Information about the subject

Degree: Bachelor of Science Degree in Biotechnology

Faculty: Faculty of Veterinary Medicine and Experimental Sciences

Code: 1100205 **Name:** Plant Physiology

Credits: 6,00 **ECTS Year:** 2 **Semester:** 1

Module: Fundamentals of Biology

Subject Matter: Plant Biology **Type:** Compulsory

Department: Basic and Cross-disciplinary Sciences

Type of learning: Classroom-based learning

Languages in which it is taught: Spanish

Lecturer/-s:

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Module organization

Fundamentals of Biology

Subject Matter	ECTS	Subject	ECTS	Year/semester
Biology	12,00	Cell Biology	6,00	1/1
		Plant and Animal Biology	6,00	1/1
Animal physiology	6,00	Animal Physiology	6,00	2/2
Plant Biology	6,00	Plant Physiology	6,00	2/1
Microbiology	6,00	Microbiology	6,00	2/1
Virology	6,00	Virology	6,00	3/2

Recommended knowledge

It is recommended to have acquired the basic knowledge of the courses Cellular Biology, Plant and Animal Biology, Chemistry and Biochemistry, for an adequate monitoring of Plant Physiology.

Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

R1 The student has understood and assimilated the contents of the subject.

R2 The student is able to solve problems or case studies related to the subject contents, by using different resources (bibliographic, IT, etc.)

R3 The student is able to work in a laboratory, carrying out basic operations correctly and taking into account the corresponding safety standards. He/she understands the planning, development and purpose of the experience, and is able to contrast and validate the obtained results.

R4 The student is able to write an intelligible and organized text on different aspects of the subject.

R5 The student is able to present and defend his/her work adequately.

R6 The student seeks bibliographic information from different sources and can analyze it with a critical and constructive spirit.

R7 The student collaborates with the teacher and his/her peers throughout the learning process; he/she works in a team; treats everyone with respects, is proactive and fulfills the organization rules of the course.

Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

BASIC		Weighting			
		1	2	3	4
CB1	Students acquire and understand knowledge in their field of study based on general secondary education but usually reaching a level that, although supported on advanced text books, also includes aspects involving state-of-the-art knowledge specific to their area.		x		
CB2	Students are able to apply knowledge to their work in a professional way and have the competences enabling them to state and defend views and opinions as well as perform problem-solving tasks in their field of study.		x		
CB3	Students are able to collect and interpret relevant data (generally in their field of study) and give opinions that involve reflection on relevant social, scientific or ethical issues.			x	
CB4	Students can communicate information, ideas, problems and solutions to a specialized or non-specialized audience.			x	
CB5	Students develop the necessary learning skills to undertake further studies with a high level of autonomy.			x	

GENERAL		Weighting			
		1	2	3	4
CG01	Capacity to analyze and synthesize.			x	

SPECIFIC		Weighting			
		1	2	3	4
CE22	Knowing and understanding contents, principles and theories related to biotechnology.		x		

CE23	Knowing how to use laboratory equipment and to carry out basic operations for each discipline including: safety measures, handling, waste disposal and activity register.			x	
CE24	Knowing basic and instrument laboratory techniques in the different areas of biotechnology.		x		
CE25	Knowing how to analyze and understand scientific data related to biotechnology.				x
CE26	To understand and identify the mechanisms that influence genetic inheritance	x			
CE30	Solving and analyzing problems posed by biotechnology.		x		
CE31	Describing and calculating important variables of processes and experiments.			x	
CE34	Knowing main characteristics of Molecular biosciences and biotechnology communication.		x		

TRANSVERSAL		Weighting			
		1	2	3	4
CT02	Capacity to organize and plan.			x	
CT03	Mastering Spanish oral and written communication.			x	
CT05	Knowing and applying Basic ITC skills related to Biotechnology.	x			
CT06	Capacity to manage information (capacity to look for and analyze information coming from different types of sources).			x	
CT07	Problem solving.			x	
CT08	Decision making			x	
CT09	Capacity to work in interdisciplinary and multidisciplinary team.				x
CT10	Interpersonal skills.			x	
CT11	Understanding multicultural and diverse environment			x	

CT12	Critical and self-critical capacity.		x	
CT13	Ethics.	x		
CT14	Capacity to learn		x	
CT15	Capacity to adapt to new situations		x	
CT16	Capacity to produce new ideas (creativity)			x
CT17	Leadership abilities			x
CT18	Taking initiatives and enterprising spirit			x
CT19	Capacity to apply theoretical knowledge			x
CT20	Research skills			x
CT21	Sensitivity to environmental issues	x		

Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
	60,00%	Written test
	25,00%	Submission of papers
	15,00%	Laboratory test

Observations

According to the general evaluation and qualification regulations, the preferred evaluation system will be by means of continuous evaluation and will be implemented by means of questionnaires at the end of each block of content, so that the student has support during the semester to prepare for the final exam.

A minimum of 5/10 points is required in each of these items in order to pass the course.

MENTION OF DISTINCTION:
In accordance with the regulations governing the assessment and grading of subjects in force at UCV, the distinction of "Matrícula de Honor" (Honours with Distinction) may be awarded to students who have achieved a grade of 9.0 or higher. The number of "Matrículas de Honor" (Honours with Distinction) may not exceed five percent of the students enrolled in the group for the corresponding academic year, unless the number of enrolled students is fewer than 20, in which case a single "Matrícula de Honor" (Honours with 9 Distinction) may be awarded. Exceptionally, these distinctions may be assigned globally across different groups of the same subject. Nevertheless, the total number of distinctions awarded will be the same as if they were assigned by group, but they may be distributed among all students based on a common criterion, regardless of the group to which they belong. The criteria for awarding "Matrícula de Honor" (Honours with Distinction) will be determined according to the guidelines stipulated by the professor responsible for the course, as detailed in the "Observations" section of the evaluation system in the course guide.

Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:

M1 Teacher presentation of contents, analysis of competences, explanation and in-class display of skills, abilities and knowledge.

M2 Group work sessions supervised by the professor. Case studies, diagnostic tests, problems, field work, computer room, visits, data search, libraries, on-line, Internet, etc. Meaningful construction of knowledge through interaction and student activity.

M3 Activities carried out in spaces with specialized equipment.

M4 Supervised monographic sessions with shared participation..

M5 Application of multidisciplinary knowledge.

M6 Personalized and small group attention. Period of instruction and/or guidance carried out by a tutor to review and discuss materials and topics presented in classes, seminars, readings, papers, etc.

M7 Set of oral and/or written tests used in initial, formative or additive assessment of the student

M8 Group preparation of readings, essays, problem-solving, seminars, papers, reports, etc. to be presented or submitted in theoretical , practical and/or small-group tutoring sessions. Work done on the university e-learning.

M9 Student's study: Individual preparation of readings, essays, problem-solving, seminars, papers, reports, etc. to be presented or submitted in theoretical, practical and/or small-group tutoring sessions. Work done on the university e-learning platform.

IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
ON-CAMPUS CLASS M1	R1, R2	37,50	1,50
PRACTICAL CLASSES M2	R1, R2, R4, R5, R6	4,20	0,17
LABORATORY M3	R1, R2, R3, R7	10,30	0,41
SEMINAR M4	R1, R2	2,00	0,08
GROUP PRESENTATION OF ASSIGNMENTS M5	R4, R5, R6, R7	2,00	0,08
TUTORIAL M6	R1, R2, R3, R4, R5, R6, R7	2,00	0,08
ASSESSMENT M7	R1, R2, R3, R4, R5, R6, R7	2,00	0,08
TOTAL		**60,00**	**2,40**

LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
AUTONOMOUS GROUP WORK M8	R1, R4, R5, R6, R7	17,90	0,72
AUTONOMOUS INDIVIDUAL WORK M9	R1, R2, R3	72,10	2,88
TOTAL		**90,00**	**3,60**

Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

Content block	Contents
DIDACTIC UNIT 1 – INTRODUCTION	Chapter 0. Introduction to Plant Physiology, and its role in Biotechnology. Chapter 1. Anatomy: cells, tissues and organs of the plant body.
DIDACTIC UNIT 2 - NUTRITION, TRANSPORT AND METABOLISM	Chapter 2. The water. Absorption and transport. Chapter 3. Mineral nutrition. Chapter 4. Transport in the phloem. Chapter 5. Primary metabolism: photosynthesis and photorespiration. Chapter 6. Secondary metabolism: compounds, and biosynthesis routes.
DIDACTIC UNIT 3 – PLANT GROWTH AND DEVELOPMENT	Chapter 7. Plant growth regulators: types, biosynthesis and mechanisms of action. Chapter 8. Cell signaling and development in plants. Chapter 9. Vegetative development in plants: embryogenesis, germination, and differentiation of roots, stems, and leaves. T Chapter 10. Reproductive development in plants: floral morphogenesis, fertilization and development of fruits and seeds. Chapter 11. Senescence and programmed death of plant cells, tissues and organs. Chapter 12. Plant Ecophysiology: environmental factors and development in plants.

DIDACTIC UNIT 4 - LABORATORY AND RESEARCH TECHNIQUES IN PLANT PHYSIOLOGY	- Practical block 1: Plant histology: study of plant tissues and organs. - Practical block 2: Plant nutrition and transport: water relations in plants. - Practical block 3: Physiology of plant development: environmental and hormonal regulation of plant development. - Practical block 4: Plant physiology applied to Biotechnology.
DIDACTIC UNIT 5 - TECHNICAL VISIT	Visit to the facilities of a research center or company specialized in the areas of Plant Physiology or Plant Biotechnology

Organization of the practical activities:

	Content	Place	Hours
PR1.	Plant Histology	Laboratory	2,00
PR2.	Nutrition and Transport	Laboratory	2,00
PR3.	Plant Developmental Physiology	Laboratory	4,00
PR4.	Plant Physiology applied to the Biotechnology	Laboratory	2,00
PR5.	Technical visit and autonomous work	Technical visit	4,60

Temporary organization of learning:

Block of content	Number of sessions	Hours
DIDACTIC UNIT 1 – INTRODUCTION	3,00	6,00
DIDACTIC UNIT 2 - NUTRITION, TRANSPORT AND METABOLISM	5,00	10,00
DIDACTIC UNIT 3 – PLANT GROWTH AND DEVELOPMENT	10,00	20,00
DIDACTIC UNIT 4 - LABORATORY AND RESEARCH TECHNIQUES IN PLANT PHYSIOLOGY	10,00	20,00
DIDACTIC UNIT 5 - TECHNICAL VISIT	2,00	4,00

References

Basic references:- Evert, R.F. y Eichhorn, S.E. (2013). Raven Biology of Plants 8th edition. Ed. WH Freeman- Taiz, L., Zeiger, E. (2006). Fisiología Vegetal. Publicacions de la Universitat Jaume I (Traduccióndal español de la edición de 2002)- Taiz, L., Zeiger, E. (2010). Plant Physiology (5ª ed.). Sinauer Associates, Inc., Publishers,Sunderland, Massachusetts.
Additional references:- Azcón-Bieto, J., Talón, M. (2008) Fundamentos de Fisiología Vegetal (2ªEd.) Ed.Interamericana-McGraw-Hill.- Barceló, J., Nicolás, G., Sabater, B., Sánchez, R. (2001). Fisiología Vegetal. Ed. Pirámide S.A.,Madrid.- Bonnier G. Delayens G. (1988) Claves para la determinación de plantas vasculares. Ed. Omega- Buchanan, B.B., Gruisem, W., Jones R.L., (eds.) 2000. Biochemistry and molecular biology ofplants. American Society of Plant Physiologists, Rockville, Maryland, EEUU.- Calderón, AA. y Ferrer, MA. (2009) Material de clase de la Asignatura de Fisiología Vegetal.Universidad Politécnica de Cartagena, Area de Fisiología Vegetal(http://ocw.bib.upct.es/course/view.php?id=47&topic=3)- Corbera i Benedicto, J, Güemes Heras J, Puche, C. (2005) Un bosque en la ciudad: el jardínbotánico de la Universitat de València. Servei Publicacions Universitat de València.- Costa, M. El jardín botánico de la universidad de Valencia (2001). Servei PublicacionsUniversitat de València.- Guardiola, J.L., García, A. 1990. Fisiología Vegetal I: Nutrición y transporte. Ed. Síntesis,Madrid.- Monerri, C., Guardiola, JL. (1999). Complementos de Fisiología Vegetal. Manual de prácticas.Editorial de la Universitat Politècnica de València.- Paniagua, R. Citología e Histología Vegetal y Animal (2002). McGraw-Hill Interamericana- Raven, P.H.; Evert, R.F. y Eichhorn, S.E. (1991). Biología de las plantas (edición en castellanode la 4ª edición inglesa). Ed. Reverté.- Sabater, B. Problemas resueltos de fisiología vegetal (2005). Universidad de Alcalá.- Santamarina, M. P., Roselló, J., García F. J. (2004). Prácticas de Biología y Botánica. Editorialde la UPV. Valencia.- Stewart, N. (2008). Plant Biotechnology and Genetics: Principles, Techniques and Applications.Ed. Wiley-Strasburger (2003). Tratado de Botánica. Ed. Omega
Web pages:- García-Freijo, FJ. Temario de la asignatura de Biología y Botánica, Universidad Politécnica deValencia: www.euita.upv.es/varios/biologia/programa.htm- www.plantphys.net- www.plantcell.org/teachingtools/teaching.dtl
- PubMed, base de datos de bibliografía científica en biología:http://www.ncbi.nlm.nih.gov/sites/entrez?db=pubmed