



## COURSE DATA

### DATA SUBJECT

**Code:** 34076

**Name:** Botany

**Cycle:** Undergraduate Studies

**ECTS Credits:** 4.5

**Academic year:** 2025-26

### STUDY (S)

Degree	Center	Acad. year	Period
1201 - Degree in Pharmacy	Facultat de Farmàcia i Ciències de L'alimentació	1	Second quarter
1211 - Double Degree in Pharmacy and Human Nutrition and Dietetics	Facultat de Farmàcia i Ciències de L'alimentació	1	Second quarter

### SUBJECT-MATTER

Degree	Subject-matter	Character
1201 - Degree in Pharmacy	Botany	COMPULSORY
1211 - Double Degree in Pharmacy and Human Nutrition and Dietetics	Asignaturas obligatorias del PDG Farmacia-Nutrición Humana y Dietética	COMPULSORY

### COORDINATION

BALLESTEROS BARGUES DANIEL

## SUMMARY

**Botany** deals with the patterns and mechanisms of the origin and distribution of plant diversity, including also algae, as well as fungi, their organisation, their levels of complexity and types of reproduction, their life forms, their importance in the natural environment and, finally, their **economic and pharmaceutical importance**. In this subject, students will learn basic notions of **systematics, evolution and ecology** of plants, algae and fungi, **tools for their identification** will be described, and mention will be made of the main plant formations on Earth. Emphasis will also be placed on the problem of anthropic 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

## COMPETENCES / LEARNING OUTCOMES

-

Acquire the ability to design the most appropriate extraction and purification method for isolating the active ingredients of a drug, as well as apply spectroscopic techniques to elucidate their structure.

Act with autonomy in learning, making informed decisions in different contexts, issuing judgements based on experimentation and analysis, and transferring knowledge to new situations.

Collaborate effectively in work teams, assuming responsibilities and leadership roles and contributing to collective improvement and development.

Contribute to the design, development and implementation of solutions that respond to social demands, taking into account the Sustainable Development Goals as a reference.

Demonstrate critical and self-critical thinking in the field of the degree programme, considering aspects such as professional ethics, moral values and the social implications of the different activities carried out.

Demonstrate understanding of the use of natural products as lead compounds for the development of new drugs.

Develop skills to update knowledge and undertake further studies, including pharmaceutical specialisation, scientific research, technological development and teaching.

Gather and transmit information in English at a level of proficiency equivalent to B1 of the Council of Europe.

Handle products, material and laboratory equipment with precision and safety.

Know and identify raw materials of biological origin (drugs) used for the production of medicines and medicinal plant-based products.

Know and understand, within the field of the degree programme, gender inequalities in society; integrate different needs and preferences based on sex and gender into the design of solutions and problem solving.

Know how to communicate effectively, both orally and in writing, adapting to the characteristics of the situation and the audience.

Know how to interpret, evaluate and communicate relevant data in the different areas of pharmaceutical activity, using information and communication technologies.

Know the bases and stages of analytical control of herbal medicines.

Know the main structural types of secondary metabolites used in drug development and their relationship with biosynthetic pathways.

Know the pharmacological activity of the active principles of those drugs considered most important due to



their therapeutic interest.

Learn about the use, efficacy and safety of medicinal plants.

Module: Biology. Develop skills related to the beneficial effects of medicinal plants and understand the health risks associated with their misuse.

Module: Biology. Know medicinal plants: botanical diversity, physiology, use and management.

Module: Chemistry. Identify, design, obtain, analyse and produce active ingredients, medicines and other products and materials of health interest.

Open new perspectives for the development of biotechnology in the research of living beings as sources of new active principles.

Propose creative and innovative solutions to complex situations or problems within the field of knowledge, to respond to diverse professional and social needs.

Recognise one's own limitations and the need to maintain and update professional competence, placing particular emphasis on self-learning of new knowledge based on available scientific evidence.

Transmit ideas, analyse problems and solve them with critical spirit, acquiring teamwork skills and assuming leadership when appropriate.

## DESCRIPTION OF CONTENTS

### 1. Introduction

1. Plants, algae and fungi in the Tree of Life. The structural complexity of algae, fungi and plants. From unicellular to multicellular organization: protophytes, thallophytes, bryophytes and cormophytes (vascular plants).
2. Reproductive strategies. Vegetative, asexual and sexual reproduction. Life cycles. Syngamy (fertilization) and meiosis. Alternation of generations.
3. Plant, algal and fungal diversity in the biosphere: taxonomy and systematics. Taxonomic units and categories. Phylogeny and molecular systematics. Importance of plants to mankind and Pharmaceutical Botany.

### 2. Fungi

4. The fungi: biology and main traits. Reproductive strategies. Diversity and systematics: mucoromycetes (including the former zygomycetes), ascomycetes and basidiomycetes. Mutualistic symbioses 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: cyanophytes and prochlorophytes. The origin of plastids. Primary and secondary endosymbiosis.
6. Algae. Brown algae, red algae and green algae: main traits, vegetative organization, reproduction, ecology and systematics. Pharmaceutical and economic importance.
7. Bryophytes. Main traits. Cycle. Structure of the gametophytes and sporophytes. Main groups: hornworts, liverworts and mosses. Ecology. Pharmaceutical and economic importance.
8. Introduction to vascular plants (cormophytes): the Ferns. General features and life cycles. Diversity: Lycophytes and monilophytes (pteridophytes). Pharmaceutical and economic importance.

### **4. Seed plants I: the 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, cupressophytes, pinophytes and gnetophytes. Economic and pharmaceutical importance.

### **5. Seed plants II: the angiosperms**

11. Angiosperms (flowering plants). Magnoliophyta, main features, ultrastructural and chemical features. Angiosperm flowers (reproductive organs). Inflorescences. Fruits and seeds. Origin, phylogeny and evolutionary trends.
12. Basal groups of Angiosperms. Magnolids. 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. Earth biomes. Zonal and non-zonal vegetation. Rainforests. Savannah. Deserts and sub deserts. The Mediterranean. Laurel forests. Temperate deciduous forests. Steppes and meadows. Taiga. Arctic tundra.

1. Observation and recognition of vegetative and reproductive structures of fungi and lichens.
2. Observation and recognition of vegetative and reproductive structures of algae.



## 7. Practical lab training

1. Observation and recognition of vegetative and reproductive structures of fungi and lichens.
3. Bryophytes and vascular plants (case of angiosperms). Recognition of the parts of a vascular plant and introduction to classification with a dichotomous key.
4. Observation and identification of flowering plants (I).
5. Observation and identification of flowering plants (II).
6. Visit to the Botanical Garden. Observation of liverworts, pteridophytes, gymnosperms and angiosperms.

## WORKLOAD

### PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	2,00
Theory	29,00
Seminar	2,00
Laboratory	12,00
<b>Total hours</b>	<b>45,00</b>

### NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	50,00
Independent study and work	0,00
Preparation of lessons	17,50
Preparation for assessment activities	0,00
Resolution of case studies	0,00
<b>Total hours</b>	<b>67,50</b>

## TEACHING METHODOLOGY

**1. THEORETICAL LECTURES:** An average of two hours per week over 15 weeks will be given in the Faculty of Pharmacy during the second quarter. The lectures will be devoted to introducing students to the contents of each topic 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.

**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 (1-2-3 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 will consist of a few questions related to the practices and the material that was shown in the lab. 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 might also be asked to 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 case of failing a course, the laboratory practicals will be optional in the following courses, as long as they have been taken at least once. Likewise, the grades of the laboratory work and the seminar will be maintained from one course to another, but not the scores of the written tests (theory and/or practical).**



The activities of **practices** and **seminars**, are of MANDATORY ATTENDANCE and, therefore, NOT RECOVERABLE, in accordance with the provisions of article 6.5 of the Regulation of Evaluation and Qualification of the UV for Bachelor and Master degrees. If, for justified reasons, you are unable to attend any of these activities, you must inform the corresponding lecturer sufficiently in advance. In this way, the person in charge of the subject may assign the student a session in another group.

Evidence of copying or plagiarism in any of the assessable tasks will result in failure to pass the subject and in appropriate disciplinary action being taken. Please note that, in accordance with article 13. d) of the Statute of the University Student (RD 1791/2010, of 30 December), it is the duty of students to refrain from using or participating in dishonest means in assessment tests, assignments or university official documents.

In the event of fraudulent practices, the "**Action Protocol for fraudulent practices at the University of Valencia**" will be applied (ACGUV 123/2020):

<https://www.uv.es/sgeneral/Protocols/C83sp.pdf>

## REFERENCES

### Basic

- AGUILLELLA, A. & F. PUCHE. (2004). Diccionari de Botànica. Col·lecció 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.



- 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.
- 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.

### **Supplementary**

- <https://bos.uniovi.es/docencia/documentacion> [ciclos biológicos]
- <http://www.botanica.unne.edu.ar/index.html> [botánica morfológica (UNNE)]
- [http://webs.uvigo.es/mmegias/1-vegetal/guiana\\_v\\_inicio.php](http://webs.uvigo.es/mmegias/1-vegetal/guiana_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]
- <https://britishlichensociety.org.uk/learning/about-lichens> [líquenes]
- <https://naturalhistory.si.edu/research/botany/research/algae> [algas]
- <https://stri.si.edu/story/bryophytes> [musgos, hepáticas y antocerotas]
- [https://blogs.ubc.ca/biology321/?page\\_id=3602](https://blogs.ubc.ca/biology321/?page_id=3602) [musgos, hepáticas y antocerotas]
- <http://www.ucmp.berkeley.edu/seedplants/seedplantssy.html> [plantas con semillas]
- <https://ebps.org.uk/ferns/> [Helechos]
- <http://herbarivirtual.uib.es/>
- <http://www.arbolesibericos.es>
- <http://www.anthos.es>