COURSE DATA

Data Subject	
Code	33051
Name	Botany
Cycle	Grade
ECTS Credits	10.0
Academic year	2018 - 2019

Study (s)

Degree	Center	Acad. year	Period
1100 - Degree in Biology	Faculty of Biological Sciences	2	Annual

Subject-matter

Degree	Subject-matter	Character
1100 - Degree in Biology	10 - Plant biology	Obligatory

Coordination

Name	Department
ATIENZA TAMARIT, M.VIOLETA	32 - Botany
PERIS GISBERT, JUAN BAUTISTA	32 - Botany
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SUMMARY

The Botany course subject is annual, is taught in the second course of the Biology degree and forms part of the Plant Biology subject, along with Plant Physiology. It covers the study of cyanobacteria, algae, plants, and fungi from an evolution and up-to-date perspective. It is one of the basic course subjects to learn diversity among living beings.

This course subject is taught in two parts: a theoretical programme, containing thirty subjects and thirty-five theoretical classes; a practical programme, comprising fourteen laboratory sessions, and includes a visit to the didactical garden in the Burjasot campus, a visit to the Botanical Gardens belonging to the Universidad de Valencia, and two field trips. The content of both parts is related in such a way that the theoretical contents will have been explained prior to the corresponding practical session.

The central part of the course subject involves studying the diversity of plants, algae and fungi, as well as their structural, reproductive, systematic, evolutionary, ecological and conservational aspects.

The aspects it includes are summarised as follows:

·Plants and fungi in the tree of life context. Role of these organisms in the biosphere and their importance.

·Complexity of algae, plants and fungi organisation.

·Endosymbiosis and the origin of chloroplasts.

·Reproduction in algae, plants and fungi. Life cycles.

·Diversity of fungi, algae and plants. This is the most extensive part of the course subject as it includes studying very diverse organisms, ranging from prokaryotes to eukaryotes and, among these, the organisms belonging to various supergroups, as well as their phylogenetic relations. Plants are studied by covering the structural characteristics of embryophytes, cormophytes and spermatophytes.

·Geographical distribution of plants and floristics divisions on Earth. Plant communities and the biomass on Earth.

Introduction to the study of conservation strategies and how to manage plant biodiversity. Threat and protection categories of threatened plants.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

OUTCOMES

1100 - Degree in Biology

- Conocer la estructura y organización de los vegetales y los hongos.
- Conocer los principales tipos de reproducción de los vegetales y de los hongos.
- Comprender los ciclos vitales de los vegetales y los hongos.
- Conocer la diversidad de los principales grupos de vegetales y de hongos.
- Conocer el papel de los vegetales y los hongos en los ecosistemas naturales y su importancia económica.
- Conocer los factores ecológicos que condicionan la vida de las plantas, los tipos de comunidades vegetales y las formaciones vegetales de la tierra.

- Conocer los principios básicos del funcionamiento de las plantas.
- Conocer el funcionamiento de aparatos y técnicas elementales relacionadas con la asignatura.
- Preparar e identificar material de origen vegetal.
- Preparar, conservar e identificar plantas utilizando claves.
- Conocer las colecciones botánicas, los bancos y las bases de datos y su importancia como fuentes de información para el conocimiento de las plantas.
- Capacidad de diseñar y llevar a cabo experimentos, así como de analizar e interpretar datos.
- Saber buscar la información bibliográfica adecuada para, en un momento dado, poder actualizar y profundizar en sus conocimientos sobre un tema especifico.
- Capacidad de análisis y síntesis de la información relativa a la materia.
- Comprender y manejar la terminología científica básica relacionada con la materia.
- Comprender e interpretar trabajos científicos relacionados con los vegetales.
- Capacidad para trabajar en grupo.
- Capacidad de comunicar ideas e información a nivel escrito y oral.
- Capacidad de interactuar tanto con el profesorado como con los compañeros.
- Habilidad para argumentar desde criterios racionales, diferenciando claramente lo que es opinable de lo que son hechos o evidencias científicas aceptadas.
- Adquisición de conciencia social y profesional sobre la problemática ambiental y la importancia de la biotecnología vegetal y sus implicaciones éticas.

LEARNING OUTCOMES

1 Knowledge of the main taxonomical groups of plants and fungi

2 Knowledge of the most frequent trees and shrubs species in the Valencian region, along with selected algae, lichens, bryophytes and pteridophytes species.

3 Preparing herbarium samples

4 Knowledge of organs and structures in plants and fungi

5 Designing scientific experiments which help verify the reliability of a theory or hypothesis

6 Knowing how to interpret scientific works relating to Botany

7 Creating a comprehensive and organised written text

8 Preparing and presenting seminars in groups using information and communication technologies (ICT)

9 Establishing the relationship between the knowledge acquired and its practical applications, particularly those relating to Biodiversity conservation.

10 Acquiring more knowledge about Botany to be able to decide and to offer reasoned and consistent opinions and reports

DESCRIPTION OF CONTENTS

1. Organisation and reproduction in plants and fungi

Organization, life cycles and reproduction of Algae, Plants and Fungi in the tree of life context are studied. Three theoretical classes are taught (T).

(T1)Plants and fungi in the tree of life context. Role of these organisms in the biosphere and their importance for humanity. Historical overview of the Botany science.

(T2)The plastid origin. Primary and secondary Endosymbiosis. Complexity of plants and fungi organization. From unicellular to multicellular organization: Thallophytes, Bryophytes and Cormophytes.

(T3)Reproduction in plants and fungi. Vegetative, asexual and sexual reproduction. Life cycles in plants and fungi: zygotic, gametic or sporic alternation of generations, meiosis. Adaptive importance of the life cycles. Representative examples.

2. Fungi and related heterotrophic organisms

Biology and diversity of fungi and related heterotrophic organism such as Amebozoa and moulds are studied. Four theoretical (T) classes and two laboratory (P) sessions are taught.

(T4)Heterotrophic organism in the Eukarya domain: Organisation and structure of the Fungi. Reproduction types (sexual, asexual and parasexual). The fungi life cycle. Nutrition, physiology and ecology of fungi.

(T5)The fungi: diversity, systematic arrangement and phylogenetic relationships. Detailed study of the main groups of fungi. Phylum Chytridiomycota. Phylum Zygomycota Phylum Glomeromycota, Phylum Ascomycota (Euascomycotina, yeasts), Phylum Basidiomycota (Hymenomicetes, rusts and smuts fungi). Mitosporic fungi.

(T6)Mutualistic symbiosis between fungi and other organisms: Lichens and mycorrhizas . Biological, ecological and economic importance of fungi.

(T7) Amebozoa (slime molds): Phylum Myxomycota; Phylum Dictyosteliomycota. Heterotrophic Heterokontophyta (aquatic molds and mildews): Phylum Oomycota.

(P1) Macroscopic/Microscopic observation of the vegetative organisation and reproductive structures of various Basidiomicetes and Ascomicetes specimens. Observation of ectomycorrhizae and endomycorrhizae.

(P2)Lichens: Macroscopic/ Microscopic observation of the vegetative organisation and reproductive structures of various lichens specimens. Major lichen growth forms. Identification of epiphytic lichens using identification keys.

3. The Algae

Biology and diversity of cyanobacteria (photoautotrophic prokaryotes) and eukaryotic algae are studied. Four theoretical (T) classes and one laboratory (P) session is taught.

(T8) Photoautotrophic prokaryotic organisms: Bacteria domain: The cyanobacteria, Phylum Cyanobacteria.

(T9) Photoautotrophic eukaryotic organisms: the algae. Organization and structure of the algae. Reproduction types, nutrition and physiology of the algae. Ecological factors; plankton and benthos. Phylum Euglenophyta.

(T10) Phylum Dinophyta: dinoflagellates. Phylum Ochrophyta: Class Bacillariophyceae (diatoms), Class Phaeophyceae: brown algae. Kelp forest of Laminariales.

(T11) Phylum Rhodophyta: Red algae. Phylum Chlorophyta and Phylum Charophyta: Green algae. Main distinguishing features, evolutionary scenario, organisation, reproduction, ecology and systematics.

(P3) Unicellular algae: vegetative organisation and reproduction. Microscopic observation of microalgae. Study of vegetative organisation and reproduction of cyanobacteria, diatoms, dinoflagellates and Chlorophyceae specimens.

(P4) Multicellular algae: macro algae. Macroscopic/microscopic observation of the vegetative and reproductive structures of some Chlorophyceae, Phaeophyceae and Rhodophyceae specimens. Observation of selected fixed and living specimens.

4. Adaptation and colonization of terrestrial environment by plants. The Bryophytes

Plant adaptations to land Biology and diversity of the bryophytes are studied. Two theoretical (T) classes and one laboratory (P) session are taught.

(T12) Terrestrial plants: The occurrence of an embryo (Embryophytes). Adaptations and terrestrial invasion by plants. The importance of the alternation of generations and the reproduction of plants. Sporophylls. Isosporous and heterosporous life cycles. Groups of embryophytes.

(T13) Bryophytes: Phylum Hepatophyta; Phylum Anthocerophyta; Phylum Bryophyta. Main characteristics of the group. Life cycle: gametophytes and sporophytes structure. Ecology. Phylogeny. Diversity.

(P5) Bryophytes: Macroscopic/microscopic observation of the vegetative organisation and reproductive structures of some representative specimens.

5. Vegetative organization of the Cormophytes

Cormophytes organisation and their adaptation to various environmental factors are studied. Four theoretical (T) classes and one laboratory (P) session are taught.

(T14) Cormophytes plant body development (1). The root. Anatomy: Primary and secondary structure. Root systems. Root modifications.

(T15) Cormophytes plant body development (2). The shoot. Shoot systems. Shoot anatomy: Primary and secondary structure. Shoot modifications.

(T16) Cormophytes plant body development (3). The leaf: types; morphology and anatomy. Leaf modifications.

(T17) The plants and the environmental factors such as climate, soil, topography, biological interactions. Biotypes. Hydrophytes, xerophytes and mesophytes plants. Plants and fire. Carnivorous plants. Holoparasites and hemiparasites. Adaptive importance of the various photosynthetic pathways for plants.

(P6) Comparative anatomical and morphological study of leaves of xerophytes, hydrophytes and mesophytes.

6. Seedless vascular plants

Seedless vascular plants are studied. Biology and the diversity of the Pteridophytes. One theoretical (T) class and one laboratory (P) session are taught.

(T18) The seedless vascular plants: The Pteridophytes: Class Lycopodiophyta, Class Pteridophyta, characteristics, diversity and phylogenetic relationships.

(P7) The Pteridophytes: vegetative organisation and reproductive structures in ferns and horsetails. Macroscopic/microscopic observation of some representative specimens.

7. Seed plants

Seed plants biology and the diversity of the Gymnosperms are studied. Two theoretical (T) classes and one laboratory (P) session are taught.

(T19) The seed plants (Spermatophytes). Main characteristics. Life cycle. The seed. Origin and evolution of the seed. Seed plants groups: Gymnosperms and Angiosperms.

(T20) Gymnosperms: Reproductive characteristics, Diversity and phylogeny. Phylum Cycadophyta, Phylum Ginkgophyta, Phylum Conipherophyta and Phylum Gnetophyta.

(P8) Gymnosperms: Macroscopic observation of members of Cupressaceae and Pinaceae. Vegetative and reproductive structures. Identification of representative specimens using identification keys.

8. The Angiosperms

Biology and diversity of the Angiosperms. Five theoretical (T) classes and six laboratory (P) session are taught.

T21 The Angiosperms: Phylum Magnoliophyta. Main characteristics. Ultra-structural and chemical characters. The Flower structure of the angiosperms. Flower parts. The perianth; flower types. Inflorescences.
T22 Androecium. Organisation of the stamen. Pollen. Main pollen types and evolutionary patterns. The gynoecium. Carpels and types of placentation. Parts of the Ovule. Genes that regulate flowering.
T23 Pollination: Definition and types. Mechanisms that avoid self-pollination. Male gametophyte and female gametophyte. The double fertilization. The seed development.
T24 Structure and development of the fruit and the seed in the Angiosperms. Fruits and seeds types. Multiple fruits. Fruits and seeds dispersal agents.
T25 Systematic arrangement of the Angiosperms: origin, phylogeny and evolutionary patterns: basal groups and main clades, Magnoliidas, Monocots, Eudicots (Rosidas, Asteridas).

P9 Extraction and microscopic observation of different pollen types. Pollen types in correlation with the pollination systems. In Vitro germination of the pollen tube.
P10 An introduction on material collection, storage, preservation of specimens and Herbarium packets (sheets) elaboration is presented. An introduction on the use of identification keys: families, genera and species is given. Family Brassicaceae.
P11 Angiosperms I: Macroscopic observation of some reproductive and vegetative structures of various families i.e. Lamiaceae and Ericaceae. Identification of representative specimens.
P12 Angiosperms II: Macroscopic observation of some reproductive and vegetative structures of various families i.e. Globulariaceae and Asteraceae. Identification of representative specimens.
P13 Angiosperms III: Macroscopic observation of some reproductive and vegetative structures of various families: Leguminosae and Fagaceae.
P14 Angiosperms IV: Poaceae and Liliaceae families

9. Plant Ecology and Biodiversity Conservation

Chorology, vegetal ecology, the worlds major terrestrial ecosystems or Biomes are studied Conservation biology of plants and fungi. Four theoretical (T) classes and Four Field trips/visits (P) are taught.

(T26) Geographical distributions of Plants and fungi. Factors that have performed the areas. Distribution areas´ types. Endemism. Worlds floristic divisions: Floristic Kingdoms.

(T27) Plant communities concept. Structure. Dynamics. Vegetation types. Primary and secondary succession. Altitudinal zones. Bioclimatology. Anthropic impact derived from agricultural practices, weeds communities: Malherbology.

(T28) Terrestrial Biomes. Vegetation zones. Tropical Rainforests. Savannas. Deserts. Mediterranean. Temperate deciduous forests. Grasslands and steppes. Taiga. Arctic Tundra. Marine ecosystems: prairies of marine phanerogams. Coral reefs. Mangroves.

(T29) The Mediterranean. The Iberian Peninsula. The Valencian Community: Climatic forests. The current landscape.

(T30) Estimation, scale and extinction of the Biodiversity. Conservation and how to manage the plant biodiversity. Protection categories, Red Lists. In situ and ex situ species protection possibilities. Invasive species. Types of protected natural areas.

(P15) Visit to the Universitys Botanical Gardens.

(P16) Visit to the Didactic Garden in the Burjasot campus. Identifying plants visually visu

(P17) Field trip to the Albufera Nature Reserve

(P18) Field trip to a Natural Reserve

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	52,00	100
Laboratory practices	40,00	100
Tutorials	8,00	100
Attendance at events and external activities	1,00	0
Development of group work	23,00	0
Study and independent work	20,00	0
Readings supplementary material	1,00	0
Preparation of evaluation activities	60,00	0
Preparing lectures	15,00	0
Preparation of practical classes and problem	15,00	0
Resolution of case studies	15,00	0
TOTAL	**250,00**	

TEACHING METHODOLOGY

The course subject will be taught by performing various activities and by using different methodologies:

Master classes, in which the teacher will explain the basic concepts of each subject with the help of ICT (presentations, videos, consulting web sites that provide useful information about the subject being explained).

Practical laboratory sessions, where the proposed programme will be followed. Students will be able to observe, prepare and identify plant or fungi material from different groups. Visits will also be organised to the University's Botanical Gardens and to the Didactic Garden in the Burjasot campus for the purpose of training students in identifying plants visually.

Field trips, shared with the Zoology course subject; two field trips will be organised: one to the Albufera Nature Reserve to visit the park´s interpretation centre at Racó de l'Olla and to observe the rich avifauna that lives in the park in May. Afterwards, a transect will be made from the beach to the wooded scrubland on stabilised dunes where flora, fauna and changes in plants can be observed. The second field trip will consist in visiting the continental Nature Reserve. During these field trips, Zoology and Botany teachers will accompany students and will explain the most relevant aspects in each place. Students will receive information about the places to be visited beforehand.

Practicals, in which students will form groups of two or three to prepare an original practical work. Throughout the course, group tutorials will be organised to solve any doubts and problems about identifying plant material, and to help prepare the report of this work. At the beginning of the course, the work objectives will be clearly set out.

Interdisciplinary work: preparing and presenting a seminar.

This interdisciplinary activity is generic and common in nature to all the course subjects taught in the second course of the Biology degree. This activity is compulsory for all the students who are registered for the second course, but not for those students who have performed this activity formerly (and whose mark has been maintained). Each work group, made up of three students, will prepare a seminar (that will consist in a written work and an oral presentation) about the subject assigned by a public draw among those proposed by the teachers of the course subjects included in this activity. Each interdisciplinary work will be considered to be linked (see its repercussion on activity evaluation) to the course subject on which the assigned subject directly depends. A tutor will be assigned to each work, who will assist in its undertaking by means of periodical meetings held throughout the course, and who will supervise its presentation. A co-tutor will also be assigned who will review the final version of the work presented. Each work will be orally presented by all the group members over a 30-minute spell. All the students in this course will attend this presentation as attendance is compulsory, along with one teacher and the work tutor. Both teachers and students will participate in selecting the works to be presented to the Biology Congress given their quality and originality. This will take place together between the first and second course of the Biology degree.

EVALUATION

The course subject evaluation system

Evaluating theoretical contents by means of exams:

The theoretical exam result will represent 45% of the mark; that is a maximum of 4.5 points (out of 10 points) in the final course subject evaluation. The result will be obtained after sitting a partial qualifying exam at the end of the first four-month period (which corresponds to the first part of the syllabus, subject units 1-5) and a second qualifying exam at the end of the second four month period (which corresponds to the second part of the syllabus, subject units 6-9). Students who have not pass these partial exams will have the chance to sit an exam taken at the end of the second four-month period as part of the first lot of exams (June).To eliminate all subject matters corresponding to the first/second partial exam, obtaining a mark equal to or higher than 5 (out of 10) will be necessary.

Should students fail the course subject in the first lot of exams, any qualifying partial theoretical exams they pass will be kept for the second lot of exams (July).

Evaluating practical classes by means of exams and practical work:

The practicals that form part of the course subject will be evaluated by means of two compulsory sections: a qualifying mark obtained in the practicals exam and that acquired with practical work. A qualifying mark in the practicals will represent 40% of the course subject grade; 20% will correspond to the practical exam, while the remaining 20% will relate to the practical work.

The practical exam will consist in a test about practical session content. Students will have to obtain 40% in the practical exam to be able to compensate with their practical work mark. Practicals will have been passed if the sum of the qualifying marks obtained in the two parts (practical exam + practical work evaluation) is equal to or higher than 5 (out of 10).

Students will have to obtain a mark of at least 5 (out of 10) in the practicals section to be able to add with their theoretical mark. Should students fail the course subject in the first lot of exams, but have passed the corresponding part of the practical exam/practical work; the qualifying mark will be kept until the second lot of exams.

Evaluating the interdisciplinary work using group seminars:

The qualifying mark obtained in the interdisciplinary work will represent 10% of the course subject mark. Those works selected to be presented in the Biology Congress will obtain an extra qualifying mark, which will correspond to 10% of the mark granted to this activity.

Those students who do not do the interdisciplinary work (which is compulsory) will fail this course subject if the present subject is linked to the interdisciplinary work (that is, that proposing the theme, and that which corresponds to the teacher who is the tutor of this work). The qualifying mark obtained in the rest of the course subject will be kept only until the next course, and will be summed to the qualifying mark obtained in the interdisciplinary activity at the time that this is done.

Should the current course subject not be the course subject linked to the interdisciplinary work, to pass the course subject, and should the interdisciplinary work not have been done, it will be necessary to obtain a mark that is equal to or higher then 5 (out of 9) for not having gained a mark in the interdisciplinary activity.

Should students fail the course subject, the qualifying mark given to the interdisciplinary work will be kept until the next course.

Students' participation evaluation

This is based on a control of students' regular attendance to class (theoretical and practical sessions) and face-to-face activities such as conferences, and also of their participation and degree of involvement in the teaching-learning process. Participation, attendance to the theoretical and practical sessions and preparation of conference records and other activities such as group tutorials will represent 0.5%, 0,5 of the course subject.

In order to pass the course subject, it will be necessary to obtain a mark of 5 (out of 10) in the overall qualifying mark for the theory, practical exam, practical work and participation sections, which will represent 90% of the course subject mark to which the qualifying mark achieved in the interdisciplinary work will be summed, which will represent the remaining 10%. The evaluation in the second lot of exams will be identical to the first lot of exams.

To request the advancement of the subject call, students must have completed the compulsory activities indicated in the course guide.

REFERENCES

Basic

- AGUILELLA, A. & F. PUCHE. (2004). Diccionari de Botànica. Colleció Educació. Material. Universitat de València. 500 pp.
- CHARCO, J., MATEO, G. & SERRA, L. (2014) Árboles y arbustos autóctonos de la Comunidad Valenciana. Centro de investigaciones Ambientales del Mediterráneo. 442pp.
- DÍAZ GONZÁLEZ, E. et al. 2004. Curso de Botánica. Ediciones Trea. Gijón. 574 p.
- IZCO, J. et al., (2004). Botánica. McGraw-Hill Interamericana (2ª edición). Madrid. 906 pp.
- MOORE, R., CLARK, D. & VODOPICH, D. (1998). Botany. 2nd ed. WCB/ McGraw-hill.
- NABORS, M. W. 2007. Introducción a la Botánica. Pearson Educación. Madrid. 744 p.
- RAVEN, P.H.; EVERT, R.F. & S. E. EICHHORN (2005). 7ª ed. Biology of plants. W.H. Freeman and Company. New York, 686 pp.

- SIMPSON, M. G. (2006). Plant Systematics. ElsevierAcademic Press, 590 pp.
- STRASBURGER, E. NOLL, F., SCHENCK, H & SCHIMPER, A. F. W. (2004). Tratado de Botánica. 35ª edición actualizada. Ed. Omega. Barcelona. 1231 pp.
- AIZPURU, I., C. ASEGINOLAZA, RM. URIBE-ECHEBARRÍA, P. URRUTIA & I. ZORRAKIN (2000) Claves Ilustradas de la Flora del País Vasco y territorios limítrofes. Servicio Central de Publicaciones del Gobierno Vasco, Vitoria.
- BOLÒS, O. DE & J. VIGO (1984-2001) Flora dels Països Catalans. [vol. 1: Introducció. Licopodiàcies - Capparàcies; vol. 2: Crucíferes - Amarantàcies; vol. 3: Pirolàcies - Compostes; vol. 4: Monocotiledònies]. Pòrtic S.A., Barcelona.
- LÓPEZ GONZALEZ, G. A. 2001 Los árboles y arbustos de la Península Ibérica e Islas Baleares. (Especies silvestres y las principales cultivadas). 2 vols, 1727 pp. Mundi Prensa. Madrid.
- MATEO, G. & CRESPO, B. 2014. Claves ilustradas para la flora valenciana 1ª Ed. Jolube consulter botánico y editor, www.jolube.es, 501pp.
- RODRÍGUEZ-PRIETO, C., BALLESTEROS, E., BOISSET, F. & AFONSO-CARRILLO, J. (2013). Guía de las Macroalgas y Fanerógamas marinas del Mediterráneo occidental. Ediciones Omega. Barcelona. 656 pp.
- VALDÉS, B., S. TALAVERA & E. F. GALIANO -eds.- (1987) Flora vascular de Andalucía Occidental. Ketres Ed. Barcelona. Versión digital en: http://bibdigital.rjb.csic.es/spa/index.php

Additional

- http://www.uniovi.es/bos/Asignaturas/Botanica/ [ciclos biológicos]
- http://www.hiperbotanica.net/ [biología (UNNE)]
- http://webs.uvigo.es/mmegias/1-vegetal/guiada_v_inicio.php [visita guiada por los tejidos de las plantas]
- http://tolweb.org/tree/ [árbol de la vida]
- http://www.ucmp.berkeley.edu/fungi/fungisy.html [hongos]
- http://www.ucmp.berkeley.edu/fungi/lichens/lichens.html [líquenes]
- http://botany.si.edu/projects/algae/ [algas]
- http://bryophytes.plant.siu.edu/ [musgos, hepáticas y antocerotas]
- http://www.ucmp.berkeley.edu/seedplants/seedplantssy.html [plantas con semillas]
- http://www.nhm.ac.uk/hosted_sites/bps/index.htm [Helechos]
- http://herbarivirtual.uib.es/cat-med/index.html
- http://www.arbolesibericos.es
- http://www.anthos.es
- http://www.seaweed.ie