



ECOL 320 Ecological Systems

Course Description

The main aim of the course is to introduce the Science of Ecology, focusing on major concepts, to present the student with a manageable synthesis of the subject. The course will concentrate on individuals, populations and communities, their relationships with the physical and chemical environment, and with other organisms. Thus, we will study large scale patterns and processes, involving the role that time and space play in the ecosystems. Finally, the course will dedicate some time to understand how of ecological principles can be used in solving environmental problems. Whenever possible, teaching will be focused on the Mediterranean region and Mediterranean ecosystems.

Prerequisites

Background in Biology is recommended

Course Goals and Methodology

- 1.- Basic – to- advanced overview of the Science of Ecology*
- 2.- Design of experiments in Ecology*
- 3.- Critical analysis of scientific literature*
- 4.- Statistical treatment of data and writing a scientific paper*

Learning Objectives

Students has to learn the interactions among organisms within populations, communities and ecosystems and with the environment along time and space. They will learn experimental design and statistical treatment and finally the will have to write a scientific paper with data obtained in the practical classes.

Required Texts

- Begon, M., Harper, J.L. & Townsend, C.R. (1996) *Ecology*. Third Edition. Blackwell Science. Milan, Italy. 1143p.
- Colinvaux, P. (1993) *Ecology 2*. First Edition. John Wiley & Sons, Inc. New York. 688 p.
- Dodson, S.I. *et al.* (1998) *Ecology*. First Edition. Oxford University Press, Inc. New York. 433p.
- Kormondy, E.J. (1996) *Concepts of Ecology*. Fourth Edition. Prentice Hall. New York. 559 p.
- Krebs, C.J. (1994) *Ecology*. Fourth Edition. Harper-Collins. New York.
- Molles, M.C. (2002) *Ecology: Concepts and Applications*. Second Edition. McGraw-Hill Companies, Inc. United States of America. 586 p.
- Smith, R.L. & Smith, T.M. (2001) *Ecology and Field Biology*. Sixth Edition. Addison Wesley Longman, Inc. United States of America. 771 p.
- Smith, R.L. & Smith, T.M. (2000) *Elements of Ecology*. Fourth Edition. Addison Wesley Longman, Inc. United States of America. 567 p.

General Course Policies

Please keep your cell phones turned off during class.
Strictly no food to be consumed in class.

Course Requirements and Grading

There will be two exams during the term, a mid-term exam and a final exam, which will count as 30% of the final grade each one. Lessons include discussion sections and students must take part in them. Their participation will be monitored along the term and it will count as 10% of the final grade. Homework will count as another 10% of the final grade and a paper will contribute 20% to the final grade.

There will be one field trip, in which we will see and apply the concepts studied in class through dynamic activities and field work techniques. These field trip will allow the students to get close to the Mediterranean nature. The field trip is compulsory.

Mid-term exam	30 %
Final exam	30 %
Participation	10 %
Homework	10 %
Final paper	20 %

Attendance and Punctuality

Attendance is mandatory. More than 3 unexcused absences will result in the lowering of the final grade. Students with more than 2 such absences may not challenge the final grade received. Punctuality is required – lateness will be penalised by 0.5 (over 15 mins) or 1 absence (over 30mins).

Missed or Late Work

Missed or late work could be penalised

Academic Dishonesty

Academic integrity is a guiding principle for all academic activity at Pablo de Olavide University. Cheating on exams and plagiarism (which includes copying from the internet) are clear violations of academic honesty. A student is guilty of plagiarism when he or she presents another person's intellectual property as his or her own. The penalty for plagiarism and cheating is a failing grade for the assignment/exam and a failing grade for the course. Avoid plagiarism by citing sources properly (using footnotes or endnotes and a bibliography).

Students with Disabilities

If you have a disability that requires special academic accommodation, please speak to your professor within the first three (3) weeks of the semester in order to discuss any adjustments. It is the student's responsibility to provide the International Center with documentation confirming the disability and the accommodations required (if you have provided this to your study abroad organization, they have most likely informed the International Center already but please confirm).

Behavior Policy

Students are expected to show integrity and act in a professional and respectful manner at all times. A student's attitude in class may influence his/her participation grade. The professor has a right to ask a student to leave the classroom if the student is unruly or appears intoxicated. If a student is asked to leave the classroom, that day will count as an absence regardless of how long the student has been in class.

Class Schedule

Program

1. **Introduction. What is Ecology?** Main concepts. Ecological processes in the Mediterranean region.
2. **Natural selection and speciation.** Life on Land: Large-Scale Patterns of climatic variation. Natural history and Geography of Biomes. Climatic diagrams. Life in Water: the hydrologic cycle; the natural history of aquatic environments.
3. **The organism and its environment.** Temperature Relations: Microclimates; Temperature and Performance of Organisms; Climatic Warming. Water Relations: Water availability; Water regulation in land; Water and salt balance in aquatic environments.
4. **Population Ecology.** Population growth: geometric and exponential population growth. Logistic Population Growth. Limits to Population. Intra-specific competition.
5. **Competition and coexistence.** Resource competition. Competition and Niches. Predation, Herbivory, Parasitism, Mutualism, commensalism. What is the meaning of Co-evolution?
6. **Community ecology.** Species Abundance and Diversity. Biodiversity. Geographical gradients. Island Biogeography. Speciation.

7. **The ecosystem: how it works.** Energy and nutrient flow. Primary Production
Nutrient cycling and retention. Succession and Stability.
8. **Global Ecology.** Disturbances. Succession. El Niño. Changes in Land Cover.
Human influence on Atmospheric Composition. Applications on conservation.

Practical exercises and Labs

Estimating Abundance in Animal and Plant Populations.

This lab includes a field sampling exercise during a session of 80 minutes. The students learn to estimate tree density by two methods: Byth and Ripley and T-Square Sampling procedure. They collect, in an area covered with pine trees using the techniques for point-to-point distances and for organism-to-nearest neighbor distances and as home work they apply the above mentioned methods. Students have to do the calculations and hand in a report of about 4-5 pages commenting on the results. The individual estimated time per student is 4 hours.

Experiment on intra- and inter- species competition

This lab runs for one and a half months since it is set in the glass house till seedling harvesting. This is the longest lab they do and the one that account the most in the final grade. The objectives are to determine whether intraspecific competition affects plant competition and to apply the most suitable statistical tests to the gathered data.

Soil respiration lab

Students investigate the factors that control the rate at which CO₂ is emitted from soil using simple soil chambers and soda lime in a field experiment. Students in small groups design and conduct their own experiments to investigate the effects of soil and microclimate factors on CO₂ emission. The projects are typically conducted over two consecutive lab periods. During the first session students design their experiment and initiate their incubations. The incubation is ended after 120 to 96 hours and during the following lab period the final results are collected, the data are statistically analyzed, and a lab report is written as homework.

Measuring Biodiversity- Invertebrate pitfall traps

The students examine invertebrate communities from a field study site on campus. The pitfall traps are set twice, one in winter and another in spring, to test for differences in insect biodiversity over time.

Required Material

The course material will be uploaded to the course web site, from where students can access them.