Teaching Guide				
Identifying Data				2023/24
Subject (*)	Applied Plant Physiology		Code	610G02029
Study programme	Grao en Bioloxía			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	Third	Obligatory	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Bioloxía			
Coordinador	Diaz Varela, Jose		E-mail	jose.diaz.varela@udc.es
Lecturers	Bernal Pita da Veiga, María de los Ángeles Carrillo Barral, Néstor Diaz Varela, Jose Pomar Barbeito, Federico Silvar Pereiro, Cristina		E-mail	angeles.bernal@udc.es n.carrillo@udc.es jose.diaz.varela@udc.es federico.pomar@udc.es c.silvar@udc.es
Web				
General description	This subject is a complement of the knowledge spreviously taught in Plant Physiology I and II, but here the point of view is the applied one. In the different units of the subject we will address agricultural, laboratory and industrial processes in which the theoretical concepts of Plant Physiology are applled to face productive challenges.			

Study programme competences	
Code	Study programme competences
A10	Avaliar actividades metabólicas.
A18	Levar a cabo estudos de produción e mellora animal e vexetal.
A21	Deseñar modelos de procesos biolóxicos.
A26	Deseñar experimentos, obter información e interpretar os resultados.
A29	Impartir coñecementos de Bioloxía.
A30	Manexar adecuadamente instrumentación científica.
A31	Desenvolverse con seguridade nun laboratorio.
B2	Resolver problemas de forma efectiva.
B3	Aplicar un pensamento crítico, lóxico e creativo.
B4	Traballar de forma autónoma con iniciativa.
B5	Traballar en colaboración.
B6	Organizar e planificar o traballo.
B8	Sintetizar a información.
B9	Formarse unha opinión propia.
B10	Exercer a crítica científica.
B11	Debater en público.
B12	Adaptarse a novas situacións.
B13	Comportarse con ética e responsabilidade social como cidadán e como profesional.

Learning outcomes	
Learning outcomes	Study programme competences

Increase knowledge and theoretical bases on the use of plant products in industry and human and animal health.	A10 A18 A26 A29 A30 A31	B2 B8	
increase knowledge on the physiological mechanisms related to agriculture and crop production. Knowing the techniques for improving crop production.	A10	B2	
Generate a preliminary vision on the in vitro culture and plant biotechnology	A26	B9	
Prepare and present works on some aspect of Applied Plant Physiology	A21 A26 A29	B3 B4 B5 B6 B8 B9 B10 B11 B12 B13	

Contents	
Topic	**Sub-topic**
Unit 1. Introduction: Plant Physiology in Agriculture. Unit 2. Plant productivity in Agriculture: yield and quality. Unit 3. Light, irrigation, substrates and fertilizers. Unit 4. Phytosanitary products: Plant growth regulators, pesticides, herbicides, biological control, integrated pest management. Unit 5. Protected crops. Unit 6. Harvesting and postharvest physiology. Unit 7. Vegetative propagation. Unit 8. Introduction to cell culture. Basic principles. Unit 9. In vitro plant tissue culture. Unit 10. Current applications of cell and plant tissue culture. Unit 11. Remote sensing. Unit 12. Chlorophyll fluorescence. Unit 13. Industrial products obtained from plants. Unit 14. Secondary metabolites and human health.	Development of the units.
Practicals	Practicals regarding the units of the subject.

Planning				
Methodologies / tests	**Competencies**	**Ordinary class hours**	**Student?s personal work hours**	**Total hours**
Guest lecture / keynote speech	A10 A18 A21 A26 A29 B2 B3 B8	23	50.6	73.6
Seminar	B4 B5 B6 B9 B10 B11 B12 B13	8	24	32
Mixed objective/subjective test	A10 A18 B2 B6 B8	3	0	3
Laboratory practice	A30 A31	20	19.4	39.4

Personalized attention		2	0	2
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
Guest lecture / keynote speech	Oral presentation of the topic supplemented with PowerPoint presentations, videos and / or diagrams on the board. During the lectures, the professor will ask questions to the students in order to think about and answer them orally, prior to the corresponding explanation by the lecturer.
Seminar	Technical working group aims intensive study of a topic. It will take place in the very small groups of students which are stablished by the faculty. This activity will include the elaboration of audiovisual materials regarding the topic studied.
Mixed objective/subjective test	It consists of two parts, in which the knowledge acquired during lectures and practicals point is evaluated. The mixed evidence may include essay questions, multiple choice or problems
Laboratory practice	Methodology that allows estudents effectively learning by means of practical activities, such as demonstrations, exercises, experiments and research.

Personalized attention	
Methodologies	**Description**
Seminar	Students will meet with the teacher to prepare the seminar work. In addition, during seminars each student will discuss with the teacher the progress of the work and ask all the doubts that may arise. For those students with official half-time dedication, the seminars might be replaced by a written work upon student request.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Mixed objective/subjective test	A10 A18 B2 B6 B8	Examination of the theoretical and practical knowledge. 40% theorical. 20% practical.	60
Seminar	B4 B5 B6 B9 B10 B11 B12 B13	Seminar grades will be based on continuous assessment.	40

Assessment comments
The qualification assessment will consist of two parts: 1) Theoretical part of the course, including two methodologies: "Seminario" ("seminar"), and the theoretical part of "proba mixta" (final exam). 2) Practical part of "proba mixta" (final exam). To get a pass a student has to get a minimum of 4 points out of 10 in the Theoretical part of the course and a minimum of 4 points out of 10 in the Practical part. Moreover, a minimum of 4 points out of 10 has to be got in in the theoretical part of the "proba mixta" and also in the practical part of the "proba mixta". Moreover, in order to get the pass, the average/mean of the different parts and methodologies has to be at least 5 points out of 10. Attendance to practicals is compulsory. If a student does not attend to one or two sessions of the practicals, he/she will have a penalty of one and two points, respectively, to be substracted from the score of the ?proba mixta?. If the student does not attend to three or more sessions of the practicals, he/she will get a fail as the final score in the course. The students that do not carry out the "proba mixta" will be qualified as "NO PRESENTADO".For those students with official half-time dedication and academic exemption, the tutorial sessions might be replaced by a written work, upon request by the student. Any academic dishonesty will be penalised in accordance with the provisions of the current UDC regulations.

Sources of information

Basic	- Benítez Burraco, A. (2005). Avances recientes en Biotecnología vegetal e ingeniería genética de plantas.. Editorial Reverté. - Hammond, J., McGarvey, P., Yusibov, V. (1999). Plant Biotechnology. New products and Applications. Springer verlag. - Loyola-Vargas, V.M. e Vázquez-Flota F. (2006). Plant cell culture protocols.. Humana Press. 2nd Edition. - Trigiano, R.N. e Gray, D.J. (2007). Plant development and biotechnology.. CRC Press. - Patrick, G.L. (2009). An Introduction to Medicinal Chemistry . Oxford - Papageorgiou, G.C. (2010). Chlorophyll a Fluorescence. Springer - Crozier,A., Clifford,M.N. & Ashihara, H. (2006). Plant Secondary Metabolites. Blackwell - Font Quer, P. (2009). Plantas Medicinales, El Dioscórides renovado. Península - Ustin, S. y Gamon, J. (2010). Remote sensing of plant functional. New Phytologist (2010) 186: 795?816 - Gonzalez?Fontes, A., Garate, A. & Bonilla I. (2010). Agricultural Sciences : Topics in Modern Agriculture . Studium Press LLC. - Hay, R.K.M. & Porter, J.R. (2006). The physiology of crop yield, 2nd Edition.. Blackwell Publishing. - Stenersen, J. (2004). Chemical pesticides mode of action and toxicology. CRC Press - TAIZ, L., ZEIGER, E., MÖLLER, I.M. & MURPHY, A. (2015). Plant physiology and development, 6th edition.. Sinauer Associates. - Slater, A., Scott, N.W. & Fowler, M.R. (2008). Plant Biotechnology: The Genetic Manipulation of Plants. Oxford University - Murphy, D (2011). Plants, Biotechnology and Agriculture.. CABI Publishers - BUCHANAN et al. (2015). Biochemistry and molecular biology of plants. Wiley-Blackwell ? ASPB - Maarten J. Chrispeels and Paul Gepts (2017). Plants, Genes, and Agriculture. Oxford University - Bhatla, S.C. & Lal, M.A. (2018). Plant physiology, development and metabolism. Springer - Lucas, J.A. (2020). Plant pathology and plant pathogens. Wiley Blackwell - Cobb, A.H (2022). Herbicides and Plant Physiology, 3rd ed.. Wiley Blackwell - Taiz, L., Zeiger, E., Moller, A.M. & Murphy, A (2022). Plant Physiology and Development, 7th ed.. Oxford University Press.
Complementary	- De Liñán, C. (2010). Vademécum de productos fitosanitarios y nutricionales.. Ediciones Agrotécnicas. - Sadras, V. & Calderini D. (2009). Crop physiology. Applications for genetic improvement and agronomy.. Academic Press. - Cobb, AH & Reade, J. (2010). Herbicides and plant physiology, 2nd edition.. Wiley-Blackwell. - Gianfagna, T (1995). Natural and synthetic growth regulators and their use in horticultural and agronomic crops. In: Davies, P.J. (Ed.) Plant hormones, pp 751-773.. Kluwer Academic Publishers. - Varios autores (2010). Guía práctica de la fertilización racional de los cultivos en España. . Ministerio de Medio Ambiente y Medio Rural y Marino.

Recommendations
Subjects that it is recommended to have taken before
Plant Physiology I/610G02027 Plant Physiology II/610G02028
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Plant Response to Adverse Conditions/610G02030
Other comments
To help achieve an immediate sustainable environment and comply with point 6 of the "Environmental Declaration of the Faculty of Sciences (2020)", the documentary work carried out in this area will be mostly requested in virtual format and computer support.

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.