

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

Code	34107
Name	Plant Physiology
Cycle	Grade
ECTS Credits	4.5
Academic year	2018 - 2019

Study (s)

Degree	Center	Acad. year	Period
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

Degree	Subject-matter	Character
1201 - Degree in Pharmacy	43 - Biology	Basic Training
1211 - D.D. in Pharmacy-Human Nutrition and Dietetics	1 - Asignaturas obligatorias del PDG Farmacia-Nutrición Humana y Dietética	Obligatory

Coordination

Name	Department
MARCO PICO, FRANCISCO	25 - Plant Biology
PEREZ LORENCES, ESTER	25 - Plant Biology

SUMMARY

The primary objective of studying Plant Physiology is the organisms which make up the plant kingdom. Plant Physiology should give students a basic knowledge of how plants work and their processes. Based on that, the basic makeup of the programme looks at all the processes of feeding, growth, continuity, and their relationship with their environment.



Students will study the major structural characteristics and plant anatomy, which is necessary in order to understand thereafter different physiological processes, hydraulics (absorption, transport, and loss of water in plants), mineral nutrition, and transport of photosynthetic products. Metabolic photosynthesis will also be analysed, as well as that of nitrogen and sulphur. Secondary metabolism will also be introduced, where students will cover some of the enormous amount of chemical compounds used to improve colour, scent and flavor of flowers and fruits, to battle against predators and organisms that cause illness, and even against their own neighbours.

Apart from the basic physiological plant processes, it is also important to know and understand the mechanisms which regulate growth and development, as well as their interaction with the environment. To this end, we will study the plant development looking at plant hormones, photoreceptors, plant movement, different processes during the life cycle, and the integration of all of them in space and time.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

It is highly recommended that apart from Biology, students have also studied mathematics, physics, and chemistry

OUTCOMES

1201 - Degree in Pharmacy

- Understand and manage the basic scientific terminology related to the subject
- Know how to apply the scientific method and acquire skills for managing the main bibliographic sources.
- Know how the plant body is organised.
- Know the basic principles of how plants work.
- Know the practical assays that can be made in order to test different hypotheses related to plant physiology.
- Know how to operate apparatus and basic techniques related to the subject.

LEARNING OUTCOMES

- Know and use the scientific terminology related to the subject
- Know plant body organisation
- Know the basic physiological functions of a plant, that allow it to feed, grow, reproduce, and interact with its environment
- Know how the environment effects plant growth and development and the development of mechanisms



that help a plant adapt to its environment

- Know how to search for relevant bibliography to update and deepen knowledge on a specific topic
- Know basic techniques and apparatus related to the subject
- Understand and interpret scientific studies about plants
- Work safely and efficiently in a laboratory
- Know how to interpret and present results obtained from laboratory experiments
- Capacity to carry out experiments, analyse and interpret results
- Capacity to design experiments that allow hypotheses or theories to be proved.
- Know how plant physiology fits into science in general

DESCRIPTION OF CONTENTS

1. The plant body

2. Water balance of plants

3. Mineral nutrition

4. Translocation in the phloem

5. Photosynthesis: The light reactions

6. Photosynthesis: Carbon reactions

7. Assimilation of mineral nutrients (Nitrogen, nitrate and sulfur)

8. Secondary metabolism and plant defense

9. Phytohormones

**10. Overview of plant growth and development****11. Photomorphogenesis and plant movements****12. The control of flowering****13. Fruit formation, growth and development****14. Seed maturation, dormancy and germination****15. Juvenility senescence and abscission****16. LABORATORY SESSIONS**

The plant body
Determination of the water potential of cells
Photosynthesis
phytohormones

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	25,00	100
Laboratory practices	15,00	100
Seminars	2,00	100
Tutorials	2,00	100
Development of group work	4,00	0
Study and independent work	30,50	0
Readings supplementary material	2,00	0
Preparation of evaluation activities	7,00	0
Preparing lectures	20,00	0
Preparation of practical classes and problem	4,00	0
TOTAL	111,50	



TEACHING METHODOLOGY

Theory classes.

For theory classes lectures will be given, since this method allows the lecturer to give key concepts to understanding the subject and recommend further detailed study. In some classes student participation will be used, both between students, and between students and lecturer.

Laboratory sessions.

In these classes students will be able to learn the practical applications of the knowledge gained in the theory classes.

Tutorials.

Tutorials will be carried out in small groups, where the teacher will direct students about everything related to the learning process, both in global and concrete terms, including the supervision of tasks.

Seminars.

In the seminars, students will present work previously proposed by their lecturer. Students should be able to summarize and present ideas both orally and using written summaries. Both the written preparation and the oral and written presentation must be carried out as a group (maximum four students) and all of them must participate in the presentation. After each seminar there will be a debate where the majority of the participation should be between students.

EVALUATION

Knowledge of theory and practice will be measured according to the following criteria:

Exams: Counts up to 9.5 points

The exam will include questions about knowledge acquired in the theory, laboratory sessions and seminars.

Theory exam: 8 points

Laboratory session exam: 1,5 points

Laboratory: Counts up to 0.5 points

Attitude, taking advantage of sessions, and skill on the laboratory

Seminars: Counts up to 1 point

Content and oral presentation will be evaluated. Seminars are voluntary, and the mark will count as a bonus on the final grade.



In order to be eligible for examination students must have attended the obligatory lab sessions. Non-attendance will mean students cannot pass this subject.

First Call

There will be an examination of the whole subject at the end of the semester/term. The exam may include short questions, long questions, and multiple choice tests. There will be questions where students must relate different parts of the subject in different lessons or which may be related to matters of current interest. The exam will also include parts related to the laboratory sessions.

The final grade will be made up of the sum of the individual parts examined. In order to sum the different parts, at least 50% of the total grade must be obtained in the theory and laboratory sessions exams and in the laboratory. In the case where a student has carried out a seminar, the seminar grade will be added to the rest, always assuming that the seminar grade is at least 50%.

Second Call:

Students who do not obtain a pass in first call should resit all of the theory and laboratory session exams. The seminar grade and the laboratory grade obtained during the semester/term will be added if appropriate.

REFERENCES

Basic

- Taiz L., Zeiger E., I.M.Moller, Murphy, A. (2015). Plant Physiology and development., Sixth edition. Signer Associates (eds).
- Azcón-Bieto J., Talón M. 2008. Fundamentos de Fisiología Vegetal. Interamericana. McGraw-Hill. Madrid.
- Barceló J. y col. 2001. Fisiología Vegetal. Ed. Pirámide S.A., Madrid. Hopkins W.G. 1999. Introduction to Plant Physiology. J. Wiley (ed.), New York
- Nabors MW (2006) Introducción a la Botánica, Pearson Educación SA, Madrid
- Salisbury FB, Ross CW (1994). Fisiología Vegetal. Grupo Editorial Iberoamericana
- <http://www.biologie.uni-hamburg.de/b-online/e00/index.htm>
- <http://www.plantcell.org/site/teachingtools/teaching.xhtml>
- <http://6e.plantphys.net>
- <http://croptechnology.unl.edu/pages/>



Additional

- Annual Review of Plant Biology. (desde 1950). Revisiones anuales de distintos Temas de Fisiología Vegetal. Annu. Reviews, INC, Palo Alto, California.

Trends in Plant Science. Revista mensual con actualizaciones sobre temas relacionados con la fisiología de las plantas. Elsevier Science Ltd.

Current Opinion in Plant Biology. Revista mensual con actualizaciones sobre temas relacionados con la fisiología de las plantas. Elsevier Science Ltd.

Alberts B. y col 2004. Biología Molecular de la Célula, 4ª edición. Ed. Omega, Barcelona.

Buchanan B., Gruissem W. Jones R. 2000. Biochemistry & molecular Biology of Plants. American Society of Plant Biology (Ed) Rockville, MD, USA

Fahn A. 1985. Anatomía vegetal. Pirámide S.A., Madrid.

Mohr H., Schopfer P. 1995. Plant Physiology. Springer-Verlag, Berlin

Scott P., 2008 Physiology and behaviour of plants. John Wiley & Sons Ltd. Inglaterra.