

## Guía docente / *Course Syllabus*

2018-19

### 1. Descripción de la Asignatura / *Course Description*

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| Asignatura<br><i>Course</i>                                | MÉTODOS DE MUESTREO EN ECOLOGÍA (docencia en inglés) |
| Códigos<br><i>Code</i>                                     | 203103   |
| Facultad<br><i>Faculty</i>                                 | Facultad de Ciencias Experimentales                  |
| Grados donde se imparte<br><i>Degrees it is part of</i>    | Grado en Ciencias Ambientales                        |
| Módulo al que pertenece<br><i>Module it belongs to</i>     | Materias optativas                                   |
| Materia a la que pertenece<br><i>Subject it belongs to</i> | Técnicas ambientales                                 |
| Departamento responsable<br><i>Department</i>              | Sistemas Físicos, Químicos y Naturales               |
| Curso<br><i>Year</i>                                       | 4º   |
| Semestre<br><i>Tern</i>                                    | 2º   |
| Créditos totales<br><i>total credits</i>                   | 6  |
| Carácter<br><i>Type of course</i>                          | Optativa   |
| Idioma de impartición<br><i>Course language</i>            | Inglés   |
| Modelo de docencia<br><i>Teaching model</i>                | C2   |

Clases presenciales del modelo de docencia C2 para cada estudiante: 23 horas de enseñanzas básicas (EB), 15 horas de enseñanzas prácticas y de desarrollo (EPD) y 7 horas de actividades dirigidas (AD). Hasta un 10% de la enseñanza presencial puede sustituirse por docencia a distancia (también presencial, pero posiblemente asincrónica), de acuerdo con la programación de la Asignatura publicada antes del comienzo del curso.

*Number of classroom teaching hours of C2 teaching model for each student: 23 hours of general teaching (background), 15 hours of theory-into-practice (practical group tutoring and skill development) and 7 hours of guided academic activities. Up to 10% of face-to-face sessions can be substituted by online teaching, in accordance with the course schedule published before it begins.*

## 2. Responsable de la Asignatura / *Course Coordinator*

## 3. Ubicación en el plan formativo / *Academic Context*

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| Breve descripción de la asignatura<br><i>Course description</i>                     | This course offers a hands-on learning about methods to design sampling programs to study a variety of organisms in the field, as well as specific approaches to handle and analyse ecological data. Students work in groups and are involved in designing field sampling programs, sampling and studying natural populations, compiling and entering data into computer data files, analyzing data, and interpreting and presenting the results. The final aim of this course is to provide students with general abilities required to design, perform and present a scientific research. |
| Objetivos (en términos de resultados del aprendizaje)<br><i>Learning objectives</i> | <ol style="list-style-type: none"><li>1. Be able to apply the most commonly used techniques in plant and animal studies.</li><li>2. Know and understand the concept of an environmental factor as well as the response of living organisms to environmental physical factors.</li><li>3. Know and understand the main types of interactions between living organisms.</li><li>4. Design and perform a scientific project.</li></ol>   |
| Prerrequisitos<br><i>Prerequisites</i>  | No special skills are required for the students to enrol in this course. However, it is advisable that the student has successfully passed the courses of Statistics, Biology, and Ecology. It is also advisable that the student has a reasonable level of English as classes, discussions and reports should be done in this language.  |
| Recomendaciones<br><i>Recommendations</i>   | It is advisable that the student has successfully passed the courses of Statistics, Biology, and Ecology, and has a reasonable level of English.  |
| Aportaciones al plan formativo<br><i>Contributions to the educational plan</i>      | This course offers a hands-on learning about methods to design sampling programs to study a variety of organisms in the field, as well as specific approaches to handle and analyse ecological data. Students work in groups and are involved in designing field sampling programs, sampling and studying natural populations, compiling and entering data into computer data files, analyzing data, and interpreting and presenting the results. The final aim of this course is to provide students with general abilities required to design, perform and present a scientific research. |

## 4. Competencias / *Skills*

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| Competencias básicas de la Titulación que se desarrollan en la Asignatura<br><i>Basic skills of the Degree that are developed in this Course</i> | <p>CB1 - Que los estudiantes hayan demostrado poseer y comprender conocimientos en un área de estudio que parte de la base de la educación secundaria general, y se suele encontrar a un nivel que, si bien se apoya en libros de texto avanzados, incluye también algunos aspectos que implican conocimientos procedentes de la vanguardia de su campo de estudio</p> <p>CB2 - Que los estudiantes sepan aplicar sus conocimientos a su trabajo o vocación de una forma profesional y posean las competencias que suelen demostrarse por medio de la elaboración y defensa de argumentos y la resolución de problemas dentro de su área de estudio</p> <p>CB3 - Que los estudiantes tengan la capacidad de reunir e interpretar datos relevantes (normalmente dentro de su área de</p> |
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|   | <p>estudio) para emitir juicios que incluyan una reflexión sobre temas relevantes de índole social, científica o ética</p> <p>CB4 - Que los estudiantes puedan transmitir información, ideas, problemas y soluciones a un público tanto especializado como no especializado</p> <p>CB5 - Que los estudiantes hayan desarrollado aquellas habilidades de aprendizaje necesarias para emprender estudios posteriores con un alto grado de autonomía</p>   |
| <p>Competencias generales de la Titulación que se desarrollan en la Asignatura</p> <p><i>General skills of the Degree that are developed in this Course</i></p>         | <p>CG1 - Comprensión de conocimientos en el área del Medio Ambiente a un nivel propio de libros de texto avanzados y textos científicos especializados</p> <p>CG2 - Capacidad de análisis y síntesis. Elaboración y defensa de argumentos</p> <p>CG3 - Comunicación oral y escrita</p> <p>CG4 - Resolución de problemas y toma de decisiones</p> <p>CG5 - Trabajo en equipo</p> <p>CG6 - Reconocimiento de la diversidad</p> <p>CG7 - Razonamiento crítico</p> <p>CG8 - Compromiso ético</p> <p>CG9 - Aprendizaje autónomo</p> <p>CG10 - Creatividad</p> <p>CG11 - Capacidad de reunir e interpretar datos relevantes para emitir juicios que incluyan una reflexión sobre temas clave de índole social, científica o ética</p> <p>CG12 - Motivación por la calidad</p> <p>CG13 - Sensibilidad hacia los temas medioambientales</p> <p>CG14 - Capacidad para aplicar conocimientos teóricos a casos prácticos</p> <p>CG15 - Capacidad de comunicarse con especialistas y con personas no expertas en la materia</p> <p>CG16 - Desarrollo de habilidades de aprendizaje necesarias para emprender estudios posteriores con un alto grado de autonomía</p> <p>CG17 - Competencias en el campo de emprendimiento o de la cultura emprendedora dentro del ámbito de las Ciencias Ambientales</p> <p>CG18 - Competencias en el Campo de las nuevas tecnologías y la gestión de la innovación</p> <p>CG19 - Respeto a los derechos humanos, el acceso para todos y la voluntad de eliminar factores discriminatorios como el género y el origen</p> |
| <p>Competencias transversales de la Titulación que se desarrollan en la Asignatura</p> <p><i>Transversal skills of the Degree that are developed in this Course</i></p> |   |
| <p>Competencias específicas de la Titulación que se desarrollan en la Asignatura</p> <p><i>Specific competences of the Degree that are developed in the Course</i></p>  | <p>CE8 - Conocer las relaciones de los seres vivos con el medio ambiente</p> <p>CE9 - Conocer los principios básicos de la Dinámica de Poblaciones</p> <p>CE10 - Conocer y dominar los procedimientos para estimar e interpretar la sucesión ecológica y la biodiversidad</p> <p>CE41 - Conocer las dimensiones temporales y espaciales de los procesos ambientales</p> <p>CE48 - Dominar las destrezas necesarias para el trabajo de laboratorio en Ciencias Experimentales</p> <p>CE78 - Ser capaz de elaborar un trabajo individual original, técnico</p>  |

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|  | o de investigación, y de temática medioambiental<br>CE79 - Saber diseñar muestreos y tratar e interpretar datos de resultados estadísticos<br>CE80 - Saber manejar programas estadísticos  |
| Competencias particulares de la asignatura, no incluidas en la memoria del título<br><i>Specific skills of the Course, not included in the Degree's skills</i> | <ul style="list-style-type: none"> <li>• To master mathematical tools (algebra, calculus) for solving problems related to the environment (COMPETENCE 1)</li> <li>• To know and apply the terminology and units of measurement in Experimental Sciences (COMPETENCE 3)</li> <li>• To master the skills needed for laboratory work in Experimental Sciences (COMPETENCE 4)</li> <li>• To know the relationships between living organisms and their environments (COMPETENCE 12)</li> <li>• To know the basic principles of population dynamics (COMPETENCE 13)</li> <li>• To know and master procedures for estimating and interpreting ecological succession and biodiversity (COMPETENCE 14)</li> <li>• To have basic knowledge of plant biodiversity and phytogeography (COMPETENCE 15)</li> <li>• To have basic knowledge of animal biodiversity and zoogeography (COMPETENCE 17)</li> <li>• To be able to develop an original technical or research work related to the environmental sciences (COMPETENCE 74)</li> <li>• To know how to design sample procedures, and analyse and interpret statistical results (COMPETENCE 75)</li> <li>• To know how to deal with statistical programs (COMPETENCE 76)</li> </ul> |

#### 5. Contenidos de la Asignatura: temario / *Course Content: Topics*

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| <b>PARTE I</b>   | <b>INTRODUCTION TO THE EXPERIMENTAL DESIGN.</b>  |
| <b>PARTE II</b>  | <b>INTRODUCTION TO SAMPLING METHODS FOR PLANT AND ANIMAL POPULATIONS IN TERRESTRIAL ECOSYSTEMS. GENERAL ASPECTS OF SAMPLING; TRANSECTS, QUADRATS, INTERCEPTION LINES AND INTERCEPTION POINTS.</b>  |
| <b>PARTE III</b> | <b>DIFFERENCES BETWEEN ANIMAL AND PLANT SAMPLING METHODS. QUANTITATIVE AND QUALITATIVE METHODS (PRESENCE-ABSENCE DATA, DENSITY, ABUNDANCE, COVER, POPULATION SIZE, ...). SAMPLE SIZE. SPECIES ACCUMULATION CURVES.</b>                                     |
| <b>PARTE IV</b>  | <b>DESIGN AND FIELD SAMPLING AND/OR LABORATORY EXPERIMENTS. PLANT AND ANIMAL SAMPLING METHODS IN THE FIELD. BIRD CENSUS TECHNIQUES. SPECIES-FACTOR RELATIONSHIPS. SOIL PARAMETERS. POPULATION GROWTH. CLIMATIC DATA AND PLANT GROWTH. CITIZEN SCIENCE.</b> |
| <b>PARTE V</b>   | <b>SCIENTIFIC PROJECT: DESIGN, SAMPLING, DATA ANALYSIS AND RESULT. SCIENTIFIC CONGRESS.</b>  |

#### 6. Metodología y recursos / *Methodology and Resources*

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| Metodología general<br><i>Methodology</i> | The teaching-learning process of this course includes theoretical classes, practical classes, seminars and tutorials. Altogether, these methodologies guarantee the best training of the students during the course. At the same time, this methodology promotes the |
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|  | development and exercise of both generic and specific skills in Ecology.  |
| Enseñanzas básicas (EB)<br><i>General teaching</i>                         | The theoretical teaching sets the basis on which the students construct their knowledge, as in these theoretical classes the student receives key information to carry out the practical activities. The theoretical classes include explanations from the instructor, individual readings and study from the students (including the search for extra information), as well as group work in which the students discuss their doubts. The general class discussion is oriented to reinforce the abilities of the students to speak to the audience and defend their personal opinions. |
| Enseñanzas prácticas y de desarrollo (EPD)<br><i>Theory-into-practice</i>  | The practical classes are conducted in groups and prepared by the students under the supervision of the instructor. They are accompanied by a series of questions that allow evaluating the level of comprehension and assimilation of the concepts. The practical classes require a high level of independence among the students, together with a strong self-responsibility and commitment to the work. The practical classes are complementary to the theoretical lessons and represent a synthesis of theory, and experimentation to check the students' acquisition of knowledge. |
| Actividades académicas dirigidas (AD)<br><i>Guided academic activities</i> | The tutorials solve problems that might arise during the formative process. During the tutorials, which can be conducted individually or in groups, the students discuss questions and expand information.<br>The final work is a research project performed by the students at the end of the course. This part of the course is very important to show how the basic concepts acquired can be translated into a true case study   |

## 7. Criterios generales de evaluación / *Assessment*

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| Primera convocatoria ordinaria<br>(convocatoria de curso)<br><i>First session</i>                              | El 100% de la calificación procede de la evaluación continua.<br>El 0% de la calificación procede del examen o prueba final.<br>The evaluation is a comprehensive compilation of the work performed by the student during the course, including: <ul style="list-style-type: none"> <li>• Discussion and participation during the theoretical classes (15%).</li> <li>• Active work in practical classes (20%).</li> <li>• Seminars to present and discuss practical classes (15%).</li> <li>• Reports about the laboratory and field-work procedures (10%).</li> <li>• Final project. (i) written report (50%) and (ii) oral presentation (50%) (40%).</li> </ul> |
| Segunda convocatoria ordinaria<br>(convocatoria de recuperación)<br><i>Second session (to re-sit the exam)</i> | The evaluation includes: <ul style="list-style-type: none"> <li>• Discussion about the theoretical classes (25%).</li> <li>• Oral presentation of the work performed during the practical classes (25%).</li> <li>• Final project. (i) written report (50%) and (ii) oral presentation (50%) (50%).</li> </ul>   |
| Convocatoria extraordinaria de noviembre<br><i>Extraordinary November session</i>                              | Se activa a petición del alumno siempre y cuando éste esté matriculado en todas las asignaturas que le resten para finalizar sus estudios de grado, tal y como establece la Normativa de Progreso y Permanencia de la Universidad.<br>Se evaluará del total de los conocimientos y competencias que figuren en la guía docente del curso anterior, mediante el sistema de prueba única.<br>The evaluation includes:  |

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|   | <ul style="list-style-type: none"> <li>• Discussion about the theoretical classes (25%).</li> <li>• Oral presentation of the work performed during the practical classes (25%).</li> <li>• Final project. (i) written report (50%) and (ii) oral presentation (50%) (50%).</li> </ul>  |
| <p>Criterios de evaluación de las enseñanzas básicas (EB)<br/><i>General teaching assessment criteria</i></p>                               | <p>Durante la evaluación continua: Discussion and participation during the theoretical classes</p> <p>Durante el examen o prueba final (1ª convocatoria): Discussion about the theoretical classes</p> <p>Durante el examen o prueba final (2ª convocatoria): Discussion about the theoretical classes</p>   |
| <p>Criterios de evaluación de las enseñanzas prácticas y de desarrollo (EPD)<br/><i>Theory-into-practice assessment criteria</i></p>        | <p>Durante la evaluación continua: • Active work in practical classes (20%).</p> <ul style="list-style-type: none"> <li>• Seminars to present and discuss practical classes (15%).</li> <li>• Reports about the laboratory and field-work procedures (10%).</li> </ul> <p>Durante el examen o prueba final (1ª convocatoria): Oral presentation of the work performed during the practical classes</p> <p>Durante el examen o prueba final (2ª convocatoria): Oral presentation of the work performed during the practical classes</p> |
| <p>Criterios de evaluación de las actividades académicas dirigidas (AD)<br/><i>Criteria of assessment of guided academic activities</i></p> | <p>Durante la evaluación continua: • Final project. (i) written report and (ii) oral presentation</p> <p>Durante el examen o prueba final (1ª convocatoria): Final project. (i) written report and (ii) oral presentation</p> <p>Durante el examen o prueba final (2ª convocatoria): Final project. (i) written report and (ii) oral presentation</p>  |
| <p>Puntuaciones mínimas necesarias para aprobar la Asignatura<br/><i>Minimum passing grade</i></p>  | <p>1ª convocatoria: To pass the exam, students should be able to discuss methods commonly used to sample animal and plant populations, criteria to select sample size, and procedures to perform a scientific research. Minimum mark: 5</p> <p>2ª convocatoria: To pass the exam, students should be able to discuss methods commonly used to sample animal and plant populations, criteria to select sample size, and procedures to perform a scientific research. Minimum mark: 5</p>  |
| <p>Material permitido<br/><i>Materials allowed</i></p>  | <p>There is no restriction about the materials to be used during the exams (books, scientific articles, personal computers)</p>  |
| <p>Identificación en los exámenes<br/><i>Identification during exams</i></p>  | <p>En cualquier momento de la realización de una prueba de evaluación los profesores podrán requerir la acreditación de la identidad de cualquier estudiante, mediante la exhibición de su carnet de estudiante, documento nacional de identidad, pasaporte u otro documento válido a juicio del examinador. Si no lo hiciese, el estudiante podrá continuar la prueba, que será calificada solo si la documentación es presentada en el plazo que el examinador establezca.</p>   |
| <p>Observaciones adicionales<br/><i>Additional remarks</i></p>  |  |

Los estudiantes inmersos en un programa de movilidad o en un programa de deportistas de alto nivel, así como los afectados por razones laborales, de salud graves o por causas de fuerza mayor debidamente acreditadas, tendrán derecho a que en la convocatoria de curso se les evalúe mediante un sistema de evaluación de prueba única. Para ello, deberán comunicar la circunstancia al profesor responsable de la asignatura antes del fin del periodo docencia presencial.

*Students enrolled in a mobility program or a program for high-level athletes, as well as students affected by work or serious health problems or reasons of force majeure duly accredited, will have the right to be evaluated during the first session through a single test evaluation system. To do this, they must report changes in their circumstances to the program coordinator before the end of the teaching period.*

## 8. Bibliografía / Bibliography

- Begon, M., Harper, J.L. y Townsend, C.R. (1988) “Ecología. Individuos, poblaciones y comunidades.”, *Omega, Barcelona*.
- Brower, J.E., Zar, J.H., von Ende, C.N. (1998) “Field and laboratory methods for general ecology.”, *McGraw-Hill, Boston, MA*
- Hulbert, S.H. (1984) “Pseudoreplication and the design of ecological field experiments.”, *Ecological Monographs 54* , pp. 187-211
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- Manly, B.F.J. (1992) “The design and analysis of research studies”, *Cambridge University Press, UK*
- Mostacedo, B. y Todd, S.F. (2000) “Manual de Métodos Básicos de Muestreo y Análisis en Ecología Vegetal”, *BOLFOR, Santa Cruz de la Sierra*
- Underwood, A.J. (1997) “Experiments in ecology: Their logical design and interpretation using analysis of variance”, *Cambridge University Press, UK*