COURSE DATA

Data Subject	
Code	33057
Name	Conservation biology
Cycle	Grade
ECTS Credits	10.0
Academic year	2018 - 2019

Study (s)

Degree	Center	Acad. year	Period
1100 - Degree in Biology	Faculty of Biological Sciences	4	Annual

Subject-matter

Degree	Subject-matter	Character
1100 - Degree in Biology	15 - Complements of biodiversity and conservation	Optional

Coordination

Name	Department
CAMACHO GONZALEZ, ANTONIO	275 - Microbiology and Ecology
ROJO GARCIA-MORATO, CARMEN	275 - Microbiology and Ecology

SUMMARY

Conservation Biology is a multidisciplinary science that focuses on the study of nature and biodiversity in order to protect the species, their genetic diversity, their habitats and the ecosystems. The term, coined by biologists B. M. Wilcox Soulé at a scientific conference held in 1978, seeks to combine the interaction between ecological theory and other biological, physical and social sciences, as well as policy and practice of conservation of biodiversity ranging at a multiscale from intrapopulation diversity to the whole biosphere, and postulated actions may also take place at different spatial and temporal scales. The current extinction crisis, exacerbated by rapid changes linked to global change is leading to the disappearance of part of the planet's biodiversity. In this global context, Conservation Biology deals with phenomena that affect the maintenance, loss and restoration of biodiversity and the processes that generate diversity at the genetic, population, taxonomic and ecosystem levels. Increasingly, Conservation Biology interacts with the ecosociological framework in which these processes occur, and tries to give a comprehensive response to the current crisis of biodiversity based on a deep scientific knowledge, but also an ethical attitude to life.

The course "Conservation Biology", corresponding to the intensification "Complements in Biodiversity and Conservation", aims to articulate with other courses of the intensification and the previous courses in the first three degree courses, so that serving as core stepping, coordination and complementarity with other courses, allow to give the student an integrated view of knowledge and foster the skills necessary to tackle the problem of conservation of biological diversity in all its facets.

The main objective of the course is to provide knowledge, both theoretical and methodological, as well as criteria, to the student so that he/she can understand and apply the basic principles relating to the conservation of biodiversity. It is also intended that future graduates will be able to design and implement conservation plans for biodiversity in their different time and space scales, applicable at different levels of organization, all based on a sound theoretical basis in addition to the application of criteria based on experience and reflection.

A secondary objective of the course will serve as the core of intensification "Complements in Biodiversity and Conservation" and will learn and apply other aspects tested in both the courses studied in previously at the Biology degree and other studied in parallel within the intensification .

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

Generic requirements to study the intensification "Complements in Biodiversity and Conservation".

OUTCOMES

1100 - Degree in Biology

- Capacidad de análisis, síntesis y razonamiento crítico.
- Capacidad de organización, planificación y gestión de la información.
- Utilización del lenguaje científico oral y escrito.
- Uso del inglés como vehículo de comunicación científica.
- Capacidad de resolución de problemas y toma de decisiones.
- Capacidad de análisis crítico de textos científicos.
- Apreciación del rigor, el trabajo metódico, y la solidez de los resultados.
- Comprender las interacciones del hombre con el medio.
- Conocimiento y aplicación del método científico.

- Redactar y ejecutar proyectos en biología.
- Conocer la diversidad de los seres vivos.
- Conocer la diversidad de los ecosistemas.
- Comprender la problemática ambiental global, regional y local.
- Catalogar y evaluar recursos biológicos.
- Realizar análisis genéticos aplicados a la conservación.
- Conocer la estructura y dinámica de las poblaciones.
- Conocer las interacciones entre especies.
- Conocer los patrones de distribución geográfica de los organismos y sus causas.
- Realizar cartografías temáticas.
- Interpretar el paisaje y restaurar hábitat.
- Planificar la explotación racional de los recursos naturales renovables terrestres y marinos.
- Identificar las amenazas de los organismos en su ambiente natural y proponer medidas de conservación.
- Conocer métodos de enriquecimiento aplicados a animales en cautividad y su reintroducción.
- Capacidad para prever las consecuencias para la conservación de las diferentes estrategias.
- Analizar las repercusiones sociales y económicas de las diferentes estrategias conservacionistas.
- Capacidad para la planificación de estrategias de conservación.
- Muestrear y caracterizar comunidades y ecosistemas.
- Muestrear, caracterizar y manejar poblaciones.
- Capacidad de gestión y manejo de áreas protegidas.

LEARNING OUTCOMES

1 - Analyze and quantify the genetic variability within a population.

2 - Apply different genetic markers and select the best for each problem.

3 - Assess the impact of genetic drift.

4 - Apply the concept of effective population size in the context of the conservation of a population or species.

5 - Calculate the degree of kinship and inbreeding in a population.

9 – Application of direct and indirect methods to measure rates and migration patterns between populations.

10 - Assess the impact of translocation and reintroduction of individuals from other populations.

11 - Analyze the structure and consequences on metapopulation dynamics of extinction-recolonization processes.

13 - Evaluating the genetic risk of extinction of populations / species.

15 - Design strategies for the conservation of populations and species.

16 - Control and monitoring of conservation measures.

18 - Assessment of the conservation of the vegetation in an area

19 Making conservation work, in situ and ex situ

20 Prepare recovery and management plans for endangered species.

21 Assessment of biodiversity planning.

22 Planning and design of networks of natural protected areas

23 Make thematic cartography

24 Diagnosing environmental problems

25 Sampling, characterization and management of populations

26 Sampling characterization and management of communities and ecosystems

27 Interpretation the landscape and restore habitats.

28 Planning for the rational exploitation of land and renewable natural resources, both aquatic and terrestrial.

29 Identify the threats to living organisms in their natural environment and propose conservation measures

30 Diagnosing environmental problems

32 Assessment of the conservation status of species.

The numbering corresponds to the learning outcomes of “Verifica” Curriculum Check

DESCRIPTION OF CONTENTS

1. SECTION I-I - GENERAL AND METHODOLOGICAL ASPECTS

SECTION I - GENERAL AND METHODOLOGICAL ASPECTS (11 hours).

1. Conservation Biology and Biodiversity. What is Conservation Biology?: Principles and postulates. Biodiversity: concept. Organizational levels of biodiversity: genetic and taxonomic diversity, diversity of communities and ecosystems. The new paradigm of non-equilibrium in nature and resilience of ecological systems: implications for biodiversity conservation. The sixth great extinction. (1 hour).

2. Importance of the conservation of biodiversity The human species as a component of ecological systems. The value of ecosystems and biodiversity. Natural capital. Intrinsic value and instrumental value. Ecological economics and sustainable development. The ecological footprint. Processes, functions and ecosystem services. Millennium Ecosystem Assessment. Food safety, sustainability and conservation of biodiversity. The integration of conservation biology and policy of biodiversity conservation. (2 hours).

3. The context of biodiversity conservation. Criteria for considering a species as threatened. Threat categories of the International Union for Conservation of Nature. Umbrella and flag species. The society's role in conservation. International organizations. NGOs. International agreements on biodiversity and its forums. The Convention on Biological Diversity. Laws (directives) of the European Union on habitats, natural areas and species, state and regional laws on habitats and species. (2 hours)

4. Biological diversity at different scales. Processes at different scales: historical-evolutionary, geographical and ecological. Quantification of global diversity, regional (gamma) and local (alpha). Spectra of diversity (beta diversity). Hot spots. Micro-reserves. Applicability in conservation. (1 hour).

2. SECTION I-II - GENERAL AND METHODOLOGICAL ASPECTS

5. Biodiversity and the assembly of communities. Assembly rules. Models, "island" divergence in the assembly. Models "characters and environment relationship" convergence in the assembly. Bidirectional relationship between richness and ecosystem properties: productivity, diversity and stability (1 hour).

6. Main methods for the study of genetic diversity. Overview. Description and quantification of genetic variability. Genetic markers and phylogenetic markers: properties and applications. Measures of variability and genetic distance. (1 hour).

7. Main methods for the study of populations, communities and ecosystems. Overview. Inventories of taxonomic diversity. Demographic and behavioral studies. Techniques for the study of interactions between populations and ecosystem processes. (1 hour)

8. Geo-referenced databases, Geographic Information Systems: applications. Commercial software (ArcView versions) and free (gvSIG). Arcview applications. Arcview data structure. Projects (views, tables, graphs and compositions). Graphic data (themes, projections, scales, legends, symbols, thematic mapping, shape files, shp). Thematic data, Tables (edition). Spatial analysis. Thematic consultations. Spatial queries (spatial relationships between elements of two themes). Data Analysis. Introduction to

digital terrain models (DTM) and raster analysis. (2 hours).

3. BLOCK II-I RISKS AND THREATS TO BIODIVERSITY. CAUSES AND CONSEQUENCES OF BIODIVERSITY LOSS

9. Models of population dynamics for the conservation and management of stocks. Deterministic and random components in population dynamics, environmental stochasticity and demographic stochasticity. Models of population dynamics, theoretical models and models based on time series. The life cycle and models for structured populations. Exploitation of populations: maximum sustainable yield, fixed quotas and fixed effort quotas. (2 hours).

10. Population Viability Analysis. Population extinction probability as a function of time. Simulation models and determination of the probability of extinction. Effects of demographic parameters on the rate of population increase: analysis of elasticity and sensitivity. (2 hours).

11. Small populations, genetic drift and effective population size. Importance of small populations in the conservation of species. Consequences of genetic drift. Effective population size: measurement and factors affecting it. Selection and mutation in small populations. (2 hours).

12. Inbreeding and inbreeding depression. Genealogies and pedigrees. Measures of inbreeding. Inbreeding in small populations. Regular systems of inbreeding. Inbreeding depression and extinction. Inbreeding in natural populations. (2 hours).

4. BLOCK II-II RISKS AND THREATS TO BIODIVERSITY. CAUSES AND CONSEQUENCES OF BIODIVERSITY LOSS

13. Genetic effects of population subdivision. Fragmentation and population structure. Measures of population structure: F statistics. Gene flow. (2 hours).

14. Implications for conservation of the spatial structure of populations. Population differentiation, local adaptation and metapopulation structure. Metapopulation models. Effects of parameters in the frequency of populations and the persistence of the metapopulation. (1 hour).

15. Degradation, destruction, fragmentation and pollution of ecosystems. Degradation and destruction. Fragmentation, spatial heterogeneity, edge effects and mosaics. Loss of species in the fragmentation processes. Effects of pollution on biodiversity. Sustainable exploitation of ecosystems (2 hours)

16. Invasive alien species. Implications on the diversity and functioning of ecosystems. Characteristics of invasiveness. Pathways. (1 hour).

17. Effects of species loss in the community. Effects of extinction depending on the structure of the food web. Measurements of the stability of the network (vulnerability, resilience, resistance). Analysis of the viability of communities (AVC): fragile networks, secondary extinctions and key species. Recent examples of chains of extinction. (1 hour)

18. Global change and biodiversity I:. Global change, ecosystems world system. Climate change: Paleo Perspective and trends. Effects of climate change on the life cycles of populations. Changing distribution and abundance. Possible evolutionary impact of CC. (1 hour).

19. Global change and biodiversity II: Impact on communities: species interactions. Effects on ecosystems: changes in biogeochemical cycles and radiation changes.

5. SECTION III -I- CONSERVATION STRATEGIES

20 Systematics and conservation. Conservation and evolution of species and populations, and management units. Evolutionary significant units (ESUs) and operational conservation units (OCUs). Traceability of individuals: forensic genetics. Hybridization of species. (1 hour).

21 Conservation of species and their variability. In situ conservation: Maintenance Technology genetic variation in managed populations. Translocation, reintroduction and reinforcement of individuals to maintain populations. Support measures for the species in situ, manipulation of the biological community or other measures. (2 hours)

22 Conservation of species and their variability. Ex situ conservation: criteria to be met. Zoos. Botanical Gardens. Vegetative conservation. Conservation in vitro. Banks of diversity: DNA banks, seed banks, preservation of pollen and seeds. Tissue culture. (1 hour)

23 Preservation of microorganisms. Principal methods of preservation. Ex situ conservation: the role of culture collections and services they offer to society. Biological Resource Centres and strategies of information management on microorganisms. (1 hour).

24 Conservation of plant species. Strategies for conservation of flora. Management plans for the conservation of flora. Microreserves. (1 hour)

6. SECTION III-II - CONSERVATION STRATEGIES

25. Conservation of animal species. Management of wildlife in natural ecosystems. Species of conservation interest. Management of game species (1 hour)

26. Actions on invasive species. Strategies for prevention and control of the invasion and its effects. (1 hour)

27. Conservation of habitats and ecosystems. Conservation planning: setting goals. Key elements of the ecosystem approach. Preservation of habitats, its structure and function: maintenance and resilience of ecological processes and key resources. Functional redundancy. Concept of environmental impact assessment and risk assessment. Temporary changes. Management plans. Types of modified landscapes. Conservation in modified landscapes. Adaptive conservation and climate change. Follow-up of conservation measures. (2 hours)

28 Protected and non-protected natural areas: Concept. Types. Criteria for the choice of areas to be

protected. Design, size and other characteristics. Reducing edge effects and fragmentation. Integration in the conservation strategy. Gap analysis. Conservation in unprotected areas. (1 hour)

29 Ecological networks. Spatial coherence of ecological networks. Ecological corridors and connectivity: importance for the maintenance of species and communities. The Natura 2000 network in Europe, the Spanish network of protected areas and other networks. (1 hour)

30 Beyond conservation: basic concepts of ecological restoration. Intervention: types, active measures. Ecological trajectory. Reference ecosystems. Basics of designing a restoration plan. (1 hour).

7. SECTION IV-PRACTICE

The practical part of the course will, in general, be integrated and articulated around to testing the key issues related to the conservation of biological diversity, in particular levels of organization. The integration is carried out mainly within the own course, but some practices may be articulated with other courses of intensification. Additionally, specific practices will also performed that are intended to confirm certain aspects of learning with applications in conservation biology, regardless of whether or not integrated in practice.

Previously learned techniques used in previous courses of the Degree in Biology will be used to obtain data necessary to address specific conservation issues. Likewise, other techniques not previously learned will also be included and learned. Together, the techniques to be tested in practice may include:

- Molecular techniques to assess genetic and taxonomic diversity.
- Strategies and tools for assessment and conservation of microbial diversity.
- Non-molecular techniques for determining the taxonomic diversity of higher organisms.
- Techniques for the study of biological communities, their similarities and interactions between its components.
- Assessment of the diversity of ecosystems and their characteristics, and the loss and degradation of habitats.
- Geo-referenced databases, Geographic Information Systems.

8. SECCION IV-II PRACTICE

The practical sessions will consist of the following:

Field Practices

Field trips will be made for work related to the theme of the course. By choosing a specific geographical environment, certain aspects of the conservation of biological complexity at different levels of organization will be addressed, covering aspects related to biological and other environmental sciences, including legal aspects and basic ecosociologics and the application of the techniques necessary to do so. These outputs will be coordinated with both practices to be done in the laboratory and those made in the computer room. Short-term field trips (1 day) and other more prolonged (several days) could be made, depending on availability and logistical development. The estimated duration of the field practice

is about 26 hours. Assistance to complete field practice is mandatory in order to be evaluated in the course.

Labs.

The laboratory practices will aim to test specific techniques and procedures to address specific issues related to conservation of biodiversity, including the study of genetic variability within populations level. The students will work with both samples taken during field practice and those provided by the teacher. The estimated duration of the labs practice is about 6 hours, divided into sessions of 2-3 hours. Attendance at a minimum of 80% of the laboratory practical sessions is mandatory.

9. SECTION IV-III PRACTICE

Practice in computer lab and problem-solving seminars.

Includes some classroom work before or after the field trips. The estimated duration of computers classroom practices in about 12 hours. Primarily addresses some of the following:

- Microbial Resources Internet catalogs, search engines and other tools.
- Estimates of genetic characteristics of a population or species.
- Population dynamics and population viability analysis.
- GIS - Preliminary study of the area for field trips. Representations.
- GIS - Analysis of data.

Case studies based on desk work.

Students will develop case studies using materials supplied by the teacher or obtained independently. These case studies will be introduced in tutorial groups, and should result in works that students will submit in the format specified by the teacher to each of them, , which will normally be seminars that should be presented to the rest of students and the teacher.

Work practices and application of knowledge acquired and criteria

Some practical work will consist in solving a case study on a specific aspect related to the conservation of a species (geographical and temporal scale appropriate) or an ecosystem, or other issues related to conservation biology. In this work, which will be linked to the practices of the course and conducted by groups, using knowledge and skills gained throughout the course, and must be submitted in the format specified by the teacher.

10. SEMINARS

The seminars will include development of specific topics, for the implementation or expansion of its content, and will be taught by specialists or by the students themselves in a study led by the teacher. Attending a minimum number of seminars will be required. The seminars may be scheduled together, when necessary, with other courses of intensification.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	53,00	100
Laboratory practices	30,00	100
Computer classroom practice	11,00	100
Tutorials	3,00	100
Classroom practices	3,00	100
Attendance at events and external activities	2,00	0
Development of group work	20,00	0
Development of individual work	10,00	0
Study and independent work	20,00	0
Readings supplementary material	8,00	0
Preparation of evaluation activities	40,00	0
Preparing lectures	20,00	0
Preparation of practical classes and problem	15,00	0
Resolution of case studies	15,00	0
TOTAL	**250,00**	

TEACHING METHODOLOGY

The course will be taught by performing different activities and the use of different methodologies, primarily:

- Lectures.
- Practices in the field.
- Practices in the laboratory.
- Practices in computer lab.
- Troubleshooting Classroom
- Seminars
- Group Tutorials.
- Case studies based on desk work.
- Application of practice and acquired knowledge and criteria in a specific work.

The virtual classroom will be used as a tool of communication and storage of work materials, among other possible uses. The specific and thematic bibliography does not fit in the space of this section of the teaching guide, for what is available to students in the "resources" the virtual classroom.

EVALUATION

Objective evidence, consisting of one or more tests which may consist of theoretical issues, practices, and problems: 60 %

Assessment of practical activities from the preparation of papers / reports and / or exhibition of these, including the preparation of seminars and the development of case studies: 40%

The mark will be global in each call, calculated by adding the scores from the previous paragraphs, provided that for each of the parts the rank is at least 4 out of 10. Otherwise the rank of the round will be “failing grade”. Failure to pass the subject in first round of the academic year, the qualifications of those parts of the course (from the two outlined in the table above) in which a grade of at least 50% of the score has been obtained will be saved for the second round within the same academic year. In no case will any of these qualifications be kept for the next academic year, except those from the field practices.

To request the advancement of the subject call, students must have completed the compulsory activities indicated in the course guide.

REFERENCES

Basic

- Groom, M. J.; G. K. Meffe, and C. R. Carroll (2006). Principles of Conservation Biology. Third Edition. Sinauer, Sunderland, MA
- Hunter M.L. and J. Gibbs (2007). Fundamentals of Conservation Biology. 3rd edition. Wiley-Blackwell
- Primack, R. B. y J. Ros. (2002). Introducción a la biología de la conservación. Ed. Ariel Ciencia. Barcelona.
- Primack R. B. (2006). Essentials of Conservation Biology, Fourth Edition. Sinauer Sunderland, MA
- Sodhi, N. S. and P. R Ehrlich (2010). Conservation Biology for All. Oxford University Press, Oxford, UK.
- Van Dyke, F. (2008). Conservation Biology: Foundations, Concepts, Applications. Springer, New York.
- Palero, F. y F. González-Candelas (2011). Introducció a la Genètica de la Conservació. Manual Docent UVEG. Aula Virtual.

Additional

- Ver listado en el aula virtual