

**Mycology**

Code: 100827  
ECTS Credits: 4

Degree	Type	Year	Semester
2500251 Environmental Biology	OB	3	1

**Contact**

Name: Sergio Santamaría del Campo  
Email: Sergi.Santamaria@uab.cat

**Use of Languages**

Principal working language: catalan (cat)  
Some groups entirely in English: No  
Some groups entirely in Catalan: Yes  
Some groups entirely in Spanish: No

**Teachers**

Laia Guardia Valle

**Prerequisites**

There are no official prerequisites.

It will facilitate the follow-up of the subject the fact of possessing basic knowledge of evolution, biology of reproduction and functioning of the organisms studied so far (animals, plants and bacteria) as well as floral, fauna and geographic knowledge of the natural environment. At the time of imparting the subject, it will be considered that the students have a minimum level of knowledge of biology of organisms acquired in subjects that treat this section like "Prospección del Medio Natural", "Zoología", "Botánica", "Microbiology", etc.

**Objectives and Contextualisation**

The study of biodiversity and the functioning of "fungal" organisms is addressed in a broad sense. The student must be able to understand and even elaborate a phylogenetic scheme to locate the different major elements of this biodiversity. This objective is closely related to both aspects of evolution and the study of the techniques and knowledge that allow the classification of living beings (morphology, anatomy, molecular indicators, etc.)

In addition, biodiversity will be studied not only from the systematic and phylogenetic perspective but also from a more ecological vision (habitats or substrates).

On the other hand, special emphasis will be placed on the main biological processes (life cycles, reproduction, development, etc.), evolutionary (phylogenetic relationships, evolutionary tendencies, co-evolution, etc.), ecological (limiting factors, habitats, adaptations to the environment, etc.) , as well as introducing briefly more applied aspects of the main groups studied.

This subject is complementary to other subjects that treat organizations and systems from an integrative point of view in the inseparable set formed by the environment.

**Competences**

- Develop a sensibility towards environmental issues.
- Focus on quality.
- Identify and interpret the diversity of species in the environment.
- Identify organisms and recognise the different levels of biological organisation.
- Integrate knowledge of different organisational levels of organisms in their functioning.
- Know a foreign language (English).
- Obtain, observe, handle, cultivate and conserve specimens.
- Recognise and analyse phylogenetic relations.
- Sample, characterise and manipulate populations and communities.

## Learning Outcomes

1. Collect and recognise in the field the principal species of fungi and their habitats.
2. Describe the basic properties of point estimators and interval estimators.
3. Develop a sensibility towards environmental issues.
4. Focus on quality.
5. Interpret the distribution and the biological interactions in the environment of fungi.
6. Interpret the evolutionary processes that have led to the diversity of fungi.
7. Know a foreign language (English).
8. Recognise the characteristics that differentiate the principal groups of fungi.
9. Recognise the metabolic, cellular and structural characteristics of fungi and their functioning.

## Content

1. What are fungi? Definition of "fungus". Systematic placement of organisms studied in mycology. True Ameboids, Pseudofungi and True Fungi. The modern classification: AFTOL and Deephypha. Systematic and fungal diversity.
2. The vegetative body of fungi. The fungal thallus. Unicellular and filamentous forms. Hypha and mycelium. The septa. The cell wall. Hyphal growth. Nuclei. Fungal mytosis. SPBs. The organelles. Hyphal modifications.
3. Physiology and Ecology. Nutrition: phagotrophy and lisotrophy. Saprobionts and symbionts. Mutualists and parasites. Biotrophs and necrotrophs. Ecological factors: temperature, water, pH, oxygen, light. Metabolism. Reserve substances. Secondary metabolism. Culture media. Sterilization. Antifungals.
4. Reproduction. Asexual and sexual reproduction. Fungal genetics. Compatibility systems. Homothalism and heterothalism. Pheromones. Heterocariones. Parasexuality. Holomorph: Anamorph and Teleomorph. Biological cycles.
5. Ameboid fungi. Systematic definition and location. Fílum Mycetoza. Myxogastria, typical "Myxomicetes". Biological cycle. Ameboflagelated stadium. Plasmodium. Fruiting bodies. Habitat.
6. Pseudofungi. Systematic definition and position. Comparison with the true fungi. Fílum Heteroconts-Stramenopiles. Oomycetes. General characteristics. Saprolegniales. Peronosporales and Pitiales: mildews and related. Biological cycle, examples and economic importance.
7. The True Fungi: Kingdom Fungi. The groups with flagella. Classification. The "chytrids". Fylum Chytridiomycota and allies. The vegetative body and the flagellated cells. Examples. Quitridiomycozes in amphibians. Fungi of rumen.
8. The Zygomycota. Classification. General characteristics. Biological cycle. Sporangia. The zygospor. Diversity and examples.
9. The Ascomycota. I. Definition. The ascus. Systematics. The yeasts: Zymology. Ascosporogenic yeasts. Saccharomycotina: the budding yeasts. Taphrinomycotina Class Schizosacharomycetes: fission yeasts. Economic importance.

10. The Ascomycota. II. The ascomata-forming groups (Pezizomycotina). Characteristics of mycelium. Biological cycle. Fertilization-Plasmogamy. Croziers. Ascosporeogenesis. Asci and types. Ascospores. Ascomata and types. Hamatecium. Asexual reproduction: anamorphs, mitosporic fungi. Systematics. Diversity and examples of groups having ecological and economical interest: Pezizales, Eurotiales, Onygenales, Sordariales, Xylariales, Hypocreales, Laboulbeniales, Pleosporales and allied.

11. The Basidiomycota. I. Definition. Characteristics of mycelium. Basidia and types: holobasidia and phragmobasidia. Systematics. Subfilum Pucciniomycotina: O. Pucciniales, the rusts, example of parasitic plant fungi. Biological cycle. Phases of the cycle in a rust.

12. The Basidiomycota. II. The basidioma-forming groups (Subfilum Agaricomycotina). Systematics. Biological cycle. Structure and parts of a basidiomata. Development types of basidiomata. Diversity and examples of the groups having most interest ecologically and economically: "Jelly fungi", "Aphyloforales", "Agarics" and "Gasteromycetes".

13. Lichens and Mycorhyza. Lichens: definition. Mycobiont and photobiont. The Lichen thallus: Anatomical structure and growing forms. Fixing structures. Structures for the exchange of air. Cephalodia. Sexual and asexual reproductive structures. Mycorhyza: definition and types. Endo or AM. Ecto or ECM.

## Methodology

Face-to-face sessions.

Part of the knowledge of this subject will be transmitted from the master classes where, apart from giving explicit information, the key points of each didactic unit will be highlighted to facilitate and encourage the student's self-learning. Subsequently, the student from the scheme can complement it with bibliographic information and a good support of graphic material (PPT) from their non-contact work.

This subject presents an inseparable practical component of theoretical knowledge.

We will distinguish between laboratory and field practices. In the first case, students will have the necessary information in the form of practical and bibliography scripts that will include both the observation methodologies of the material and the main structures to identify and their terminology. In the second case, the student will be offered all the necessary information to acquire the skills and attitude necessary for "mycological" fieldwork. In addition, all the necessary written information will be provided, which will include the methodology to follow for both identification and sampling methods in the field of mycology.

## Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Field practices	4	0.16	2, 5, 1, 8, 3
Laboratory practices	9	0.36	7, 2, 9, 8
Theoretical classes	22	0.88	7, 4, 6, 9, 8
Type: Supervised			
Tutorials	6	0.24	
Type: Autonomous			
Study	52	2.08	7, 4, 6, 9, 8

## Assessment

This subject will be evaluated from two eliminatory partial exams (plus the corresponding recovery, if applicable) and the evaluation of the practices according to the following characteristics and conditions:

I. First written partial exam of theory, eliminatory, with questions of type test and / or short answer: 40% weight in the final note. Only the subject is eliminated if the grade is equal to or greater than 5.

II. Written exam, partial, theoretical, eliminatory, with questions of type and / or short answer: 40% weight in the final mark. Only the subject is eliminated if the grade is equal to or greater than 5.

III. Final recovery exam. Only by examining the partial / s pending / s. With the same structure as the partial exams and maintaining the weight of 40% for each block. To pass the course, the approved partials must be obtained with a mark equal to or greater than 5. There are no compensations.

If someone with the partial exams passed wants to submit to the final recovery to make a note, you can do this by notifying the teacher beforehand, and renouncing the grade of the first exam (which could be higher than the new one).

To participate in the recovery, the students must have previously been evaluated in a set of activities whose weight equals to a minimum of two thirds of the total grade of the subject or module. Therefore, students will obtain the "Non-Valuable" qualification when the assessment activities carried out have a weighting of less than 67% in the final grade.

IV. Evaluation of practices. Practices are evaluated through assistance control, plus the use and interest shown by the student. The teacher will carry out a continuous assessment through questions during the practical session and may be supplemented with a questionnaire or test during the end of the practice. The weight of the practical note in the final mark of the subject is 20%.

Attendance at practical sessions (or field trips) is mandatory. The students will obtain the "Non-Valuable" qualification when the absence exceeds 20% of the programmed sessions.

Not-Appraising

See the previous section.

Assistance

The attendance to the practices is obligatory, will be controlled passing list and is part of his evaluation.

## Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation of the practices	20	2	0.08	7, 2, 4, 6, 5, 1, 9, 8, 3
First written eliminatory test	40	2.5	0.1	7, 4, 6, 9, 8
Second written eliminatory test	40	2.5	0.1	7, 4, 6, 9, 8

## Bibliography

GENERAL OUVRAGES

AHMADJIAN, V. & HALE, M.E. (eds.) (1974). The Lichens. Academic Press. London & New York.

ALEXOPOULOS, C.J., MIMS C.W. & BLACKWELL, M. (1996). Introductory Mycology. John Wiley & Sons Inc. New York.

ESSER, K. & LEMKE, P.A. (eds.) (1994-2004). The Mycota. A comprehensive treatise on fungi as experimental systems for basic and applied research. Vols. I-XII. Springer Verlag. Berlin.

KENDRICK, B. (2000). The Fifth Kingdom. 3rd. ed. Focus Information Group Inc. Newburyport.

KIRK, P.M., CANNON, P.F., DAVID, J.C. & STALPERS, J.A. (eds.) (2001). Dictionary of the Fungi. 9<sup>th</sup> ed. CABI Publ. Wallingford.

LLIMONA, X. (ed.) (1991). Els fongs i els líquens. Història Natural Països Catalans. vol. 5. Enciclopèdia Catalana. Barcelona.

MOORE-LANDECKER, E. (1996). Fundamentals of the fungi. 4rd. ed. Prentice Hall. New Jersey.

WEBSTER, J. & WEBER, R.W.S. (2007). Introduction to fungi. Cambridge University Press. Cambridge.

#### FIELD GUIDES / MONOGRAPHS / LABORATORY BOOKS

BON, M. (1988). Guía de campo de los hongos de Europa. Omega. Barcelona.

CAMBRA, J., GOMEZ, A. & RULL, J. (1989). Guía de les algues i els líquens dels Països Catalans. Pòrtic. Barcelona.

CETTO, B. (1979-1980). Guía de los hongos de Europa. 3 vol. Omega. Barcelona.

COURTECUISSÉ, R. & DUHEM, B. (2005). Guía de los Hongos de la Península Ibérica, Europa y Norte de África. Omega. Barcelona.

ELLIS, M.B. & ELLIS, J.P. (1985). Microfungi and land plants. Croom Helm. London.

ELLIS, M.B. & ELLIS, J.P. (1988). Microfungi on miscellaneous substrates. Croom Helm. London.

GERHARDT, E., VILA, J. & LLIMONA, X. (2000). Bolets dels Països Catalans i d'Europa. Omega. Barcelona.

HANLIN, R.T. (1990). Illustrated genera of Ascomycetes. APS Press. St. Paul. Minnesota.

HANLIN, R.T. (2000). Illustrated genera of Ascomycetes. Vol. II. APS Press. St. Paul. Minnesota.

MORENO, G., GARCIA MANJON, J.L. & ZUGAZA, A. (1986). La guía INCAFO de los hongos de la Península Ibérica. 2 vol. INCAFO. Madrid.

MUNTAÑOLA, M. (1997). Guia dels fongs microscòpics. Ed. Pòrtic. Barcelona.

OZENDA, P. & CLAUZADE, G. (1970). Les lichens. Étude Biologique et Flore Illustrée. Masson. Paris.

PASCUAL, R. (1999). Guia dels bolets dels Països Catalans. Pòrtic. Barcelona.

SOCIETAT CATALANA DE MICOLOGIA. (eds.) (1982-2010). Bolets de Catalunya. 29 series. Barcelona.

#### INTERNET

DOCTOR FUNGUS - <http://www.doctorfungus.org/>

FUNGI IMAGES ON THE NET.- <http://www.in2.dk/fungi/imageframe1.htm>

LICHENS - <http://helios.bto.ed.ac.uk/bto/microbes/lichen.htm>

MYKOWEB.- <http://www.mykoweb.com/>

TREE OF LIFE - FUNGI - <http://tolweb.org/Fungi/2377>

ZOOSPORIC FUNGI ONLINE - <http://www.botany.uga.edu/zoosporicfungi/>

