Teaching Guide				
Identifying Data				2020/21
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	Hybrid			
Prerequisites				
Department	Bioloxía			
Coordinador	Pomar Barbeito, Federico	E-mail	federico.pomar@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 course complements the contents acquired in Plant Physiology I and II, from an applied perspective. Will be addressed in different subjects, agricultural, experimental and industrial processes, where the theoretical concepts of Plant Physiology are implemented.			
Contingency plan	1.Modifications in the contents The contents will not be modified, as they are basic for the formation of a Graduated in Biology 2. Methodologies Being a subject of the first semester two situations can occur: A- Hybrid teaching, if access to the Faculty had been restricted during hours or capacity. In which case there would be a combination of face-to-face and online teaching. This is the method foreseen in the Faculty for the first semester. B- No face-to-face, if access to the Faculty was totally prohibited in that semester. In that case the teaching would be completelly online. * Teaching methodologies that are maintained * Teaching methodologies that are modified. In the case A the lectures would be taught on a rotating basis (the number of students would not exceed the allowed capacity of the classroom) and at the same time the class would be broadcasted online with Teams. In the case of the practices, if the maximum capacity of the laboratory does not allow total attendance, part of the practices would be taught online with ad hoc materials generated by the teachers. In the case A the small groups would be face-to-face. In case B, master classes, practices and small groups would be carried out entirely online. 3. Mechanisms for personalized attention to students Email, tutoring by Teams and forums in Moodle, with daily attention in the case of email and forums, and upon request of the students in the case of tutoring by Teams. 4. Modifications in the evaluation In the case A, in person. In case B, online evaluation (Moodle and other institutional tools). * Evaluation observations: 5. Modifications of the bibliography or webgraphy In both cases, if possible, alternative and / or additional books in electronic format that were accessed from the beginning of that semester (provided that they are published as Open Access in the coming months or have an institutional subscription), and in any case additional ad hoc material generated by the lecturers.			

Study programme competences / results	
Code	Study programme competences / results
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 / results		
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

Topic 1 Introduction. Plant Physiology in Agriculture Topic 2. Plant productivity and conditioning factors in agriculture Topic 3. Development Plant Growth Regulators in Agriculture Topic 4. Mechanism of action of pesticides and herbicides Topic 5. Introduction to cell cultures. Main methodology Topic 6. In vitro plant tissue cultures. Topic 7. Current applications of cell culture and plant tissue Topic 8. Vegetative propagation Unit 9- Remote Sensing Topic 10 -. Chlorophyll fluorescence Topic 11 -. Industrial products from plants Topic 12 -. Secondary metabolites on human health	Development of the proposed topics

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A10 A18 A21 A26 A29 B2 B3 B8	18	45	63
Seminar	B4 B5 B6 B9 B10 B11 B12 B13	10	25	35
Mixed objective/subjective test	A10 A18 B2 B6 B8	4	0	4
Laboratory practice	A30 A31	20	26	46
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 development of the topic questions will be inserted students to reflect on and answer them orally, prior to explanation by the teacher.
Seminar	Technical working group aims intensive study of a topic. It will take place in very small groups of 10-15 students. It will include making of audiovisual materials on the topic studied.
Mixed objective/subjective test	Consist of two parts, in which the knowledge acquired theoretical and practical point is evaluated. The mixed evidence may include essay questions, multiple choice or problems
Laboratory practice	Methodology that allows estudantes effectively learn through conducting practical activities, such as demonstrations, exercises, experiments and research.

Personalized attention	
Methodologies	Description
Seminar	Students, in groups of 10, will meet with the teacher to prepare the seminar work. In addition, tutorial sessions, each student will discuss with the teacher the progress of the work and all the doubts that may arise. For those students with official half-time dedication, the tutorial sessions might be replaced by a written work, if the student requires it.

Assessment			
Methodologies	Competencies / Results	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	Activities during the seminars will be evaluated on an ongoing basis by the teacher.	40

Assessment comments
The qualification assessment will have 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, if the student requires it.

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 - Cobb A.H. & Kirkwood R.C. (2000). Herbicides and their mechanisms of action. Sheffield Academic Press. - 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
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

(*)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.