COURSE SYLLABUS

Academic year: 2017-2018

Course description

Degree:	**Environmental Sciences, University Pablo de Olavide, Seville**
Course:	**Sampling methods in Ecology**
Departament:	**Physical, Chemical and Natural Systems**
Academic year:	**2017-2018**
Semester:	2nd
Credits:	**6**
Year:	2nd
Type of course:	Optional
Language:	English

Teaching model:	
• **General/background:**	50%
• **Theory-into-practice/developmental knowledge-building**	50%
• **Guided Academic Activities:**	

Teaching team information

2.1. Course coordinator: Martina Carrete	
2.2. Professors	
Name:	**Martina Carrete**

Faculty:	**Experimental Sciences**
Departament:	**Physical, Chemical and Natural systems**
Academic Area:	**Ecology**
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Objectives of the course

The specific objectives of this course are:

1. To develop basic knowledge about design sampling programs and experimental design.
2. To know the most common sampling methods used in terrestrial ecology.
3. To get insight and to apply tools, techniques and protocols for experimental work in the laboratory, and to gain the capability to observe and interpret the results obtained.
4. To integrate experimental evidences with the theoretical knowledge.
5. To develop basic experimental skills, by means of the description, quantification, analysis and critical evaluation of experimental results obtained in an autonomous way.
6. To promote self-study and reflection – supporting individual reflection on the practical work and data analysis.
7. To support collaborative work – in particular the group-based data analysis activities.
8. To design and perform a research project.
9. To understand the Scientific Method.
10. To develop the critical thinking.

Contributions to the training plan

This course offers a hands-on learning about methods to design sampling programs for sampling and studying a variety of organisms in the field, as well as about 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 on the sampling programs. The final aim of this course is to provide students with the minimum abilities required to design, perform and present a scientific research.

After having passed the course, the student will:

1. Be able to apply the most common used techniques in plant and animal studies.
2. Know and understand the concept of environmental factor as well as the response of living organisms to environmental physical factors.
3. Know and understand the main types of interactions between living organisms.

Recommendations or Prerequisites

No special skills are required to the students to enrol at 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.

Instrumental, personal and systemic skills that are develop during the course

- Comprehension of concepts in the area of Environmental Sciences at a level of advanced textbooks and specialized scientific texts (COMPETENCE 1)
- Ability to analyze and synthesize information. Elaboration and defence of arguments (COMPETENCE 2)
- Oral and written communication (COMPETENCE 3)
- Problem solving and decision making (COMPETENCE 4)
- Team work (COMPETENCE 5)
- Recognition of diversity (COMPETENCE 6)
- Critical thinking (COMPETENCE 7)
- Ethical commitment (COMPETENCE 8)
- Autonomous learning (COMPETENCE 9)
- Creativity (COMPETENCE 10)
- Ability to gather and interpret relevant data to make judgments that include a reflection on key social, scientific or ethical issues (COMPETENCE 11)
- Motivation for quality (COMPETENCE 12)

- Sensitivity toward environmental issues (COMPETENCE 13)
- Ability to apply theoretical knowledge to practical cases (COMPETENCE 14)
- Ability to communicate with specialists and with people who are not experts in the field (COMPETENCE 15)
- Development of learning skills needed to undertake further studies with a high degree of autonomy (COMPETENCE 16)
- Foreign Language: Students must have the B2 Level of the Common European Framework of Reference for Languages in English language, because it is considered the international working language (COMPETENCE 17)
- Respect for human rights, access for all and the will to eliminate discriminatory factors such as gender and origin (COMPETENCE 20)

Specific skills

- To master mathematical tools (algebra, calculus) for solving problems related to the environment (COMPETENCE 1)
- To know and apply the terminology and units of measurement in Experimental Sciences (COMPETENCE 3)
- To master the skills needed for laboratory work in Experimental Sciences (COMPETENCE 4)
- To know the relationships between living organisms and their environments (COMPETENCE 12)
- To know the basic principles about population dynamics (COMPETENCE 13)
- To know and master procedures for estimating and interpreting ecological succession and biodiversity (COMPETENCE 14)
- To have basic knowledge of plant biodiversity and phytogeography (COMPETENCE 15)
- To have basic knowledge of animal biodiversity and zoogeography (COMPETENCE 17)
- To be able to develop an original technical or research work related to the environmental sciences (COMPETENCE 74)
- To know how to design sample procedures, and analyse and interpret statistical results (COMPETENCE 75)
- To know how to deal with statistical programs (COMPETENCE 76)

Working Plan: student groups and time distribution

The course ‘Sampling methods in ecology’ enables the students to be proficient at:

1. Interpreting quantitatively complex systems (ecosystems) after the implementation of
2. sampling methods and technologies.
3. To independently design and establish a field experiment
4. To be able to apply statistical tests to experimental complex designs in ecology
5. To be able to plot results obtained from sampling campaigns, to interpret those results
6. and to write a scientific paper of ecological relevance.
7. To be able to select and to use instrumentation and technologies appropriate for
8. fieldwork in the area of Ecology.
9. To design and to organize a field campaign to study the physical and biological
10. environments.
11. To be able to treat the data collected the field and to present them as part of a
12. technical report.

Contents

In order to accomplish the aforementioned goals, the contents of this course are distributed in 5 Units, as described below.

UNIT 1: Introduction to the experimental design.

UNIT 2: Introduction to sampling methods for vegetable and animal populations in terrestrial ecosystems. General aspects on field sampling: sampling types. Transects, quadrats, interception lines and interception point sampling types.

UNIT 3: Quantifying the sampling. Qualitative sampling methods: presence-absence, appreciative quantification, density, abundance, cover. Indirect sampling. Plant communities sampling: Measurement types; density; cover; other measurement types. Estimating the correct number of samples. Curves of species accumulation. Animal population samplings: Abundance index; Itineraries and stations of census; plots; capture controls; direct counting.

UNIT 4: Design and field sampling and/or laboratory experiments. Vegetation sampling methods in the field. Field sampling of animal populations. Evaluation of density in animal populations.

Bird census techniques. Species-factor relationships: the effect of temperature on the development of living organisms. Measurement of soil parameters. Population growth. Analyses of climatic data. Landscape perception and analysis

UNIT 5. Scientific project: design, sampling, data analysis and result presentation.

Methodology

The teaching-learning process of this course includes theoretical classes, practical classes, seminars and tutorials. All together, these methodologies guarantee the best training of the students during the course. At the same time, this methodology promotes the development and exercise of both generic and specific skills in Ecology.

1. 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 (8 hs).

2. 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 of 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 (37hs).

3. The **seminars** are useful to demonstrate that students have acquired not only knowledge of the contents, but also the skills to communicate them in a coherent way in front of an expert audience (5hs).

4. The **tutorials** solve problems that might arise along the formative process. During the tutorials, which can be conducted individually or in groups, the students discuss questions, and expand information.

5. 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 (10hs).

Theoretical and practical classes, the seminars and the final work are all mandatory.

Study Materials and recommended bibliography

Classes are based on instructor presentations, and readings of articles, books and manuals related to the subjects. All the materials need for a class are uploaded and available for the students in the Blackboard Learn platform.

It is advisable that the students consult the basic Bibliography mentioned at the end of this teaching program. This text selection has been produced according the bibliographical funds already existing at the library at Pablo de Olavide University.

Course evaluation

The evaluation is a comprehensive compilation of the work performed by the student during the course, including:

- Discussion and participation during the theoretical classes (15%).
- Active work at practical classes (20%).
- Seminars to present and discuss practical classes (15%).
- Reports about the laboratory and field-work procedures (10%).
- Final project. (i) written report (50%) and (ii) oral presentation (50%) (40%).

ITEM	CRITERIA	INSTRUMENT	VALUE
Theory	-Command of theoretical knowledge	Written assignments, including a Final Report based on a study case	40 %
Practicals	- Correct and coherent design of field samplings. -Aptitude to propose working hypothesis and to plan the study to accept or to reject the proposed hypotheses. - Correct data obtaining and data processing. - Production of coherent conclusions - Work's quality (aptitude to recognize importance of contents)	Constant follow-up on check on the intermediate reports of the Practicals (Home work on specific practicals) --- There will be an exam on the practicals for those students who did not attend the practical classes (that includes the field trip). It is compulsory to pass the practicals to be evaluated on the complete course. Class attendance and tutorials are compulsory	40 %
Seminars	- Oral and written communication skills	Class Project Presentation	20%

References

This course is not based on any single textbook, so managing several books is recommended. Note that some of the books in the list have a higher level and scope than that required to pass the course, but they can be very useful to gain further knowledge in some topics. Specific books for some parts of the course will be recommended in due course.

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 54:187-211.

Margalef, R. 1982. Ecología. Omega, Barcelona. 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.