COURSE DATA

Data Subject	
Code	43054
Name	Climate change and biodiversity
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
2139 - Master's Degree in Environmental Pollution, Toxicology and Health	Faculty of Biological Sciences	1	Second term

Subject-matter

Degree	Subject-matter	Character
2139 - Master's Degree in Environmental Pollution, Toxicology and Health	2 - Environmental pollution	Optional

Coordination

Name	Department
SORIA GARCIA, JUAN MIGUEL	275 - Microbiology and Ecology

SUMMARY

The Intergovernmental Panel on Climate Change (IPCC, UN) recognizes that the atmospheric concentration of CO2 far exceeds the natural range of the last 650,000 years. Human activities that pollute the atmosphere with greenhouse gases have recently been identified as the main cause of global and regional climate variation (IPCC 2001, 2007). It is therefore necessary to know the components of the climate and their susceptibility to modification by natural or human causes.

The effect of climate change on biota has been difficult to demonstrate, but since the beginning of the 21st century there has been conclusive evidence of the impact of climate change on species during the 20th century. Biodiversity as the sum of species, ecosystems and genetic diversity in the world has been continuously transformed by changes in climate, and now the changes in this diversity (e.g., losses) are being accelerated by the addition of the effect of man's effect on climate to its natural variability. It is therefore important to study in order to be able to relate them to: a) the components of climate and its variability due to increasing pollution by gases such as CO2; b) the dynamics of biodiversity at all levels, including c) the variability in the processes or functional diversity of ecosystems. In addition, climate is a

complex system of interacting external and internal forces: the climate system. This includes the atmosphere, oceans, ice, land (including its biota), snow cover, hydrology, water bodies (including their biota), etc. Thus, it is understood that climate change affecting ecological systems will produce synergistic effects when the altered natural systems in turn favor climate change. This synergy will also be addressed in this course as the alteration of the gas emitter/sink ratio of ecosystems related to their diversity and climate change. Finally, the differences in the effect of climate change on very different ecosystems (land, sea and freshwater) will be analyzed. And the knowledge on these issues will be detailed for its application to the Iberian Peninsula.

- Recognition of climate change: What is climate change, the past of climate variability and recent trends.

- Climate change in Spain.

- Biodiversity dynamics: changes in populations and communities.

- Biodiversity and ecosystem functioning.

- Biotic responses to climate change: evolutionary impact, life cycles, population abundance distribution.

- Models of ecosystem, biome or planetary response to climate change.

- Effects of climate change on terrestrial, marine and inland water systems.

- Modification of basic ecosystem processes: greenhouse gas sinks or emitters, vulnerability to climate change.

- Efforts and strategies for conservation in the face 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

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

2139 - Master's Degree in Environmental Pollution, Toxicology and Health

- 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 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.
- Capacidad de utilizar las nuevas tecnologías de la información y la comunicación.
- Capacidad de análisis, síntesis y razonamiento crítico en la aplicación del método científico.
- Capacidad para el aprendizaje autónomo y organizado y para la adaptación a nuevas situaciones.
- Comprensión del mundo natural como producto de la evolución y de su vulnerabilidad frente a la influencia humana.
- Desarrollo de un compromiso ético y capacidad de participación en el debate ?social.
  ?
- Conocer los mecanismos desarrollados por los organismos para la resistencia a la contaminación ambiental.
- Diseñar y ejecutar proyectos para aplicar indicadores de sostenibilidad ambiental.
- Valorar integralmente del estado de salud del medio ambiente.
- Conocer la estructura y dinámica de las poblaciones.
- Valorar los efectos del cambio climático.
- Realizar diagnóstico de problemas ambientales.
- Diseñar los indicadores específicos para un riesgo ambiental concreto.

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

SKILLS TO ACQUIRE.
¬ To handle scientific terminology properly and become familiar with their sources.
¬ To get an integrated view of the defense mechanisms of adaptation to the environment of animals. Make sense of foreground, interrelate and apply.
¬ Ability to analyze data, choosing the right method, critical evaluation and interpretation of experimental results in various forms of expression (tables, graphs ...).

¬ Acquire synthesis capacity to collect, coherently and in an organized way, information or data of different origins.
¬ Meet the management of basic scientific instrumentation typical of Applied Physiology.

SOCIAL SKILLS
¬ Develop capacity for critical thinking, fostering communication and discussion with a view to stimulating individual creative ability.
¬ Ability to work in groups when dealing with problematic situations collectively.
¬ Ability to build a comprehensive text written and organized.
¬ Ability to speaking to a public audience, such as the class itself, by exposure or intervention in a debate on a topic or controversial issue.
¬ Ability to interact with both the teacher and with peers.

¬ Interest in social and economic application of science and in particular the Environmental Toxicology.
¬ Interest in popular science and the impact of science on culture and consciousness of society.
¬ Professional training. Acquisition of scientific and technical knowledge related to resistance to xenobiotics that will facilitate the work in Environmental Toxicology in a society in continuous technological progress.

DESCRIPTION OF CONTENTS

1. Climatic change

1.1. Climate components and teleconnection.
1.2. Identification of climate change.
Effects on the hydrological cycle, atmospheric circulation and teleconnections. 2.1.
2.1. Paleoperspective on climate variability and change. 2.2.
2.2. Gradual and rapid changes.
Natural changes and the human effect. 2.4.
2.4. Recent climate trends.
2.5. Projection and models.
2.6. Climate change in Spain.
3.1. What is biodiversity?
3.2. Biodiversity measurements.
3.3. Biodiversity and space-time scales. 3.4.
Patterns of diversity.
4.1. Diversity balance models.
4.2. Phylogenetic losses and gains: from population to large groups. 4.3.
Community gains and losses: from population to global diversity. 5.1.
Biodiversity, ecosystem composition and processes. 5.2.
Diversity, complexity, productivity and stability. 5.3.
Effects of biodiversity on ecosystem functioning.
6.1.Evolutionary impact.

6.2. Life cycles.
6.3. Distribution of population abundance.
7.1. Distribution of biodiversity.
Modification of basic ecosystem processes.

7.3. Models of the world system and synergistic effects.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	26,00	100
Laboratory practices	4,00	100
Development of individual work	30,00	0
Study and independent work	10,00	0
Preparing lectures	5,00	0
TOTAL	**75,00**	

TEACHING METHODOLOGY

- Master class for acquiring the fundamental knowledge, including methodological aspects.

- Practice class on the evaluation of pollution effects.

- Students will work in groups (of 2 or 3 people) on specific subjects proposed by the lecturer, finally showing their results in an oral presentation to the rest of the class.

- A tutorship of 1.5 hours will be carry out in the class. On the other hand, other tutored sessions will be available by e-mail or using the “aula virtual” tool.

- All activities and master classes are reinforced with documentation and information exchanges between lecturers and students using the “aula virtual” tool of the Universitat de València webpage.

EVALUATION

SE1 - Continuous assessment of the student in theory classes, laboratory and seminars: participative attendance, handling of material and equipment, work organisation, understanding and use of the practical syllabus, calculations, teamwork, etc.
SE2 - Assessment of non-face-to-face activities related to laboratory classes: reports and/or practical reports handed in.
SE3 - Written exams on theoretical and/or practical classes: based on the learning outcomes and the specific objectives of each subject.
SE4 - Attendance at tutorials for the completion of work and/or participative attendance at course/s scheduled for the promotion of transversal competences.
SE5 - Preparation of a report on the activities carried out for the promotion of transversal competences.

REFERENCES

Basic

- Lovejoy, T.E. y Hannah, L. 2005. Climate change and Biodiversity. Yale University Press.
IPCC 2007-. Intergovernmental Panel on Climate Change Fourth Assessment Report. (el Quinto Informe aparecerá en 2013).
Moreno, J.M. (ed.) 2006. Evaluación preliminar de los impactos en España por efecto del cambio climático Ministerio de Medio Ambiente y Universidad de Castilla-La Mancha.
Loreau, M. et al. 2002. Biodiversity and ecosystem functioning. Oxford Univ. Press.
McKinney, M.L. y Drake, J.A. 1998. Biodiversity dynamics. Columbia Press.
Kinzing, A.P. et al. 2001. The functional consequences of biodiversity. Princeton University Press.

Additional

- Begon, M. et al. 2006. Ecology. From individuals to ecosystems. Blackwell Publishing.
Morin, P.J. 1999. Community Ecology. Blackwell Science.
Putman, R.J. 1994. Community Ecology. Chapman & Hall.
Walker, L.R. y Moral, R. 2003. Primary succession and ecosystem rehabilitation. Cambridge Univ. Press.
Brown, J.H. 1995. Macroecology. University of Chicago Press.