BOTANY (2015-16)

GENERAL INFORMATION

Code 26523

ECTS Credits 6

Departments and areas

Department	Area	Area	Report R.
ENVIRONMENTAL SCIENCES AND NATURAL RESOURCES	BOTANICA	YES	YES

Studies

DEGREE IN MARINE SCIENCES

DEGREE IN BIOLOGY

Context of subject

Botany is a compulsory subject in the Formative Key Module of the Degree in Biology, whose primary goal is to provide students a complete picture of the different groups of plant organisms: algae, fungi and plants. Consequently, Botany has always been considered as one of the basic pillars of the degree, proving essential not only for future biologists to gain a complete picture of the overall complexity of the plant organisms and systems -and the evolutionary processes in which they are involved-, but also to enable them to understand and successfully cope with other biological matters to be addressed within the next semesters.

Botany aims to provide students the basic tools for the better knowledge of plant world as a whole. Plant organisms, due to their biodiversity and biomass in terrestrial and marine ecosystems, are of paramount importance in almost all environments, not only as primary producers but as sustenance and support for other groups of living being, with which they constantly interact in ecosystems. The course begins with an overview of this discipline, by recalling and expanding some of the aspects studied in previous semesters. The subsequent study of the basic morphology of vegetative and reproductive plant structures is the principal part of the subject, they always being focused from evolutionary and adaptive perspectives. Furthermore, the study of vegetation and landscape is undertaken in the final part of the course, which will facilitate to study relationships of plant organisms among themselves and with the environment.

The location of this subject in the First semester of the Second course (year) of the Biology degree will provide the student an easier comprehension of the basics of Botany, as other subjects will have already been studied that are basic for a correct understanding of botanical matters. Furthermore, students will be able to deepen with agility and solvency in the particular contents of Botany, allowing them to reach the competences own of the subject. However, it has to be properly coordinated with the rest of subjects of both the Degree and the Second course to ensure proper acquirement of generic skills of the module. In particular, Botany is basic to deal with solvency enough the subject Plant biodiversity, which complements it in the Second semester of the Second course.

Summarizing, Botany provides the basic knowledge to successfully cope with some of the matters and subjects of the degree that are tenable at the following semesters, as well as for the development of the professional activity of the future Graduate in Biology, according with the specific competencies conferred by the Spanish Official College of Biologists (COB).

OBJECTIVES

Subject objectives/competences (2015-16)

Objectives listed in the tab of the subject (*Verifica*):

- To recognize different organization levels of plant organisms (algae, fungi and plants).
- To discuss the main morphological features of plant organisms.
- To analyze and interpret life cycles of plant organisms.
- To understand the basics of Geobotany.
- To generate reports and talks on Botany from the information obtained in both lectures and practical classes.

Specific objectives recommended by lecturers:

- To manage botanical terms in different languages, in relation with their Spanish and English equivalencies.
- To know the order of magnitude data are located within.
- To produce value judgments of materials and methods used for some given targets.
- To acquire abilities enough to interpret data from a plant organism, being able to classify it into a particular system.

CONTENTS

Theoretical and practical contents (2015-16)

Programme of Lectures

Unit 1. *Introduction and general matters* (4 hours)

L1. Botany: basic contents. Brief history. The domain of Botany and its relationships with other sciences. The boundaries of plant world. The plant species concept and speciation processes. Botanical nomenclature and taxonomic categories.

L2. Life modes in plant organisms. Autotrophy: photosynthetic pigments and reserve substances; taxonomic significance. Diversity and evolution of plastids. Heterotrophy: saprophytism, parasitism and symbiosis. Other mechanisms.

L3. Reproduction in plant organisms. Vegetative and spore-based propagation. Sexual reproduction: gametangia and gametes. Special cases. Life cycles: types and meaning. Nuclear phase and generations athermancy.

L4. Morphological levels of organization. Plant diversity: phylogenetic groups and lineages.

Unit 2. *Level 'Protophytes'* (2 hours)

L5. Structural types: coccal, monadal, coenobial, prototrichal and protocolonial. Prokaryotic Protophytes: the beginning of aerobic life. Main characteristics and organization of the first photoautotrophic organisms.

L6. Eukaryotic Protophytes: structural and morphological diversification. Special cell coatings: mucilage, pellicles, frustules, and thecae. Value and evolutionary significance.

Unit 3. *Level 'Thallophytes'* (4 hours)

L7. The thallus: structure and diversification. Morphologial complexity and of life cycles.

L8. Heterotrophic Thallophytes. The plasmodium and the fungal mycelium: types and modifications. The dikaryon phase: fibulation and uncinulation. Fungal fruitbodies. Case study: parasitic fungi, mycorrhizae, and lichen symbiosis.

L9. Autotrophic Tallophytes. Evolutionary lineages and phylogenetic relationships: brown, red and green algae. Modes of cell division, metabolic pathways and mobile cells in Chlorophytes. Case study: Charophytes as precursors to land plants.

Unit 4. *Level 'Protocormophytes'* (2 hours)

L10. Terrestrial environment: adaptations to hostile conditions. Origin of land plants: antithetic and homologous theories. Antheridium and archegonium: characteristics and evolution. The embryo: evolutionary significance.

L11. Bryophytes: the poikilohydric lifestyle and the cycle with dominant gametophyte. Basic corporal model: rhizoid, caulidium and phyllidium. The parasitic sporophyte. Origin and evolution of bryophythes: structural changes in lineages.

Unit 5. *Level 'Cormophytes'* (10 hours)

L12. Vascular plants: Tracheophytes or Cormophytes: the homeohydric lifestyle and the cycle with dominant sporophyte. Morphology of cormus: roots, stems and leaves. Theories on the origin and evolution of cormus. Root types and modifications. Stem types and modifications. Leaf types and modifications.

L13. Non-seed Cormophytes. Isospory and heterospory: microsporangium and macrosporangium. Types of gametophytes: endosporic and exosporic development. Evolutionary lineages: licophytic and monilophytic ferns.

L14. Seed plants: gymnosperms and angiosperms. Pollen and pollination agents. The ovule primordium and the megaspore. Development of gametophytes and fertilization. Double and simple fertilization.

L15. From the gymnosperm strobile to the angiosperm flower. Floral whorls (verticils): perianth, androecium and gynoecium. Floral diagrams and formulas. Origin and evolution of flower. Inflorescences: types and inter-relationships.

L16. Seed development and ripening. Seminal ancillary structures. Fruit development and morphology; the pericarp. Typology of fruits and most representative examples. Infrutescences. Peudocarps or false fruits.

L17. Dissemination or dispersal of diaspores. Dispersal systems: anemochory, hydrochory, zoochory and autochory. Effect of anthropochory: ruderal plants and weeds. Seed germination: processes and types. Viviparism or viviparity

L18. Ecomorphology of cormus. Adaptations to water availability, soil salinity, light and temperature. Life forms or biotypes. Totally or partially heterotrophic Cormophytes: parasitic, insectivorous and humicolous plants.

Unit 6. *Introduction to Geobotany* (3 hours)

L19. Factors conditioning plant life. Bioclimatology: biomes and macrobioclimates of the World. Phytogeography: basis

concepts. Flora: autochthonous and allochthonous plants. Floristic kingdoms of the World. Chorological sectorization of the Iberian Peninsula.

L20. Vegetation science: basic concepts. Phytosociology: the plant association. Dynamics of vegetation: plant succession and vegetation series. Phytotopography or Landscape science. Zonation and catenae.

Practical contents

FIELD WORK.

Two field excursions are programmed, both to be realized preferably after accomplishing lectures of the Second unit. 1. Cabo de las Huertas (4 hours). 2. Campus of San Vicente and Bosque ilustrado (5 hours).

LABORATORY PRACTICAL SESSIONS (6 sessions of 3 hours each).

PR 1. ***Vegetative and reproductive structures in the main groups of Algae.*** (3 hours)

Learning objectives: Identification and recognition of the major vegetative (morphology and anatomy) and reproductive (sexual and asexual) structures of a number of different groups of brown, red and green algae. Recognition of the principal tallophytic levels of cellular organization will also be studied from representative genera of those groups.

Material required: binocular and light microscopes with adapted camera, computer and LCD projector, specialized literature, preserved and fresh samples.

PR 2. ***Vegetative and reproductive structures in fungi.*** (3 hours)

Learning objectives: Identification and recognition of the major vegetative (morphology and anatomy) and reproductive (sexual and asexual) structures of different groups of both macroscopic and microscopic fungi. Special emphasis will be placed on the analysis of morphological characters of macroscopic fruitful bodies (ascocarps and basidiocarps), on the basis of representative genera of Ascomycetes and Basidiomycetes.

Material required: binocular and light microscopes with adapted camera, computer and LCD projector, specialized literature, preserved and fresh samples.

PR 3. ***Vegetative and reproductive structures of the lichenized fungi*****.** (3 hours)

Learning objectives: Identification and recognition of the major vegetative (morphology and anatomy) and reproductive (sexual and asexual) structures of the lichenized fungi or lichens, from representative genera of the various life forms in Ascolichenes.

Material required: binocular and light microscopes with adapted camera, computer and LCD projector, specialized literature, preserved and fresh samples.

PR 4. ***Vegetative and reproductive structures in non-seed Embryophytes.*** (3 hours)

Learning objectives: Identification and recognition of the major vegetative structures of the Protocormophytic organization level (Protocormophytes or bryophytes). Recognition of the major reproductive structures of the most primitive land plants (archegonia and antheridia), based on examples from various families of bryophytes and ferns.

Material required: binocular and light microscopes with adapted camera, computer and LCD projector, specialized literature, preserved and fresh samples.

PR 5. ***Structure of cormus: roots, stems and leaves.*** (3 hours)

Learning objectives: Identification and recognition of the main types of root systems, stems and leaves, on the basis of the larger groups of Cormophytes (ferns, gymnosperms, angiosperms, monocots and eudicots). In addition, the principal modifications found in these structures mainly as a response to environmental changes will also be studied, on the basis of representative genera of different families.

Material required: binocular and light microscopes with adapted camera, computer and LCD projector, specialized literature, preserved and fresh samples.

PR 6. ***Reproductive structures of the seed plants: flowers, fruits and seeds.*** (3 hours)

Learning objectives: Identification and recognition of various types of inflorescences, floral verticils (perianth, androecium and gynoecium), fruits and seeds, from a selection of families of spermatophytes (gymnosperms and angiosperms).

Material required: binocular and light microscopes with adapted camera, computer and LCD projector, specialized literature, preserved and fresh samples.

EVALUATION

Instruments and criteria of Evaluation 2015-16

Comments:

Student presence in any activity of the subject (as a part of the continuous evaluation, which equals 50% of the final grade) is not mandatory, although it is extremely convenient. Practical classes (laboratory and fieldwork), seminars and tutorials will only be scored if students have previously attended those sessions in evaluation. Only under highly exceptional circumstances that are to be properly justified to lecturers, exceptions will be made.

In the official timetable of the course, two evaluation periods exist for the so-called ***Final test***. In the first period of evaluation (to be performed during January) the final score will come from the sum of the percentage of the continuous evaluation (50 %) plus the percentage of the final control (50 %), provided that the latter have gained 4 points out of the possible maximum 10 points (which means the students have passed thus 20% of the subject). As part of the continuous evaluation several written short tests (partials) will be carried out which will cover the entire theory matter studied up to that time (not matter is released in each one). Furthermore, in the practical sessions written tests or resolution of problems will also be carried out, which will be global every time. The final score of the continuous evaluation will be calculated by the sum of parts it is composed of, each with the percentage indicated above.

In the extraordinary period of evaluation (to be performed in July), students will be able to recover all parts of the subject (including the continuous evaluation), only if the single Final test in that period (which equals 100% of the grade) is passed. In this final test, students will be assessed of all matters developed during the course (lectures, laboratory and field practicals, exercises in seminars and tutorials, etc.). Therefore, students who wish to raise the score obtained in the period of regular evaluation will be able to try, though they will warn previously -always prior to the closure of the proceedings of this first period- the responsible lecturer, who will arrange everything to this effect.

Once the extraordinary evaluation test is completed, none of the scorings (neither from final testing or continuous evaluation) previously obtained by those students who have not passed the whole subject until then. They must course all the activities of the subject in the following years.

Recommendations for subject recovery:

After the first evaluation period, the final score for the ***Final test*** will be determined by the direct sum of the continuous evaluation plus the final control, taking into account all the observations described above.

In the extraordinary evaluation every student can raise score in any of the parts of the continuous evaluation. For this reason, it is sufficient to overcome the single written ***Final test***, which will include all the aspects covered in the subject during the course. In special cases, and as an exception, students affected by special circumstances will be asked for doing some additional reports or new tests to overcome any deficiencies noted during the process of continuous evaluation. The way for recovery will be specified in time when taking into account the particular circumstances concerning each particular case.

Extraordinary evaluation period (December)

A single written ***Final test*** is to be overcome in which all the aspects covered in the subject during the course (theory, laboratory and field practicals, tutorials, classroom and on-line exercises, etc.) will be included.

Type	Criterion	Description	Ponderation
FINAL TEST	This will include 60-90 questions (test-type control), which will deal with all activities carried out during the course: lectures, practicals (laboratory and fieldwork), tutorials, and/or seminars.	Final control	50
ACTIVITIES OF EVALUATION DURING THE SEMESTER	Practicals will be evaluated in situ, both in the field and the laboratory, or through exercises on line or the delivery of reports. A final practical test will be realized over the entire items studied.	Written controls on practical sessions	20

ACTIVITIES OF EVALUATION DURING THE SEMESTER	Short written controls will be carried out in classroom, as well as on-line controls (the so-called `partials¿) through the appropriate tool of the virtual campus. The different controls will not eliminate matter, so that they will include all items studied until that time.	Short controls (theory)	15
ACTIVITIES OF EVALUATION DURING THE SEMESTER	Very specific objectives of the subject will be handled, and they will be assessed through on-line exercises or valuing the participative work in classroom. Active participation in sessions will be also evaluated.	Group tutorials	5
ACTIVITIES OF EVALUATION DURING THE SEMESTER	These will include individual and cooperative work on videos, oral presentations, and exercises connected to theoretical/practical items. Active participation in debates and in-class presentations.	Oral presentations (Seminars)	10