

Degree programme	Type	Course
Environmental Biology	OB	2

Contact lecturer

Name : Moisès Guardiola Bufí

Email : moises.guardiola@uab.cat

Teaching staff

Pau Carnicero Campmany

Group languages

You can consult this information at the [end](#) of the document.

Prerequisites

There are no official prerequisites.

It will facilitate the follow-up of the subject having basic knowledge of evolution, biology of the reproduction and functioning of the plants as well as botanical and geographical 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 plant biology acquired in the subject of the first course "Prospecting of the Natural Environment".

Objectives

The study of the biodiversity of photoautotrophic organisms (algae and plants) is addressed. The student must be able to understand and even develop a phylogenetic scheme where to locate the different elements of this plant biodiversity. This objective is closely related with both aspects of plant evolution and the study of techniques and knowledge that allow us to classify living beings (morphology, anatomy, molecular indicators, biogeographical aspects, etc.).

In addition, biodiversity will be studied not only from a systematic and phylogenetic perspective but also from a more ecological perspective (plant communities and biomes).

On the other hand, special emphasis will be given to the main biological processes (life cycles, reproduction, development, etc.), evolutionary (phylogenetic relationships, evolutionary trends, coevolution, etc.), ecological (limiting factors, habitats, adaptations to the environment, etc.) and applications by man (industry, territorial management, etc.) of the main groups studied.

This subject is complementary to other subjects such as "Prospecting the natural environment", "Analysis of environmental cartography" and "Analysis of vegetation", as well as those that make up the path of plant biology in the fourth year but always from an integrating point of view in the inseparable set formed by the

environment.

Learning outcomes

- CM24 (Integrate the potential of plant diversity in ecosystems, relating it to environmental factors and assessing the environmental impact of human activity.) Integrate the potential of plant diversity in ecosystems, relating it to environmental factors and assessing the environmental impact of human activity.
- CM25 (Communicate knowledge in the field of botany objectively and clearly, both orally and in writing, to both a specialist and non-specialist audience.) Communicate knowledge in the field of botany objectively and clearly, both orally and in writing, to both a specialist and non-specialist audience.
- KM31 (Describe the development, growth and biological cycles of plants, as well as their diversity and evolution.) Describe the development, growth and biological cycles of plants, as well as their diversity and evolution.
- KM32 (Identify plant species using current techniques for classifying living organisms.) Identify plant species using current techniques for classifying living organisms.
- SM31 (Apply methods for the observation and analysis of the different parts of the anatomy of the main groups of plants.) Apply methods for the observation and analysis of the different parts of the anatomy of the main groups of plants.
- SM32 (Obtain plant specimens and materials for subsequent laboratory analysis.) Obtain plant specimens and materials for subsequent laboratory analysis.
- SM33 (Prepare reports and analyse samples and data in the field of botany, presenting them in both written and oral form.) Prepare reports and analyse samples and data in the field of botany, presenting them in both written and oral form.
- SM34 (Analyse the origin, evolution and diversity of plants.) Analyse the origin, evolution and diversity of plants.

Contents

1. The science of botany. Definition. What is a plant? The modern classification systems. Biodiversity. How many species are there on the planet? Definition of species. Genera, subspecies and varieties. Systematics, Evolution, Taxonomy and Phylogeny. Phylogenetic or Cladistic Systematics. Monophyly, paraphyly and polyphyly.

2. Resources for Systematics in Botany. Linnaeus's "Species Plantarum" and the binomial system. Scientific names and vulgar names. Taxonomical categories (taxa) and hierarchy. International Code of Botanical Nomenclature. Dichotomous keys. Herbaria.

3. Morphological Organization. Prokaryotes and Eukaryotes. Protophytes: unicellular, colonies, aggregation consortiums. Thallophytes: siphonal, filamentous, pseudoparenchyma, tissue. Bryophytes. Cormophytes.

4. Reproduction and biological cycles. Asexual and sexual reproduction. Asexual: bipartition, fragmentation, by mitospores, by propagules. Sexual: isogamy, anisogamy, oogamy, spermatization, conjugation. Spores and sporangia. Gametes and gametangia. Biological cycles: haploid, diploid and diplohaploid.

5. Photosynthetic bacteria: cyanobacteria. Type of nutrition: according to the carbon source, according to the source of energy and according to the electron donor. Photosynthesis. Photosynthetic pigments. Cell structure of cyanobacteria. Movement ("gliding"). Sheath. Filament and Trichoma. Akinets and heterocysts. Asexual reproduction: hormogonia and baeocytes. Symbiosis. Diversity. Ecology. Importance of stromatolites for the interpretation of the origin of life. Cyanotoxins. Uses.

6. Introduction to Algae. Phylogeny of algae. Origin and evolution of the chloroplast. Lines green, red and brown. Classification criteria.

7. Rhodophytes (red algae). General characteristics. Cell structure. "Pit connections" or synapses. Reproduction and cycles: the trigenetic cycle. Diversity-Morphology. Uses: nori, agar and carrageenan.

8. Euglenophytes. General characteristics. Cell structure. Pellicle.Movement. Diversity. Ecology.

9. Dinophytes (dinoflagellates). General characteristics. Cell structure. Teca. The flagella. Life cycle. The red tides. Bioluminescence. Zooxantela-Symbiosis. Diversity.

10. Heteroconts: Diatoms. Stramenopiles, Chromista or Heteroconts. Diatoms. General characteristics. The frustule. Life cycle of pennal diatoms. Movement. Blooms. Applications. Diversity.

11. Heterocontss: Phaeophyceae (brown algae). General characteristics. Morphology. Growth. Systematics. Dictyotales: Dictyota dichotoma (morphology and life cycle), Padina pavonica. Laminariales ("kelps"): morphology, diversity and cycle. Fucales: Fucus spp. (Morphology and life cycle), Cystoseira spp. Uses of the brown algae: wakame, kombu, alginates, fucoidan.

12. The Plants (Green Plants or Viridiplantae). Chlorophytes (green algae). Definition of Viridiplantae. Phylogeny. Position of the Chlorophytes. General characteristics of Chlorophytes. Characteristics used to distinguish large groups of chlorophytes. The flagellar roots. Type of mitosis. Phragmoplast and phycoplast. Phylogeny. Diversity. Chlorophyceae: Chlamydomonas (life cycle) and other volvocales. Trebouxiophyceae: Chlorella and other Clorellales, Trebouxia. Ulvophyceae: Ulotricales, Ulvales (Ulva, life cycle), Cladoforales, Dasycladales, Caulerpales (Caulerpa and Codium -vital cycle-). "Streptophytes" - Charophyceae: phylogenetic location; Zygnematales, Charales and Coleocetales.

13. The Terrestrial Plants (Embryophyta). The origin. Adaptations to the terrestrial environment. Vegetative and reproductive structures.

14. Bryophytes. Phylogeny. General characteristics. Life cycle. Gametophyte: Stems and leaves. Antheridia and Archegonia. Differential characters among the three groups. Liverworts (Marchantiophyta): gametophytes, talose and foliose, characteristics of gametophyte and sporophyte, biological cycle, diversity. Mosses (Bryophyta): biological cycle, spores, protonema, characteristics of the gametophyte and sporophyte. Acrocarpic and pleurocarpic, diversity, environments rich in mosses. Hornworts (Antocerotophyta).

15. The Vascular Plants (Tracheophytes). Phylogenetic situation. Apomorphies of Vascular Plants. The corm: root, stem and leaves. Evolution of the leaves: microphylls and megaphylls. Lignin. Cuticle and stomata. Vascular tissue: xylem and phloem.

16. The Vascular Cryptogams ("Pteridophytes"). Phylogenetic situation. The origin: the Rhynie Chert. The fossil vascular plants. Systematics: the "Pteridophytes", the Lycophytes, the Monilophytes.

17. Pteridophyta I: Lycopodiophytina and Psilophytina. General characteristics of the Pteridophyta. Life cycles: Homospory and Heterospory. Sporangia on leaves or stems. Eusporangia and Leptosporangia. Lycopodiophytina: General characteristics. Extinct forms. Isoëtes. Selaginella: model of a heterosporic cycle. Euphyllophyta. Monilophyta. Psilophytina (Psilotum).

18. Pteridophyta II: Equisetophyta ("Horse tails"). General characteristics. Extinct forms. Structure of the aerial stems and fertile stems. Gametophyte. Biological Cycle. Diversity.

19. Pteridophyta III: Pterophytina ("Ferns"). General characteristics. Phylogeny. Sporophyte: leaf, sporophylls, trophosporophylls, trophophylls, sporangia, sori, indusium. Gametophyte. Biological Cycle. Diversity. Aquatic ferns..

20. Plants with seed: Spermatophytes. What is the seed? What are the steps that have led to the evolution of the seed? Heterospory, endospory, reduction of the number of megaspores, retention of megaspore, evolution of integuments. The grain of pollen. The seed. Comparison of spermatophytes with vascular cryptogams. Origins of plants with seed. Pteridosperms and Progymnosperms.

21. Gymnosperms I: Cycadopsida and Ginkgopsida. Phylogeny. Origin. Cycadopsida: General characteristics. *Cycas revoluta*. Ginkgopsida: General characteristics. *Ginkgo biloba*

22. Gymnosperms II: Coniferopsida. Pinaceae. Phylogeny. Distribution. General characteristics. Pinaceae: General characteristics. Vegetative elements: the leaves. Reproductive elements: male cones and female cones, seeds. Life cycle of *Pinus* sp. Details of the pollen grain and the ovule. Diversity: *Abies*, *Pinus*, *Picea*, *Pseudotsuga*, *Larix*, *Cedrus*.

23. Gymnosperms III: Coniferopsida. Cupressaceae and Taxaceae. Cupressaceae: General characteristics. Phylogeny. Vegetative elements: the leaves. Reproductive elements: male cones and female cones, woody strobili or fleshy galbules. Diversity: *Juniperus*, *Cupressus*, *Thuja*, *Sequoia*, *Sequoiadendron*. Taxaceae: General characteristics. Phylogeny. The yew (*Taxus baccata*). Taxol.

24. Gymnosperms IV: Gnetopsida. General characteristics. *Ephedra*, *Gnetum*, *Welwitschia*.

25. Plants with flowers: Angiosperms. Apomorphies of the Angiosperms. The flower. Inflorescences. The Stamens. Male Gametophyte. The Carpels. The Ovule or Seminal Primordium. Life cycle of Angiosperms. Microsporogenesis. Megasporogenesis. Pollination. Embryogenesis. The seed. The fruits. Dispersion of seeds and fruits.

26. Angiosperms I: Introduction. Basal and Magnoliidae groups. Comparative Gymnosperms-Angiosperms.

Phylogeny of Angiosperms or Magnoliopsida. From the classical to the current systematic. The basal or protoangiosperm groups: Nymphaeaceae. Magnolids: Lauraceae, Magnoliaceae.

27. Angiosperms II: Monocots. General characteristics. Liliaceae. Smilacaceae. Orchidaceae. Asphodelaceae. Asparagaceae. Ruscaceae. Amaryllidaceae. Arecaeae. Juncaceae. Cyperaceae. Poaceae.

28. Angiosperms III: Eudicots I. Phylogeny. General characteristics. Papaveraceae. Ranunculaceae. Amaranthaceae Cactaceae. Caryophyllaceae. Polygonaceae. Saxifragaceae.

29. Angiosperms IV: Eudicots II. Geraniaceae. Rutaceae. Brassicaceae. Malvaceae. Cistaceae Fabaceae (legumes). Rosaceae. Fagaceae. Betulaceae Cucurbitaceae. Euphorbiaceae. Salicaceae

30. Angiosperms V: Eudicots III. Ericaceae Boraginaceae Gentianaceae. Rubiaceae Lamiaceae Scrophulariaceae. Plantaginaceae. Convolvulaceae. Solanaceae. Apiaceae. Asteraceae.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Laboratory practices	24	0.96	CM24, KM31, KM32, SM31
Study	67	2.68	CM24, KM31, KM32, SM31, SM34
Field practices	11	0.44	CM24, KM32, SM31, SM32, SM34
Elaboration of works	55.75	2.23	CM24, CM25, KM31, KM32, SM31, SM32, SM33
Theoretical classes	36	1.44	KM31, KM32, SM31, SM34

Face-to-face sessions

A part of the knowledge of this subject will be transmitted from the lectures where in addition to giving explicit information will highlight the key points of each teaching unit to facilitate and encourage self-learning of the student. Subsequently, the student from the scheme made will be able to complement it with bibliographic information and a good support of graphic material (slides) from their non-contact work.

This subject presents an important practical component inseparable from theoretical botanical knowledge.

We will distinguish between laboratory and field practices. In the first case, the students will have a script of practices that will include both the methodologies of observation of the plant material and the main structures to identify and their terminology. In the second case, the student will have a dossier which will include the environmental and landscape characteristics of the itineraries visited as well as the list of species that we intend to be recognized.

Preparation of works

We consider that the elaboration of works is a necessary element as long as they are well defined, supervised and allow the work in group with other students and the interaction with the professors.

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Second eliminatory partial exam (individual assessment)	30%	2.5	0.1	CM24, CM25, KM31, SM34
Evaluation of the herbarium	20%	0.75	0.03	CM25, KM31, KM32, SM31, SM32, SM33
First eliminatory partial exam (individual assessment)	30%	2.5	0.1	CM24, CM25, KM31, SM34
Examination of practices (individual assessment)	20%	0.5	0.02	CM25, KM32, SM31

This subject will be evaluated based on two eliminatory partial theory examinations, the corresponding recovery if applicable, a practice exam and a work. The conditions and characteristics are:

I. Written exam of the first partial of Theory, eliminatory, with questions of type and short answer. The weight is 30% in the final grade of the subject. Only the subject is eliminated if the grade is equal to or greater than 5.

II. Written exam of the second part of Theory, eliminatory, with questions of type and short answer. The weight is 30% in the final grade of the subject. Only the subject is eliminated if the grade is equal to or greater than 5.

III. Written exam of Final Recovery of Theory, only by examining the partial / s pending / s. With the same test structure as the partial ones, and keeping the weight of 30% for each partial. If someone with the partial exams passed wants to submit to the final recovery to make a note can do so, previously advising the teacher and accepting in writing the resignation of the first one (which could be higher than the new one).

See the section \"Not-Appraising\".

The I-III evaluations correspond to the Theory block, with a weight of 60% of the final mark. In order to pass this block you have to have the partial ones passed with a mark equal to or greater than 5 (the partial ones do not compensate each other).

IV. Written examination of practices, consists of the identification and morphological description of vegetal organisms seen during the sessions of laboratory practices and field trips. Weight of 20% in the final note.

V. Work, Presentation of a herbarium of a number to identify wild plants identified with the scientific name, some of which must incorporate a complete description. Weight of 20% in the final note.

The IV-V evaluations correspond to the Practices block, with a weight of 40% of the final mark. To pass the block of internships, the two assessments (IV and V) must be compensated, each with a mark equal to or greater than 4.

For the calculation of the final note we have to take into account that the activities evaluate two blocks of the subject: the theory and the practices, and that they must approve the two separately with a mark equal or superior to 5. For So much, there are no compensations between the notes of Theory and Practices. If one of the two is suspended, the whole course must be repeated the following course.

Not-Appraising

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.

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

Attendance and use of practices

The attendance to the practices is obligatory and will be controlled passing list. See the \"Not-Appraising\" section above.

For each student, the use of a unique and exclusive note book for laboratory and field practice will be required.

Single evaluation

This subject/module does not have a single assessment planned.

Academic Misconduct in Assessment Activities

Any form of academic misconduct during an assessment activity (including academic fraud, plagiarism, or the improper use of AI, unless such use is explicitly authorised in the course syllabus) that could significantly affect the assessment outcome will result in a grade of 0 (zero) for that assessment activity. If the course syllabus establishes that obtaining a minimum grade in that assessment activity is a compulsory requirement to pass the course, or if multiple instances of academic misconduct occur within the same course, the student will receive a final course grade of 0 (zero). In addition, disciplinary proceedings may be initiated against any student found to have committed such academic misconduct.

Bibliography

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BRESINSKY, A. et al. (2013). Strasburger's plant sciences : including prokaryotes and fungi. Springer

BARRENO-RODRÍGUEZ, E. & IZCO, J. (2015). Botánica. (2ª ed.) McGraw-Hill.

CARRIÓN, J.S. 2003. Evolución vegetal. DM. Murcia.

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LLIMONA, X. (ed.) 1985. Plantes inferiors. Història Natural dels Països Catalans. Vol. 4. Enciclopèdia Catalana. Barcelona.

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RECOMMENDED BIBLIOGRAPHY OF PRACTICES

AGUILELLA, A.; PUCHE, F. 2004. Diccionari de Botànica. Universitat de València. València.

BOLÒS, O. de; VIGO, J. 1984-2001. Vols. I-IV. Flora dels Països Catalans. Ed. Barcino. Barcelona.

BOLÒS, O. de et al. 2005. Flora Manual dels Països Catalans. 3ª ed. Ed. Pòrtic. Barcelona.

BONNIER, G.; DE LAYENS, G. 1990. Claves para la determinación de plantas vasculares. Ed. Omega. Barcelona.

CAMBRA, J. & RULL, J. & GÓMEZ-BOLEA, A. 1989. Guia de les algues i els líquens dels Països Catalans. Pòrtic.

CASTROVIEJO, S. (ed.). 2001. Claves de Flora Ibérica. Plantas Vasculares de la Península Ibérica e Islas Baleares. Vol. 1. Real Jardín Botánico - CSIC. Madrid.

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FONT i QUER, P. 2009. Diccionario de Botánica. (4ª ed.) Labor. Barcelona.

HEYWOOD, V.H. 1985. Las plantas con flores. Ed. Reverté.

LLISTOSELLA, J. & BERNAL, M. 2022. Manual pràctic de botànica : morfologia de les plantes vasculars. Edicions de la Universitat de Barcelona.

LLISTOSELLA, J. & SÀNCHEZ-CUXART, A. 2020. Guia il·lustrada per a conèixer els arbusts i les lianes. Universitat de Barcelona Edicions.

LLISTOSELLA, J. & SÀNCHEZ-CUXART, A. 2015. Guia il·lustrada per a conèixer els arbres. Publicacions i Edicions de la Universitat de Barcelona.

LLISTOSELLA, J. & SÀNCHEZ-CUXART, A. 2019. L'Herbari : mates, herbes i falgueres. (2ª ed.) Edicions de la Universitat de Barcelona; Publicacions de la Universitat de València.

LLISTOSELLA, J. & SÀNCHEZ-CUXART, A. 2003. L'herbari : arbres, arbusts i lianes. Edicions Universitat de Barcelona.

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MASCLANS, F. 1990. Guia per a conèixer els arbres. 9ª ed. Ed. Montblanc-CEC. Barcelona.

MASCLANS, F. 1990. Guia per a conèixer els arbusts i les lianes. 8ª ed. Ed. Montblanc-CEC. Barcelona.

SÁEZ, L. 2025. Les Falgueres de Catalunya. (1ª ed.) Brau.

SALVO TIERRA, E. 1990. Guía de helechos de la Península Ibérica y Baleares. Ed. Pirámide. Madrid.

WIRTH, V. 2004. Guía de campo de los líquenes, musgos y hepáticas : con 288 especies de líquenes y 226 de briófitos (musgos y hepáticas). Omega.

NOTA.- Hi ha publicades una gran quantitat de guies, impossible de ser totes incloses en aquesta llista.

INTERNET

<http://www.unex.es/botanica/LHB>

http://www.aulados.net/Botanica/Curso_Botanica/Curso_Botanica.htm

<http://tolweb.org/tree/>

<http://biodiver.bio.ub.es/biocat/homepage.html>

<http://herbarivirtual.uib.es/cat-med/index.html>

<http://blogs.uab.cat/herbari/>

<http://www.floraiberica.org/>

<http://www.anthos.es/>

<http://www.biologia.edu.ar/botanica/>

<https://www.floracatalana.cat/>

Software

There is no specific software in this course.

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	22	Catalan	second semester	afternoon
(PLAB) Practical laboratories	221	Catalan	second semester	morning-mixed
(PCAM) Field practices	221	Catalan	second semester	morning-mixed
(PCAMs) Suport a les pràctiques de camp dirigides	221	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	222	Catalan	second semester	morning-mixed
(PCAM) Field practices	222	Catalan	second semester	morning-mixed
(PCAMs) Suport a les pràctiques de camp dirigides	222	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	223	Catalan	second semester	morning-mixed
(PCAM) Field practices	223	Catalan	second semester	morning-mixed
