,00** |

# TEACHING METHODOLOGY

The course is based on the use of different learning activities including the following:

**Participative lectures**:

- Presentation of theoretical content in the classroom and discussion.

- Comparison with nearby experiences, critical analysis of the same.

- Proposals for environmental management strategies.

- Reasoned selection of different solution proposals.

**Practical classes**:

- Approach and resolution of applied cases.

- Use of GIS (IDRISI and ARC MAP) for the treatment of basic digital cartography (DTM, lithology, land use, etc.), as well as for the elaboration of risk cartography (hazard, exposure/vulnerability and flood risk maps, etc.).

**Field work**:

- Field trips will take the form of itinerant visits to points of interest, with brief explanations by the teaching staff and/or group discussion.

**Reading of scientific articles and manuals**.

**Tutorials**

## EVALUATION

Assessment of learning will be carried out by taking into account one or more of the sections proposed by the module teachers:

- Continuous assessment taking into account attendance and participation in class.

- Attendance and participation in field trips (compulsory).

- Completion of work or reports proposed by the lecturer.

- Reading and summarising research articles.

- Completion of an objective test on the basic knowledge taught.

The evaluation model will be adjusted to the following percentages:

- Attendance at face-to-face classes (minimum requirement of 80% attendance).

- Exam: 15%.

- Directed work and practicals: 50%.

- Complementary activities: 35%.

Regarding the evaluation and qualification, it will follow what is reflected in Chapter VI of the Regulation of evaluation and qualification of the Universitat de València for bachelor's and master's degrees. ACGUV 108/2017 (http://www.uv.es/graus/normatives/2017_108_Reglament_avaluacio_qualificacio.pdf).

Regarding the plagiarism of any of the works requested in the framework of this module, the CEC approved, in the meeting of 26 March 2024, that the deliveries with 20% or more of plagiarism will be suspended.

We also recommend accessing and reading the Protocol of action against fraudulent practices at the Universitat de València. ACGUV 123/2020 (https://www.uv.es/sgeneral/Protocols/C83sp.pdf).

## REFERENCES

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