COURSE DATA

DATA SUBJECT

Code: 47174
Name: Técnicas de conservación in situ y ex situ
Cycle: Master's Degree
ECTS Credits: 3
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
2291 - Master's degree in Biodiversity: Conservation and Evolution	Facultat de Ciències Biològiques	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2291 - Master's degree in Biodiversity: Conservation and Evolution		

COORDINATION

BALLESTEROS BARGUES DANIEL

ALBERTOS BOFARULL BELEN

SUMMARY

Living beings are fundamental to life on Earth, providing food, oxygen, and other essential resources, and the conservation of biodiversity is crucial for protecting ecosystems and ensuring human well-being. Biological conservation is the discipline that addresses the study of and strategies for preserving biodiversity, and the techniques developed in this context are intended to protect organisms and their ecosystems, both within and outside their natural habitats. This course will cover the fundamental aspects of in situ and ex situ conservation from a theoretical and practical perspective. This includes the protection of threatened species, the restoration of degraded areas, the sustainable management of natural resources, and the promotion of awareness about the importance of biological diversity.
In detail, biological conservation encompasses the following aspects:
• In situ conservation: protection of living organisms in their natural habitats, whether protected areas or not (nature reserves, national parks).
• Ex situ conservation: conservation of living organisms outside their natural habitats, such as in germplasm banks or living collections (zoos, botanical gardens).
• Ecosystem restoration: recovery of areas degraded or damaged by human activities, such as mining or intensive agriculture.
• Education and awareness: Disseminating knowledge about the importance of conservation is fundamental to engaging society in its protection.
• Scientific research: Research on the biology of living organisms, their interactions with the environment,

and conservation techniques is essential to improving the effectiveness of protection measures.
The course "Techniques for in situ and ex situ conservation" will introduce students to all these areas, emphasizing the most common conservation techniques applied to plants and animals.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

No prior requirements or recommendations.

COMPETENCES / LEARNING OUTCOMES

2291 - Master's degree in Biodiversity: Conservation and Evolution

Act autonomously in learning, making informed decisions in different contexts, forming judgements based on experimentation and analysis, and transferring knowledge to new situations.

Apply acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to biodiversity and conservation.

Apply acquired research experience to initiate the research phase of a doctoral programme in topics related to biodiversity evolution and conservation.

Apply critical reasoning and post-formal thinking to problem-solving in conservation and sustainability contexts where the social dimension is fundamental.

Collaborate effectively in teams, assuming responsibilities and leadership roles and contributing to collective improvement and development.

Communicate effectively, both orally and in writing, adapting to the characteristics of the situation and the audience.

Contribute originality to the development and/or application of ideas to solve problems related to biodiversity, its evolution and conservation, often in a research context.

Contribute to the design, development and implementation of solutions that respond to societal demands, taking the Sustainable Development Goals as a reference framework.

Critically use tools and information sources, as well as relevant databases and specialised software, to carry out research and projects on biodiversity, conservation and evolution.

Demonstrate critical and self-critical reasoning in the field of study, considering professional ethics, moral values and the social implications of the activities undertaken.

Design and plan studies involving biodiversity inventories, and the use of GIS tools and thematic maps for the management and conservation of biodiversity and geodiversity, in both private companies and public

institutions.

Design studies to assess the conservation status of species, communities and ecosystems, identifying potential threat factors and applying environmental management and restoration techniques when necessary.

Establish the scientific basis for developing in situ and ex situ conservation strategies for threatened or endangered species.

Implement appropriate sampling, analysis and data interpretation methods in biodiversity conservation and management contexts, applying acquired knowledge and problem-solving skills in new, unfamiliar or multidisciplinary settings related to the field of study.

Incorporate into research or professional activity an explicit commitment to fundamental rights and duties, the environment and democratic values, in accordance with the Sustainable Development Goals, with the aim of achieving common sustainability objectives.

Possess sufficient scientific foundations and technical knowledge to prepare action plans or project proposals related to biodiversity assessment, management and conservation at different scales.

Present and defend research results publicly, before both specialised and non-specialised audiences, in a clear and rigorous manner.

Propose creative and innovative solutions to complex situations or problems within the field of study, addressing diverse professional and social needs.

Recall the fundamentals of international, national and regional legislation and regulations affecting biodiversity conservation and the habitats that support it (geodiversity).

Understand and recognise, from within the discipline, inequalities based on sex and gender in society; integrate the different needs and preferences related to sex and gender into the design of solutions and problem-solving processes.

Understand basic sampling designs and techniques for different groups of organisms, in both terrestrial and aquatic ecosystems, to address research and conservation problems.

Understand the nature and dimensions of biodiversity, from molecules to ecosystems, as well as the main methodologies used to understand its functioning at different levels of organisation, and promote sustainable development.

Understand theories and principles that, from a multidisciplinary perspective (including scientific, ethical, socioeconomic and political aspects), allow informed decision-making in biodiversity conservation.

Work effectively in a team, fostering interpersonal relationships in multidisciplinary contexts and assuming leadership when necessary for the development of professional and/or research work on biodiversity.

DESCRIPTION OF CONTENTS

This subject covers aspects related to the most significant techniques used in biodiversity conservation,

with an emphasis on plant conservation as an example of their application.
Contents included:
Module 1: Introduction to biological conservation. Reproductive biology of threatened species. Genetic variability and the most appropriate techniques for its study and preservation. Conservation organizations. Threat categories. Species assessment processes. Guidelines for reintroductions and other translocations for conservation purposes.
Module 2: In situ conservation techniques: Habitat management. Main in situ conservation designations (protected natural areas). Species recovery, conservation, and management plans.
Module 3: Ex situ conservation techniques: Types of germplasm and their collection. Living collections. Germplasm banks. In vitro conservation and cryopreservation. Germplasm viability and regeneration or rearing for translocations.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	16,00
Laboratory	14,00
Total hours	**30,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	20,00
Independent study and work	10,00
Preparation of lessons	0,00
Preparation for assessment activities	15,00
Resolution of case studies	0,00
Total hours	**45,00**

TEACHING METHODOLOGY

To achieve the objectives of this course, the teaching is structured in two main parts: a theoretical program with three modules, which will be developed over ten lecture sessions, and a practical program consisting of one laboratory session and two field trips and/or visits to experimental centers to observe real-world conservation practices. The content of both is complementary and coordinated, so that the theoretical content is explained before the corresponding practical session.
Lectures: Over ten one-hour lecture and interactive sessions, the instructors will explain the fundamental concepts of each module, using available audiovisual resources. These presentations will be accessible to students through the Virtual Classroom.
The methodology used will therefore be:
• Presentation of fundamental concepts using audiovisual resources.
• Interactive sessions with group discussion of key topics.
Field trips: Two field trips will be conducted, one of which will be a full day trip. These will involve analyzing in situ conservation cases or visiting experimental centers to learn about both in situ and ex situ conservation practices.
Laboratory practical session: Some ex situ conservation topics will be covered in the laboratory. During a three-hour session, the most common methods and techniques for ex situ germplasm conservation,

including cryopreservation, will be addressed.
Seminars: During the seminars, students will orally present the results of an assigned in situ and/or ex situ conservation case study. The seminars will include discussions on possible interpretations and the resolution of the hypotheses presented.

EVALUATION

The subject will be assessed in both its theoretical and practical aspects.
• **Exam** based on the learning outcomes and specific objectives of the course in its theoretical and practical components: 70% of the grade.
• Attendance and **participation** in lectures and practical sessions will account for 5% of the final grade.
• **Seminars** and comprehension tests will be graded. Seminar attendance is mandatory. After the final presentations, the seminars will be evaluated based on their content, presentation, delivery, and defense. A short question from the seminars may be included in the theory/practice exam to assess comprehension of all seminars presented, including the student's own: 25% of the final grade.
All items must have a score of 5 or higher, and the final grade to pass the course must be 5 or higher out of 10 points.

REFERENCES

Referencias básicas
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Breman, E., Ballesteros, D., Castillo-Lorenzo, E., Cockel, C., Dickie, J., Faruk, A., ... & Ulian, T. (2021). Plant diversity conservation challenges and prospects—the perspective of botanic gardens and the Millennium Seed Bank. Plants, 10(11), 2371.
Convention on Biological Diversity (CBD). (2020). Global Strategy for Plant Conservation: 2021–2030.
Domínguez Lozano, F. 2019 Mundi-Prensa ¿Qué sabes sobre biodiversidad?:Preguntas y respuestas en torno a la Biología de la Conservación.
Guerrant, E.O.; K. Havens-Young, M. Maunder (Eds) 2004. Ex Situ Plant Conservation Supporting Species Survival In The Wild. Island Press, Washington, D.C. 536 pages
Elzinga, C. L., et al. (1998). Measuring and monitoring Plant Populations. Colorado, Bureau of Land Management/The Nature Conservancy.
Garilleti, R., & Albertos, B. (2012). Atlas y libro rojo de los briófitos amenazados de España.
IUCN/SSC (2013). Guidelines for Reintroductions and Other Conservation Translocations. Gland, Switzerland: IUCN Species Survival Commission.
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DirecciónGeneraldeMedioNaturalyPolíticaForestal(MinisteriodeMedioAmbiente,yMedioRuralyMarino)-SociedadEspañoladeBiologíadela Conservación de Plantas.
Nagel, M., Pence, V., Ballesteros, D., Lambardi, M., Popova, E., & Panis, B. (2024). Plant cryopreservation: Principles, applications, and challenges of banking plant diversity at ultralow temperatures. Annual Review of Plant Biology, 75.

Recursos en linea
ATLAS DE LA FLORA VASCULAR AMENAZADA: https://www.miteco.gob.

es/es/biodiversidad/temas/inventarios-nacionales/inventario-especies-terrestres/ieet_flora_vascular.html
IUCN Red List: https://www.iucnredlist.org
(Evaluación de especies amenazadas, criterios, fichas técnicas)
BGCI PlantSearch Database: https://www.bgci.org/plantsearch.php
(Localización de especies en jardines botánicos a nivel mundial)
FAO WIEWS – World Information and Early Warning System on Plant Genetic Resources: https://www.fao.org/wiews/en/
(Gestión de recursos genéticos vegetales para la agricultura)