



1. General information

Course: APPLIED ECOLOGY IN CIVIL ENGINEERING
 Type: CORE COURSE
 Degree: 345 - UNDERGRADUATE DEGREE PROGRAMME IN CIVIL ENGINEERING
 Center: 603 - E.T.S. CIVIL ENGINEERS OF CR
 Year: 2

Code: 38314
 ECTS credits: 6
 Academic year: 2023-24
 Group(s): 20
 Duration: First semester
 Second language: English
 English Friendly: Y
 Bilingual: Y

Main language: Spanish

Use of additional languages:
 Web site:

| Lecturer: MAXIMO FLORIN BELTRAN - Group(s): 20 | | | | |
|--|--|--------------|-----------------------|--|
| Building/Office | Department | Phone number | Email | Office hours |
| Edificio Politécnico / 2D61 | CIENCIA Y TECNOLOGÍA AGROFORESTAL Y GENÉTICA | 926295209 | maximo.florin@uclm.es | Mondays and Thursdays, from 15-18 h, or at any other day and time, previous appointment. |

2. Pre-Requisites

- Statistics
- Graphic and Cartographic Expression
- Descriptive Geometry
- Computing
- Fundamentals of Physics
- Topography

3. Justification in the curriculum, relation to other subjects and to the profession

It is impossible to carry out a wise and sustainable planning of our ecosystems without knowing the mechanisms that control the various processes of their functioning. The situation is worsened, in many cases, not because that precise knowledge is lacking, but because many of the problems related to decision-making result from the lack of bridges between different approaches to the understanding of nature. This fact is reflected in the absence of conceptual and methodological proposals in which the territory is considered as a set of elements that interact with each other. The ecosystemic approach is nothing more than a line of thought and methodological strategy that allows analyzing and modeling the complex system of biophysical interrelations, among which man is included, which defines the natural environment. It takes the ecologist as a general framework of reasoning, it uses the renewed concept of ecosystem, and as the main thread of his argument, the integration of knowledge coming not only from ecology but also from other disciplines belonging to the field of environmental sciences and the ecosystemic approach is nourished by the theoretical and applied principles of three major disciplines belonging to the field of natural science, ecology, geomorphology and hydrology, without dismissing the knowledge of other sciences with abiotic or biotic approach. Its field of action relates to ecosystems destroyed or highly degraded, entering the terrain of the so-called ecological engineering; also called ecotechnology, is defined as the design that makes human society of the natural environment for the benefit of both. Its basic objectives are focused on the functional restoration of ecosystems highly altered by human activities and in the design and creation of new ecosystems with ecological and social values that self-organize with small amounts or without supplementary energy. Through ecological engineering, the ecosystem approach is integrated with environmental technologies, especially environmental engineering, involved in the practice of principles and technologies related to the resolution of pollution problems.

4. Degree competences achieved in this course

| Code | Description |
|-------|--|
| CE20 | Students have the capacity to apply methodologies for environmental impact assessments and studies |
| CE32 | Students have knowledge and understanding of ecosystem structure and functioning, landscape and environmental factors. |
| CE33 | Students have the ability to apply ecological and landscape criteria to the practice of the profession of Civil Engineer in general, with special attention to the functions of design, project, construction, operation and monitoring. |
| CE34 | Students reach the understanding of the ecological, environmental and landscape constraints of a technical and legal nature that arise in the construction of a public work, and the ability to use proven methods and technologies, with the aim of achieving the greatest efficiency in construction while respecting the environment. |
| CE35 | Students have the capacity for integrated management and sustainable use of water and energy resources. |
| CE36 | Students have the capacity to carry out studies on spatial planning and on the environmental aspects related to infrastructures. |
| TSU04 | Students have knowledge of the impact of infrastructure on spatial planning and have knowledge to participate in the urban development, such as water supply, sanitation, waste management, transportation systems, traffic, lighting, etc. |

5. Objectives or Learning Outcomes

Course learning outcomes
 Description
 Students can define territorial and urban planning criteria and linear infrastructure layout based on the diagnosis, analysis and interpretation of ecosystem sectorization and classification and ecological, environmental, landscape and cultural processes at different scales of space, time and level of organization (main competency E5; secondary competencies E1, E2, E3).
 Application of environmental assessment techniques for the design, review and improvement of civil engineering projects and the planning of remedial action, compensation and ecological restoration, and development of innovations, based on the analysis of ecosystem responses to natural and human disturbances and understanding of the ecological effects of civil engineering on ecosystems (core competencies CRC11, E3; secondary competency E5).
 Sustainability in the design, development, implementation, operation and monitoring of civil engineering projects, in cooperation with the life support system, through the application of tools for the assessment and analysis of the structure and functioning of ecosystems and the landscape (core competencies E1 and E2; secondary competencies E3 and E5).
 Students can define design criteria for hydraulic and environmental engineering projects from the river basin scale to the aquatic habitat scale, considering temporal variability from daily to interannual, using standardized office, field and laboratory techniques for the diagnosis and physical, chemical and biological analysis of the condition of water bodies (core competencies TSU4 and E4; secondary competencies E1, E2, E3).

6. Units / Contents

- Unit 1: Introduction to ecology and environment
- Unit 2: Energy and matter flows through ecosystems
- Unit 3: Populations and communities
- Unit 4: Ecosystem dynamics
- Unit 5: Mediterranean ecosystems
- Unit 6: Qualitative and quantitative methods in ecology
- Unit 7: Ecology and management of natural resources
- Unit 8: Environmental conflicts
- Unit 9: Ecological and social basis of landscape
- Unit 10: Introduction to land planning
- Unit 11: Environmental protection systems
- Unit 12: Environmental impact assessment

7. Activities, Units/Modules and Methodology

| Training Activity | Methodology | Related Competences (only degrees before RD 822/2021) | ECTS | Hours | As | Com | Description |
|---|--------------------------------------|---|------|-------|----|-----|--|
| Class Attendance (theory) [ON-SITE] | Lectures | CE20 CE32 CE33 CE34 CE35 CE36 | 0.48 | 12 | Y | Y | Recoverable in the final exam and / or in the extraordinary. The evaluation will be made from the results of the teacher's questions, cooperative learning, flipped class, etc. The non-compulsory nature of class attendance is recognized in the right to non-continuous evaluation. In the "Non-continuous evaluation" modality, the monitoring will be carried out through concerted tutorships. |
| Study and Exam Preparation [OFF-SITE] | Self-study | CE20 CE32 CE33 CE34 CE35 CE36 | 1 | 25 | Y | N | It will be evaluated through tutorials. |
| Problem solving and/or case studies [ON-SITE] | Project/Problem Based Learning (PBL) | CE20 CE32 CE33 CE34 CE35 CE36 | 0.16 | 4 | Y | Y | Recoverable in the final exam and / or in the extraordinary. In the "Non-continuous evaluation" modality, the monitoring will be carried out through concerted tutorships. |
| Problem solving and/or case studies [ON-SITE] | Case Studies | CE20 CE32 CE33 CE34 CE35 CE36 | 0.16 | 4 | Y | Y | Recoverable in the final exam and / or in the extraordinary. In the "Non-continuous evaluation" modality, the monitoring will be carried out through concerted tutorships. |
| Study and Exam Preparation [OFF-SITE] | Cooperative / Collaborative Learning | CE20 CE32 CE33 CE34 CE35 CE36 | 0.72 | 18 | Y | N | It will be evaluated through tutorials. |
| Progress test [ON-SITE] | Assessment tests | CE20 CE32 CE33 CE34 CE35 CE36 | 0.04 | 1 | Y | N | |
| Final test [ON-SITE] | Assessment tests | CE20 CE32 CE33 CE34 CE35 CE36 | 0.04 | 1 | Y | Y | |
| Analysis of articles and reviews [OFF-SITE] | Workshops and Seminars | CE20 CE32 CE33 CE34 CE35 CE36 | 0.8 | 20 | Y | N | The details on the content, length and requirements of the written submissions will be indicated in Moodle at the beginning of the semester. |
| Writing of reports or projects [OFF-SITE] | Workshops and Seminars | CE20 CE32 CE33 CE34 CE35 CE36 | 0.08 | 2 | Y | N | The details on the content, length and requirements of the written submissions will be indicated in Moodle at the beginning of the semester. |
| Project or Topic Presentations [ON-SITE] | Workshops and Seminars | CE35 | 0.04 | 1 | Y | Y | Recoverable in the final exam and / or in the extraordinary. In the "Non-continuous evaluation" modality, the monitoring will be carried out through concerted tutorships. |
| Workshops or seminars [ON-SITE] | Workshops and Seminars | CE20 CE32 CE33 CE34 CE35 CE36 | 0.4 | 10 | Y | Y | Recoverable in the final exam and / or in the extraordinary. In the "Non-continuous evaluation" modality, the monitoring will |

| On-line Activities [OFF-SITE] | Workshops and Seminars | CE20 CE32 CE33 CE34 CE35 CE36 | 0.04 | 1 | Y | N | be carried out through concerted tutorships. The details on the content, length and requirements of the written submissions will be indicated in Moodle at the beginning of the semester. |
|---|----------------------------------|-------------------------------|----------|------------|--|---|--|
| Laboratory practice or sessions [ON-SITE] | Practical or hands-on activities | CE20 CE32 CE33 CE34 CE35 CE36 | 0.24 | 6 | Y | Y | Recoverable in the final exam and / or in the extraordinary. |
| Computer room practice [ON-SITE] | Problem solving and exercises | CE20 CE32 CE33 CE34 CE35 CE36 | 0.16 | 4 | Y | Y | Recoverable in the final exam and / or in the extraordinary. |
| Practicum and practical activities report writing or preparation [OFF-SITE] | Group Work | CE20 CE32 CE33 CE34 CE35 CE36 | 0.8 | 20 | Y | N | The details on the content, length and requirements of the written submissions will be indicated in Moodle at the beginning of the semester. |
| Field work [ON-SITE] | project-based learning | CE20 CE32 CE33 CE34 CE35 CE36 | 0.28 | 7 | Y | Y | Recoverable in the final exam and / or in the extraordinary. |
| Writing of reports or projects [OFF-SITE] | project-based learning | CE20 CE32 CE33 CE34 CE35 CE36 | 0.56 | 14 | Y | N | The details on the content, length and requirements of the written submissions will be indicated in Moodle at the beginning of the semester. |
| Total: | | | 6 | 150 | | | |
| Total credits of in-class work: 2 | | | | | Total class time hours: 50 | | |
| Total credits of out of class work: 4 | | | | | Total hours of out of class work: 100 | | |

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

| Evaluation System | Continuous assessment | Non-continuous evaluation* | Description |
|---|-----------------------|----------------------------|---|
| Self Evaluation and Co-evaluation | 1.00% | 1.00% | In the "non-continuous evaluation" modality, it will be carried out through concerted tutorships. |
| Practicum and practical activities reports assessment | 13.00% | 13.00% | |
| Theoretical papers assessment | 21.00% | 21.00% | |
| Final test | 15.00% | 30.00% | |
| Progress Tests | 15.00% | 0.00% | |
| Assessment of activities done in the computer labs | 3.00% | 3.00% | |
| Laboratory sessions | 4.00% | 4.00% | |
| Fieldwork assessment | 14.00% | 14.00% | |
| Assessment of problem solving and/or case studies | 6.00% | 6.00% | In the "non-continuous evaluation" modality, it will be carried out through concerted tutorships. |
| Assessment of active participation | 3.00% | 3.00% | In the "non-continuous evaluation" modality, it will be carried out through concerted tutorships. |
| Total: | 100.00% | 100.00% | |

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

Individual work: Continuous evaluation through the follow-up of the work in case studies, seminars, presentations and tutorials. Global evaluation through multiple-choice tests (2 partials / final / extraordinary).

Team work: Continuous evaluation of practical notebooks, presentations and follow-up of the work carried out with the methodology of Project Based Learning. Global evaluation by environmental study report made after the fieldwork trip.

Final numerical grade from 0 to 10 according to current legislation, rescaling mark above 5 to cover the proportions and categories of the ECTS System, namely: A 10% Excellent (10 Honors), B 25% Very good (Outstanding), C 30% Good (Remarkable), D 25% Satisfactory (Pass) and E 10% Sufficient (Pass).

Unless stated otherwise, continuous evaluation criteria will be applied to all students.

Anyone choosing non-continuous assessment must notify it to the lecturer within the class period of the subject. The option is only available if the student's participation in evaluation activities (from the continuous assessment) has not reached 50% of the total evaluation for the subject.

For the retake exam, the assessment type used for the final exam will remain valid.

The qualifications of laboratory practices, computer practices and field work will be valid until the following academic year, upon written request of the student.

Non-continuous evaluation:

Final examination. Students who, having partially or totally followed the academic activities, have passed a delivery, practice, exam, etc., will have the right to examine the entire subject or only the part of the subject that they have not passed, which should be communicated to the lecturer immediately after the publication of the provisional notes. This right will expire with the academic year.

Unless stated otherwise, continuous evaluation criteria will be applied to all students.

Anyone choosing non-continuous assessment must notify it to the lecturer within the class period of the subject. The option is only available if the student's participation in evaluation activities (from the continuous assessment) has not reached 50% of the total evaluation for the subject.

For the retake exam, the assessment type used for the final exam will remain valid.

Specifications for the resit/retake exam:

Individual work: Continuous evaluation through the follow-up of the work in case studies, seminars, presentations and tutorials. Global evaluation through multiple-choice tests (2 partials / final / extraordinary).

Team work: Continuous evaluation of practical notebooks, presentations and follow-up of the work carried out with the methodology of Project Based Learning. Global evaluation by environmental study report made after the fieldwork trip.

Final numerical grade from 0 to 10 according to current legislation, rescaling mark above 5 to cover the proportions and categories of the ECTS System, namely: A 10% Excellent (10 Honors), B 25% Very good (Outstanding), C 30% Good (Remarkable), D 25% Satisfactory (Pass) and E 10% Sufficient (Pass).

Unless stated otherwise, continuous evaluation criteria will be applied to all students.

Anyone choosing non-continuous assessment must notify it to the lecturer within the class period of the subject. The option is only available if the student's participation in evaluation activities (from the continuous assessment) has not reached 50% of the total evaluation for the subject.

For the retake exam, the assessment type used for the final exam will remain valid.

The qualifications of laboratory practices, computer practices and field work will be valid until the following academic year, upon written request of the student.

Specifications for the second resit / retake exam:

Extraordinary examination. Students who, having partially or totally followed the academic activities, have passed a delivery, practice, exam, etc., will have the right to examine the entire subject or only the part of the subject that they have not passed, which should be communicated to the lecturer immediately after the publication of the provisional notes. This right will expire with the academic year.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

| Hours | hours |
|---|-----------------------------|
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Cooperative / Collaborative Learning] | 2 |
| Progress test [PRESENCIAL][Assessment tests] | 1 |
| Final test [PRESENCIAL][Assessment tests] | 1 |
| Writing of reports or projects [AUTÓNOMA][Workshops and Seminars] | 2 |
| Project or Topic Presentations [PRESENCIAL][Workshops and Seminars] | 1 |
| On-line Activities [AUTÓNOMA][Workshops and Seminars] | 1 |
| Unit 1 (de 12): Introduction to ecology and environment | |
| Activities | |
| Class Attendance (theory) [PRESENCIAL][Lectures] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 2 |
| Problem solving and/or case studies [PRESENCIAL][Case Studies] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Cooperative / Collaborative Learning] | 2 |
| Analysis of articles and reviews [AUTÓNOMA][Workshops and Seminars] | 2 |
| Workshops or seminars [PRESENCIAL][Workshops and Seminars] | 1 |
| Unit 2 (de 12): Energy and matter flows through ecosystems | |
| Activities | |
| Class Attendance (theory) [PRESENCIAL][Lectures] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 2 |
| Problem solving and/or case studies [PRESENCIAL][Project/Problem Based Learning (PBL)] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Cooperative / Collaborative Learning] | 2 |
| Analysis of articles and reviews [AUTÓNOMA][Workshops and Seminars] | 2 |
| Workshops or seminars [PRESENCIAL][Workshops and Seminars] | 1 |
| Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities] | 4 |
| Computer room practice [PRESENCIAL][Problem solving and exercises] | 2 |
| Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work] | 12 |
| Field work [PRESENCIAL][project-based learning] | 1 |
| Writing of reports or projects [AUTÓNOMA][project-based learning] | 2 |
| Group 20: | |
| Initial date: 08/09/2018 | End date: 15/09/2018 |
| Group 21: | |
| Initial date: 08/09/2014 | End date: |
| Unit 3 (de 12): Populations and communities | |
| Activities | |
| Class Attendance (theory) [PRESENCIAL][Lectures] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 2 |
| Problem solving and/or case studies [PRESENCIAL][Project/Problem Based Learning (PBL)] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Cooperative / Collaborative Learning] | 2 |
| Analysis of articles and reviews [AUTÓNOMA][Workshops and Seminars] | 2 |
| Workshops or seminars [PRESENCIAL][Workshops and Seminars] | 1 |
| Group 20: | |
| Initial date: 22/09/2018 | End date: 29/09/2018 |
| Group 21: | |
| Initial date: 20/09/2014 | End date: |
| Unit 4 (de 12): Ecosystem dynamics | |

| Activities | Hours |
|---|----------------------|
| Class Attendance (theory) [PRESENCIAL][Lectures] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 2 |
| Problem solving and/or case studies [PRESENCIAL][Project/Problem Based Learning (PBL)] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Cooperative / Collaborative Learning] | 2 |
| Analysis of articles and reviews [AUTÓNOMA][Workshops and Seminars] | 2 |
| Workshops or seminars [PRESENCIAL][Workshops and Seminars] | 1 |
| Field work [PRESENCIAL][project-based learning] | 1 |
| Writing of reports or projects [AUTÓNOMA][project-based learning] | 2 |
| Group 20: | |
| Initial date: 29/09/2018 | End date: 06/10/2018 |
| Group 21: | |
| Initial date: 27/09/2014 | End date: |
| Unit 5 (de 12): Mediterranean ecosystems | |
| Activities | Hours |
| Class Attendance (theory) [PRESENCIAL][Lectures] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 2 |
| Analysis of articles and reviews [AUTÓNOMA][Workshops and Seminars] | 2 |
| Workshops or seminars [PRESENCIAL][Workshops and Seminars] | 1 |
| Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities] | 2 |
| Computer room practice [PRESENCIAL][Problem solving and exercises] | 2 |
| Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work] | 8 |
| Field work [PRESENCIAL][project-based learning] | 1 |
| Writing of reports or projects [AUTÓNOMA][project-based learning] | 2 |
| Group 20: | |
| Initial date: 06/10/2018 | End date: 13/10/2018 |
| Group 21: | |
| Initial date: 04/10/2014 | End date: |
| Unit 6 (de 12): Qualitative and quantitative methods in ecology | |
| Activities | Hours |
| Class Attendance (theory) [PRESENCIAL][Lectures] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 2 |
| Field work [PRESENCIAL][project-based learning] | 1 |
| Writing of reports or projects [AUTÓNOMA][project-based learning] | 2 |
| Group 20: | |
| Initial date: 13/10/2018 | End date: 20/10/2018 |
| Group 21: | |
| Initial date: 17/10/2014 | End date: |
| Unit 7 (de 12): Ecology and management of natural resources | |
| Activities | Hours |
| Class Attendance (theory) [PRESENCIAL][Lectures] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 2 |
| Problem solving and/or case studies [PRESENCIAL][Case Studies] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Cooperative / Collaborative Learning] | 2 |
| Analysis of articles and reviews [AUTÓNOMA][Workshops and Seminars] | 2 |
| Workshops or seminars [PRESENCIAL][Workshops and Seminars] | 1 |
| Group 20: | |
| Initial date: 20/10/2018 | End date: 27/10/2018 |
| Group 21: | |
| Initial date: 20/10/2014 | End date: |
| Unit 8 (de 12): Environmental conflicts | |
| Activities | Hours |
| Class Attendance (theory) [PRESENCIAL][Lectures] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 2 |
| Problem solving and/or case studies [PRESENCIAL][Case Studies] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Cooperative / Collaborative Learning] | 2 |
| Analysis of articles and reviews [AUTÓNOMA][Workshops and Seminars] | 2 |
| Workshops or seminars [PRESENCIAL][Workshops and Seminars] | 1 |
| Group 20: | |
| Initial date: 27/10/2018 | End date: 03/11/2018 |
| Group 21: | |
| Initial date: 27/10/2014 | End date: |
| Unit 9 (de 12): Ecological and social basis of landscape | |
| Activities | Hours |
| Class Attendance (theory) [PRESENCIAL][Lectures] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 2 |
| Analysis of articles and reviews [AUTÓNOMA][Workshops and Seminars] | 2 |
| Workshops or seminars [PRESENCIAL][Workshops and Seminars] | 1 |
| Field work [PRESENCIAL][project-based learning] | 1 |
| Writing of reports or projects [AUTÓNOMA][project-based learning] | 2 |
| Group 21: | |
| Initial date: 07/11/2014 | End date: |
| Group 20: | |
| Initial date: 03/11/2018 | End date: 10/11/2018 |
| Unit 10 (de 12): Introduction to land planning | |
| Activities | Hours |
| Class Attendance (theory) [PRESENCIAL][Lectures] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 2 |
| Problem solving and/or case studies [PRESENCIAL][Case Studies] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Cooperative / Collaborative Learning] | 2 |
| Analysis of articles and reviews [AUTÓNOMA][Workshops and Seminars] | 2 |
| Workshops or seminars [PRESENCIAL][Workshops and Seminars] | 1 |
| Group 20: | |
| Initial date: 17/11/2018 | End date: 24/11/2018 |
| Group 21: | |
| Initial date: 14/11/2014 | End date: |
| Unit 11 (de 12): Environmental protection systems | |
| Activities | Hours |
| Class Attendance (theory) [PRESENCIAL][Lectures] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 2 |
| Analysis of articles and reviews [AUTÓNOMA][Workshops and Seminars] | 2 |
| Workshops or seminars [PRESENCIAL][Workshops and Seminars] | 1 |
| Field work [PRESENCIAL][project-based learning] | 1 |
| Writing of reports or projects [AUTÓNOMA][project-based learning] | 2 |
| Group 20: | |
| Initial date: 24/11/2018 | End date: 01/12/2018 |
| Group 21: | |
| Initial date: 21/11/2014 | End date: |
| Unit 12 (de 12): Environmental impact assessment | |
| Activities | Hours |
| Class Attendance (theory) [PRESENCIAL][Lectures] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 2 |
| Problem solving and/or case studies [PRESENCIAL][Project/Problem Based Learning (PBL)] | 1 |
| Study and Exam Preparation [AUTÓNOMA][Cooperative / Collaborative Learning] | 2 |
| Field work [PRESENCIAL][project-based learning] | 1 |
| Writing of reports or projects [AUTÓNOMA][project-based learning] | 2 |
| Global activity | |
| Activities | hours |
| Class Attendance (theory) [PRESENCIAL][Lectures] | 12 |
| Problem solving and/or case studies [PRESENCIAL][Project/Problem Based Learning (PBL)] | 4 |
| Problem solving and/or case studies [PRESENCIAL][Case Studies] | 4 |
| Project or Topic Presentations [PRESENCIAL][Workshops and Seminars] | 1 |
| Workshops or seminars [PRESENCIAL][Workshops and Seminars] | 10 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 25 |

| | |
|---|------------|
| Study and Exam Preparation [AUTÓNOMA][Cooperative / Collaborative Learning] | 18 |
| Analysis of articles and reviews [AUTÓNOMA][Workshops and Seminars] | 20 |
| Writing of reports or projects [AUTÓNOMA][Workshops and Seminars] | 2 |
| Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities] | 6 |
| Computer room practice [PRESENCIAL][Problem solving and exercises] | 4 |
| Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work] | 20 |
| Field work [PRESENCIAL][project-based learning] | 7 |
| Writing of reports or projects [AUTÓNOMA][project-based learning] | 14 |
| Progress test [PRESENCIAL][Assessment tests] | 1 |
| Final test [PRESENCIAL][Assessment tests] | 1 |
| On-line Activities [AUTÓNOMA][Workshops and Seminars] | 1 |
| Total horas: | 150 |

| 10. Bibliography and Sources | | | | | | |
|--------------------------------|---|---|------|----------------------|------|--|
| Author(s) | Title/Link | Publishing house | City | ISBN | Year | Description |
| | Ecosystem ecology : a new synthesis | Cambridge University Press | | 978-0-521-73503-2 | 2010 | |
| | Ecology of desert rivers | Cambridge University Press | | 0-521-81825-7 | 2006 | |
| | Evolutionary behavioral ecology | Oxford University Press | | 0195331923 (pbk. : a | 2010 | |
| | Foundations of restoration ecology | Island Press | | 1-59726-017-7 | 2006 | |
| | Introducción al análisis espacial de datos en ecología y cie | Dykinson | | 978-84-9849-308-5 | 2008 | |
| | Key topics in landscape ecology | Cambridge University Press | | 978-0-521-61644-7 | 2007 | |
| | Mathematics for ecology and environmental sciences | Springer | | 978-3-540-34427-8 | 2007 | |
| | Methods in stream ecology | Elsevier | | 0-12-332907-8 | 2007 | |
| | Plant disturbance ecology : the process and the response | Elsevier/Academic Press | | 0-12-088778-9 | 2007 | |
| | Temporal dimensions of landscape ecology : wildlife response | Springer | | 0-387-45444-6 (hd.bd | 2007 | |
| | The Princeton guide to ecology | Princeton University Press | | 978-0-691-12839-9 | 2009 | |
| | Theoretical ecology : principles and applications | University Press | | 978-0-19-920998-9 (H | 2007 | |
| | | | | | | Changes in seasonal movements and population dynamics of migratory birds in response to ongoing changes resulting from global climate changes are a topic of great interest to conservation scientists and birdwatchers around the world. Because of their dependence on specific habitats and resources in different geographic regions at different phases of their annual cycle, migratory species are especially vulnerable to the impacts of climate change. In Bird Migration and Global Change, eminent ecologist George W. Cox brings his extensive experience as a scientist and bird enthusiast to bear in evaluating the capacity of migratory birds to adapt to the challenges of a changing climate. Cox reviews, synthesizes, and interprets recent and emerging science on the subject, beginning with a discussion of climate change and its effect on habitat, and followed by eleven chapters that examine responses of bird types across all regions of the globe. The final four chapters address the evolutionary capacity of birds, and consider how best to shape conservation strategies to protect migratory species in coming decades. The rate of climate change is faster now than at any other moment in recent geological history. How best to manage migratory birds to deal with this challenge is a major conservation issue, and Bird Migration and Global Change is a unique and timely contribution to the literature. |
| Cox, George W. | Bird Migration and Global Change | Island Press | | 9781597266888 | 2010 | |
| | https://islandpress.org/book/bird-migration-and-global-change | | | | | |
| Allan, J. David | Stream Ecology : Structure and Function of Running Waters | Kluwer Academic | | 978-1-4020-5582-9 | 2007 | |
| Augier, H. (Henry) | Guía de los fondos marinos del Mediterráneo : ecología, flor | Omega | | 978-84-282-1472-8 | 2008 | |
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