COURSE SYLLABUS

Academic year 2016-2017

1. COURSE DESCRIPTION

Degree:	**Environmental Sciences, University Pablo de Olavide, Seville**
Double Degree:	
Course:	**Sampling Methods in Ecology**
Module:	
Department:	**Physical, Chemical and Natural Systems**
Academic Year:	**2016-2017**
Term:	**Second- Spring**
Total Credits:	**Six**
Year:	**Second**
Type of Course:	**Optional**
Course Language:	**English**

Teaching model:	
a. General/background:	**50%**
b. Theory-into-practice/developmental knowledge-building	**50%**
c. Guided Academic Activities:	**0**

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2. TEACHING TEAM INFORMATION

2.1. Course coordinator Prof. Dra**.** María Pérez Fernández

2.2. Teachers	
Name:	**María Pérez Fernández**
Faculty:	**Experimental Sciences**
Departament:	**Physical, Chemical and Natural Systems**
Academic Area:	**Ecology**
Category:	**Professor of Ecology**
Office hours:	**Tuesday and Thursday & from 8:30-10:30 and 16:00-18:00**
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3. ACADEMIC CONTEXT

3.1. Course Description and Objectives

1. The students can relate values of the environmental factors with the abundance and distribution of the living organisms by means using field sampling techniques
2. The students know the most common sampling method used in terrestrial Ecology.
3. The students can apply the principles to quantify the abundance of living organisms
4. The students can design and independently complete a field study.
5. The students are able to integrate the experimental evidences found in field and/or laboratory studies with the theoretical knowledge.
6. The students know the importance of biodiversity and taxonomy, as sources of knowledge by themselves and as base of application for other
7. The students can relate the ecosystem's characteristics and its historic evolution with the degree of maturity of that ecosystem.

3.2. Contribution to the Training Plan

This is an optional unit of fourth course in the Degree of Environmental Science and requires strong command of environmental issues. It will allow the students to acquire a real view of the fieldwork for what it will be needed to put into practice a great proportion of the knowledge learnt in the previous courses of the degree. The student reaches maturity and independence in data collection in the field and in the laboratory as well as in data treatment and interpretation. Finally, the student has to elaborate conclusive and coherent reports meaningful in both the scientific and the environmental management areas.

3.3. Recommendations or Prerequisites

Despite that Ecology is a subject located in the second course of the degree, no prerequisite are required to the students to enrol the course. However, it is advisable that

the student has successfully passed the units of Mathematics, Physics, Chemistry, Geology, Biology, and Economy of first year; similarly, they have to have passed the courses Flora and Fauna, Microbiology, Meteorology and y Climatology, Hydrology, Soil Science and Ecology of second year.

It is also advisable that the student has a reasonable level of English as all communication having to do with this course will take place in English; in addition all the bibliography to be used is only available in such language. Students with knowledge of computer science and of statistics will find this subject more accessible than those without them (i.e use of spread-sheet, SPSS or similar statistical programmes, internet searchers).

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4. SKILLS

4.1 Degree Skills Developed during this Course

After having studied this course, the student will have acquired the following skills:

1. Comprehension of knowledge in the environmental area to a text books and scientific specialized texts level
2. Synthesis and analysis capacities as well as production and defence of ideas
3. Oral and written communication
4. Environmental problem solving and decision-making.
5. Team work
6. Critical reasoning
7. Autonomous learning
8. Aptitude to assemble and interpret relevant information to issue judgments that include a reflection on key topics of social, scientific or ethical nature
9. Ability to apply theoretical knowledge to practical cases
10. Capability to discuss environmental aspects with specialists and with non-expert people
11. Development of the needed skills to undertake further studies with a high degree of autonomy.

Specific Skills

1. To know the relations between the living organisms and the environment.
2. To know and to apply the techniques to estimate and to interpret biodiversity and the ecological succession
3. To be able to apply the technologies of landscape evaluation in the environmental and territorial ordination.
4. To be able to design samplings campaigns and to be able to interpret information from statistical analyses
5. To understand factors that regulate the ecosystem's development and ecosystem variations

4.2. Module Skills Developed during this Course

After having passed the course, the student will:

1. To be able to apply the most common used techniques in plant studies.
2. To know and to understand the concept of environmental factor as well as the response of living organisms to environmental physical factors.
3. To know and to understand the main types of interactions between living organisms
4. To know and to understand the temporal variation of an ecosystems as well as the ecosystem's structure and function.
5. To know and to understand the structure and the microbial diversity in contrasting ecosystems.

4.3. Course-specific Skills

The course 'Ecological Sampling Methods' enables the students to be proficient at:

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

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5. COURSE CONTENT (COURSE TOPICS)

1. Introduction to the methods of sampling of plant and animal populations in terrestrial ecosystems.
2. Sampling quantification.
3. Design and accomplishment of field samplings and / or laboratory experiments
4. Data treatment, analysis and interpretation.

SPECIFIC CONTENTS

Section 1. Introduction to sampling methods for vegetable and animal populations in terrestrial ecosystems.

Lesson 1. General aspects on field sampling: sampling types. Tansects, quadrats, interception lines and interception point sampling types.

Lesson 2. Environmental factors in terrestrial and aquatic ecosystems

Section 2. Quantifying the sampling

Lesson 3 Qualitative sampling methods: presence-absence, appreciative quantification, density, abundance, cover. Indirect sampling.

Lesson 4. Plant communities sampling: Measurement types; density; cover; other measurement types.

Lesson 5. Estimating the correct number of samples. Curves of species cummulation

Lesson 6. Animal population samplings: Abundance index; Itineraries and stations of census; plots; capture controls; direct counting.

Lesson 7 Introduction to the experimental design.

Section 3. Design and carrying out of field sampling and/or laboratory experiments.

Practical 1: Vegetation sampling methods in the field. Measuring vegetation.
Practical 2: Field sampling of animal populations (Arthropods)
Practical 3: Evaluation of density in animal populations
Practical 4: Bird census
Practical 5: Relationship between species-factor. Effect of temperature on the development of living organisms
Practical 6: Sampling to determine soil parameters
Practical 7. Population growth
Practical 8. Analyses of climatic data: mean values and trends
Practical 9. Landscape perception and analysis

6. METHODOLOGY AND RESOURCES

The teaching-learning process of this course includes theoretical classes, practical classes, seminars and tutorials.

Each one of the above mentioned methodologies provide methodological orientations that guarantee taking the most of the course content. At the same time, the methodology of this course aims at promoting the development and exercise of both generic and specific skills in Ecology. The theoretical teaching sets the basis on which the students construct their knowledge, as in these theoretical classes the student receives key information without which he/she would not be able 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 will discuss their doubts. There will also be general class discussion oriented towards the students to practise the speech publicly and the defence of his/her opinions. These theoretical classes are compulsory in the teaching of Ecology and offer the students a basic and general perspective of the necessary knowledge with which to develop the entire subject.

The practical classes will be used as a complementary procedure to the theoretical lessons in the teaching of the course. Practical classes will represent a synthesis between theory, experimentation and a way of checking the students' acquisition of the contents. Thanks to the practical classes students will reinforce the concepts raised in the theoretical classes. In this sense, practical classes are as important as theoretical ones and will make the best part of the course.

The practical classes will be conducted in a cooperative way, in groups of 3 to 4 students each. They will be accompanied by a series of questions that will allow evaluating the level of comprehension and assimilation of the concepts introduced in the theoretical classes. These include field, laboratory and clerical work. The practical classes require a high level of independence among the students, together with a strong self-responsibility and commitment to the work, as everyone's work is indispensable for

the correct and complete development of the group work. Special care has to be taken for an equal participation to take place within the group, in which all the students have to interact simultaneously.

The seminars are useful for the students to demonstrate that they have acquired not only knowledge of the contents, but also the skills to communicate them in a coherent way in front of expert public. The tutorials will serve to settle and solve any problems that might arise along the formative process. During the tutorials, which can be conducted individually or in groups or even at a class level, the students will be able to discuss questions, expand information and to raise new challenges for the audience.

6.1. Study Materials and recommended bibliography

The classes are based on PowerPoint presentations, as well as on the readings of articles related to the subject and on the consultation of manuals and specialized web pages. Each lesson will have a particular distribution, depending on the topic. All the materials that are going to be used in class will be uploaded and at the disposal of the students in the Blackboard Learn platform.

In addition, 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.

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7. ASSESSMENT

1. Written tests on the theoretical contents and on practical cases.

2. Written tests and/or reports on the laboratory and field-work as well as on the technical visits performed.

3. Evaluation of the final project. This includes two parts (i) the written report (50%) and (ii) the presentation in class (50%).

4. The theoretical, the practical and the seminar parts of the course need to be passed with a minimum of 5 out of 10. Once all parts are passed, the final grade will be calculated as average of the three of them.

The following chart shows the percentages given to each item and the instrument of evaluation.

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%

8. 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* 54:187-211.

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.

* Most relevant readings