

**COURSE DATA****Data Subject**

<b>Code</b>	34076
<b>Name</b>	Botany
<b>Cycle</b>	Grade
<b>ECTS Credits</b>	4.5
<b>Academic year</b>	2021 - 2022

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
1201 - Degree in Pharmacy	Faculty of Pharmacy and Food Sciences	1	Second term
1211 - D.D. in Pharmacy-Human Nutrition and Dietetics	Faculty of Pharmacy and Food Sciences	1	Second term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1201 - Degree in Pharmacy	10 - Botany	Obligatory
1211 - D.D. in Pharmacy-Human Nutrition and Dietetics	1 - Asignaturas obligatorias del PDG Farmacia-Nutrición Humana y Dietética	Obligatory

**Coordination**

<b>Name</b>	<b>Department</b>
STUBING MARTINEZ, GERARDO	32 - Botany

**SUMMARY**

Botany is to understand the patterns and mechanisms of origin and distribution of plant diversity, organization, complexity levels and types of reproduction, their lifestyles, their importance in the natural environment and its economic importance and pharmaceutical industries. Basics of Systematics, Evolution and Ecology of plants and major plant formations on Earth. Problems of human pressure on plants and their conservation.



## 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

### 1201 - Degree in Pharmacy

- To possess and to understand the knowledge in the different areas of study included in the formation of the pharmacist.
- To know how interpret, value and communicate relevant data in the different aspects of pharmaceutical activity, making use of information and communication technologies.
- Skill to communicate ideas, analyze problems and solve them with a critical mind, achieving team-working abilities and assuming leadership whenever required.
- Development of skills to update their knowledge and undertake further studies, including pharmaceutical specialization, scientific research and technological development, and teaching.
- Develop know-hows for their professional career.
- Understand and manage the basic scientific terminology related to the subject
- Knowledge of the morphology and systematics of plants, fungi and algae, especially those with interest in Pharmacy, including medicinal plants.
- Understanding and interpreting scientific works related to plants, fungi and algae.
- To carry out works of collection, preparation and conservation of plants, fungi and algae samples in order to study and identify these organisms by keys.
- To know how plants, fungi and algae can influence the development of the pharmaceutical profession.

## LEARNING OUTCOMES

The student after taking this course should be able to:

- Place the tree of life the diversity of photosynthetic organisms.
- Learn about the different levels of organization and complexity of the algae, fungi and plants.
- Understand the importance of some of the pharmaceutical major groups of the algae, fungi and plants.
- Understanding and interpretation of scientific papers related to the algae, fungi and plants.
- Compression and basic use of scientific terminology related to the subject.



## DESCRIPTION OF CONTENTS

### 1. Introduction

1. Plants, algae and fungi in the tree of life context. The structural complexity of plants, algae and fungi. From unicellular to multicellular organization: Protophytes, Thallophytes, Bryophytes and Cormophytes (vascular plants).
2. Reproductive strategies. Vegetative, asexual and sexual reproduction. Life cycles. Syngamy (fecundation, fertilization) and meiosis. Alternating generations.
3. Plant, algae and fungi diversity in the Biosphere: Taxonomy and Systematics. Taxonomic units and Categories. Phylogeny and Molecular Systematics. Importance of plants to mankind. Pharmaceutical Botany. The interactions between plants and the environment. Botany in pharmaceutical insights.

### 2. Fungi

4. Fungi. Biology and general characteristics. Reproductive strategies. Diversity and systematics. Chytridiomycetes, Glomeromycetes, Zygomycetes, Ascomycetes, Basidiomycetes. Mutualistic Symbiosis between fungi and photosynthetic organisms: lichens and mycorrhizae. Pharmaceutical, ecological and nutritional importance.

### 3. Algae, Bryophytes, Ferns and Cormophytes (General)

5. Cyanobacteria. Main groups of prokaryotic algae: Cyanophyta and prochlorophyta. The origin of plastids. Primary and secondary endosymbiosis.
6. Algae. Brown algae, red algae and green algae: General characteristics, organization, reproduction, ecology and systematics. Pharmaceutical and economic importance.
7. Bryophytes. General features. Cycle. Structure of the gametophyte and sporophyte. Groups: Antoceros, liverworts and mosses. Ecology. Pharmaceutical and economic importance.
8. Introduction to Vascular plants (Cormophytes). Ferns. General features. Life cycles: Heterospory and Isospory in Ferns. Diversity: Lycophyta and Monilophyta (Pteridophyta). Pharmaceutical and economic importance.

### 4. Seed plants I: Gymnosperms

9. Seed plants (Spermatophytes). General features. Life cycles. Seeds: Origin and evolution. Groups of seed plants.
10. Gymnosperms. Reproductive traits. Diversity and phylogeny. Cycadophytes, Ginkgophytes, Conifers and Gnetae. economic, ecological and pharmaceutical importance.



## **5. II. Angiosperms**

11. Angiosperms (Flowering plants). Magnoliophyta, General features, ultrastructural and chemical features. Angiosperm flowers (reproductive organs). Inflorescences. Fruits and seeds. Origin, phylogeny and evolutionary trends. Angiosperm systematics. Major clades: Magnolia, Monocotyledons (=Monocots) and Eudicotyledons (=Eudicots).
12. Basal groups of Angiosperms. Magnoliidae. General features. Most representative families. Environmental and pharmaceutical importance.
13. Monocots. Morphological features. Most representative families. Environmental, alimentary and pharmaceutical importance.
14. The basal Dicots. General features. Most representative families. Environmental and pharmaceutical importance.
15. EuDicots (I): Rosidae. General features. Most representative families. Economic, pharmaceutical, environmental and alimentary importance.
16. EuDicots (II). Asteridae. General features. Most representative families. Ecological, pharmaceutical, economic and nutritional importance.

## **6. Biogeography**

17. Plant biogeography. Biomes of the Earth. Zonal and non-zonal vegetation. Rainforests. Savannah. Deserts and sub deserts. Mediterranean. Laurel forests. Temperate deciduous forests. Steppes and meadows. Taiga. Artic tundra.

## **7. Practical lab training**

1. Fundamentals concerning the identification of plants. Practical examples
2. Observation and identification of fungi and lichens
3. Observation and identification of algae and bryophytes
4. Observation and identification of pteridophytes and gymnosperms
5. Observation and identification of flowering plants (I)
6. Observation and identification of flowering plants (II)

When possible, the students will attend to a field trip guided by the lecturer to an area of particular botanical and/or pharmaceutical interest, such as Sierra de Espadán or Sierra de Javalambre (providing that university insurance covers any possible damage to the students).

**WORKLOAD**

ACTIVITY	Hours	% To be attended
Theory classes	28,00	100
Laboratory practices	12,00	100
Seminars	2,00	100
Tutorials	2,00	100
Development of group work	20,00	0
Development of individual work	30,00	0
Preparing lectures	17,50	0
<b>TOTAL</b>	<b>111,50</b>	

**TEACHING METHODOLOGY**

1. **THEORETICAL LECTURES:** An average of two hours per week over 15 weeks will be given by the Faculty of Pharmacy during the second quarter. The lectures will be devoted to introducing students to the contents of each issue in the most graphic and entertaining way possible with the support of media if deemed appropriate. The scheme for the contents of each issue may be placed in the Virtual Classroom, or may be left in reprography.

2. **PRACTICAL LECTURES:** Consist of the examination and identification of the most important features of plants, algae and fungi with the help of adequate material. Several selected families representative of the Mediterranean flora will be presented when available (depending on the climatology).

3. **SEMINARS:** Attendance is mandatory. We will propose the establishment of small working groups. The lecturer will present several topics to the students. Each topic will be randomly assigned to every group (2-3 members). Seminars can be defended via poster or through a brief oral exposition (8-10 minutes). The student who will defend the topic of the seminar will be selected by draw.

4. **TUTORIALS.** Attendance is mandatory. Problems posed previously by the lecturer in class will be solved, as well as any question related to the content of each lecture. The lecturer will evaluate the learning process globally.

Likewise, tutorials will provide guidance on the working methods for problems resolution. The lecturer shall provide specific exercises according to the students' needs. The construction of a glossary will make the understanding of botanical terminology easier and help to settle the botanical acquired knowledge.





## EVALUATION

The evaluation of the two parts of the subject, Practice and Theory, will be held at the end of the academic year by examining in THEORY the content delivered over the same, with one or more questions of variable extension and/or several test questions, both relatives to the contents taught during the course.

The examination of the practical module consisting of questions related to the practices and the possibly delivery of a document about everything observed during the development of these practices. Previous documentation about the content of each practice will be supplied, so students have to study the content before going to the laboratory for observations and sample analysis improving its performance. Likewise, at the end of each practice, the teacher responsible for the group may ask the student to submit a brief report on the practice carried out. At the end, a global report will also be evaluated in order to obtain the corresponding final grade together with the grade obtained in the practice exam.

The final grade will be the sum of grades:

**Theory:** 70% of the final (up to 7 points).

**Practical training:** 20% of the final (up to 2 points).

**Seminars:** 10% of the final (up to 1 point).

To get a minimum pass in Botany (5 points) it is necessary to achieve at least 3,5 points in Theory, 1 point in Practice and 0,5 points in Seminars.

In the second examination round, the marks of those grades passed in the first round will be maintained.

**In any case grades will not be saved for future academic years.**

## REFERENCES

### Basic

- AGUILELLA, A. & F. PUCHE. (2004). Diccionari de Botànica. Col·leció 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.
- EVERT, R.F. & S. E. EICHHORN (2013). 8ª ed. Raven Biology of Plants. W.H. Freeman and Company. New York, 727 pp.
- SIMPSON, M. G. (2006). Plant Systematics. Elsevier Academic Press, 590 pp.
- BOLÓS, 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.

MATEO, G. & CRESPO, B. 2014. Claves ilustradas para la flora valenciana 1ª Ed. Jolube consultor botánico y editor, www.jolube.es, 501pp.

VARGAS, P & ZARDOYA, R. (eds.) (2012) El Árbol de la Vida: sistemática y evolución de los seres vivos. Madrid 597 pp.

### **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](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](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>

### **ADDENDUM COVID-19**

**This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council**

#### **1. Contents**

The contents previously collected in the teaching guide are kept.

#### **2. Volume of work and temporary planning of teaching**

The workflow and tasks composing the amount of dedication hours in terms of ECTS credits as marked in the original teaching guide are kept.

#### **3. Teaching methodology**



With regard to the theory sessions, lessons will be face-to-face and in accordance with the course calendar, but pertinent precautions in order to fulfill the security regulations and protocols for COVID19 will be applied. In the event that the classroom capacity may be insufficient for the entire number of students, students will be distributed by groups, so that the 50% will join the Faculty classroom while the other 50% will join the class online (from home), alternating their attendance each week. Lessons will always be held following the schedule (date and time) approved by the Center Board and teaching materials will be provided following the same order and timing reported in the teaching guide.

Tutorials and Seminars will be face-to-face following the course calendar schedule and all the security and safety instructions set by the Faculty of Pharmacy will be followed.

In the event of a significant worsening of the actual situation or the establishment of a new state of total confinement, all face-to-face teaching would be carried out online and the official protocol will be:

-Synchronously. Using virtual classroom tools (preferably blackboard, collaborate and teams) during the established group class time.

-Asynchronously. Using powerpoint / pdf resources uploaded to the virtual classroom or using the mmedia.uv.es portal.

Laboratory sessions, will keep being face-to-face and in accordance with the course calendar schedule, but fulfilling the appropriate modifications to comply with the safety regulations for COVID-19. The student capacity for each laboratory will be limited up to the 50%, establishing attendance shifts in each group. Videos, presentations, and multimedia activities will be included to ensure students' tasks during online sessions. In the event of a full online session, videos and self-explanatory presentations will be uploaded to the virtual classroom, allowing students to understand and simulate step by step the laboratory practice. In addition, a specific set of results will be provided, so to allow the development of simulated laboratory tasks.

#### **4. Evaluation**

According to the evolution of the current pandemic, the evaluation will be held face-to-face, following the terms

and conditions reported in the teaching guide. Only due to force majeure, the evaluation will be carried out online, using multiple-choice questions test through the virtual classroom, complemented with short questions and/or on specific occasions oral exams via videoconference.

The evaluation criteria of the teaching guide are maintained.

#### **5. Bibliography**





The recommended bibliography is kept.

