| Teaching Guide | | | | |
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| Identifying Data | | | | 2023/24 |
| Subject (*) | Plant Response to Adverse Conditions | | Code | 610G02030 |
| Study programme | Grao en Bioloxía | | | |
| Descriptors | | | | |
| Cycle | Period | Year | Type | Credits |
| Graduate | 2nd four-month period | Fourth | Optional | 6 |
| Language | Spanish | | | |
| Teaching method | Face-to-face | | | |
| Prerequisites | | | | |
| Department | Bioloxía | | | |
| Coordinador | Bernal Pita da Veiga, María de los Ángeles | E-mail | angeles.bernal@udc.es | |
| Lecturers | Bernal Pita da Veiga, María de los Ángeles<br>Carrillo Barral, Néstor<br>Diaz Varela, Jose | E-mail | angeles.bernal@udc.es<br>n.carrillo@udc.es<br>jose.diaz.varela@udc.es | |
| Web | | | | |
| General description | Stress, plant disorder and disease. Water stress and flooding. Oxidative stress. Stress by excessive light or dark. Stress by extreme temperatures. Stress by mineral nutrients. Plant diseases. Types of pathogens. Pathogenesis: Infection and colonization processes. Plan defense and resistance. The physiology of the diseased plant. Plant pests. Response to herbivores. | | | |

| Study programme competences | |
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| Code | Study programme competences |
| A4 | Obter, manexar, conservar e observar especímenes. |
| A9 | Identificar e utilizar bioindicadores. |
| A10 | Avaliar actividades metabólicas. |
| A11 | Identificar e analizar material de orixe biolóxica e as súas anomalías. |
| A17 | Realizar bioensaios e diagnósticos biolóxicos. |
| A19 | Analizar e interpretar o comportamento dous seres vivos. |
| 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. |
| B1 | Aprender a aprender. |
| 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. |
| B7 | Comunicarse de maneira efectiva nunha contorna de 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 | |
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| Learning outcomes | Study programme competences |

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| Comprise the different situations of stress to which can be subjected a plant in his natural environment and describe the different strategies in front of the same. | A10<br>A19<br>A26<br>A30<br>A31 | B1<br>B2<br>B3<br>B6 | |
| Know the most important characteristics of the pathogens of the plants.<br>Know the mechanisms of attack of the pathogens.<br>Know the mechanisms of defence of the plants. | A4<br>A11<br>A17<br>A19<br>A26<br>A29<br>A30<br>A31 | B1<br>B3<br>B4<br>B6<br>B8 | |
| Comprise the complexity of the interaction between plant and pathogen, very dynamic and in which they influence diverse factors. | A11<br>A19 | B1<br>B2<br>B3<br>B4<br>B8 | |
| Take consciousness of the economic and social importance of the knowledge and control of the illnesses of the plants. | | B9<br>B13 | |
| Be able to work in group for the preparation of a subject of answer of the plants to adverse conditions, and to expose it to the mates | | B5<br>B6<br>B7<br>B8<br>B9<br>B10<br>B11<br>B12 | |
| Be able to realise basic experimentation in the field of the physiology of the plants in adverse conditions | A9<br>A10<br>A17<br>A26<br>A30<br>A31 | B1<br>B2<br>B3<br>B4<br>B6 | |

| Contents | |
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| **Topic** | **Sub-topic** |
| Topic 1. Introduction: plant responses to adverse conditions.<br>Topic 2. Water stress and flooding.<br>Topic 3. Stress by light.<br>Topic 4. Stress by extreme temperatures.<br>Topic 5. Stress by nutrients.<br>Topic 6. Introduction to plant diseases and plant pathogens.<br>Topic 7. Pathogenesis: Processes of infection and colonization by pathogens.<br>Topic 8. Plant defense and resistance against pathogens.<br>Topic 9. Physiology of the diseased plant.<br>Topic 10. Plant pests and response to herbivores. | Different aspects of the proposed topics. |

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| Practicals | Practicals about the topics of the subject. |

| Planning | | | | |
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| Methodologies / tests | Competencies | Ordinary class hours | Student?s personal work hours | Total hours |
| Guest lecture / keynote speech | B1 B9 B10 | 21 | 52.5 | 73.5 |
| Seminar | A9 A10 A11 A19 A26 A29 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 | 7 | 28 | 35 |
| Mixed objective/subjective test | A4 A9 A10 A11 A17 A19 A26 A30 A31 | 4.5 | 0 | 4.5 |
| Laboratory practice | A17 A19 A26 | 14 | 21 | 35 |
| 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 | |
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| Methodologies | Description |
| Guest lecture / keynote speech | Oral exhibition of the subject complemented with presentations in Power Point, videos and/or diagrams of blackboard. During the development of the subject we make questions to the student so that thinking on them and oral response, previously to his explanation by the professor. |
| Seminar | Technician of work in group that has like purpose the intensive study of a subject. It will realise in groups very reduced of 25 students |
| Mixed objective/subjective test | It will consist of two parts, in which they will evaluate the knowledges purchased so many theorists like practical. The mixed proof can to include questions to develop, type test or problems |
| Laboratory practice | Methodology that allows that the students learn sure enough through the realisation of activities of practical character, such like demonstrations, exercises, experiments and investigations. |

| Personalized attention | |
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| Methodologies | Description |
| Seminar | The students, in groups of 25, will gather with the teacher for to preparation of a work of seminar. In schedule of tutorías, each student will be able to comment with the teacher the course of the work, as well as all the doubts that present him . For those students with official part-time dedication, the seminar sessions might be replaced by a written work, if the student requires it. |

| Assessment | | | |
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| Methodologies | Competencies | Description | Qualification |
| Seminar | A9 A10 A11 A19 A26 A29 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 | The activities developed during the seminars will be evaluated of way contínua by the teacher. | 30 |
| Mixed objective/subjective test | A4 A9 A10 A11 A17 A19 A26 A30 A31 | Probe of the theoretical and practical knowledges.<br>55% theorist.<br>20% practical. | 70 |

| Assessment comments |
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| To pass the subjet the students have to obtain at least 4 points in the mixed proof (and in each one of his two parts, theoretical and practical) and in seminars. The average of all the activities has to be as minimum of 5;If it resulted to be of 5 or more points, but obtained less than 4 points in one of the parts of the mixed proof, the final note will be of 4,9 (fall). In the second opportunity (July), will realise only the mixed proof, the qualifications obtained in the seminars keep of the first opportunity. They will be considered like NON PRESENTED those students that no present to the mixed proofs.<br>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.<br>For those students with official part-time dedication and academic exemption , the seminar sessions might be replaced by a written work, if the student requires it.<br>The students with top marks in the first evaluation period (June) will have priority to achieve MATRÍCULA DE HONOR (qualification with Honors)<br>For to the students that request the ANNOUNCEMENT ADVANCED OF<br>DECEMBER, will apply the rule, as which<br>rixe the educational guide of the course.<br>In the event of fraud in tests or evaluation activities, the regulations in force at UDC will be applied. |

| Sources of information | |
|---|---|
| **Basic** | - Agrios, G. N (2005). Plant pathology, 5ª Ed.. Academic Press.<br>- Buchanan et al. (2015). Biochemistry and molecular biology of plants, 2nd edition. Wiley-Blackwell ? ASPB<br>- Dickinson, M. (2003). Molecular Plant Pathology.. Bios Scientific Publishers.<br>- Larcher, W (2003). Physiologycal Plant Ecology. Springer Verlag<br>- Leclerc, JC. (2002). Plant Ecophysiology. Science Publishers, Enfield, New Hampshire<br>- Lucas, J.A. (2020). Plant pathology and plant pathogens, 4th edition. Wiley Blackwell<br>- Ortolá, AG (2001). Ecofisiología Vegetal.<br>- Reigosa, MJ., Pedrol, N., Sánchez, A (2004). La Ecofisiología vegetal. Thomsom<br>- Bhatla, S.C. & Lal, M.A. (2018). Plant physiology, development and metabolism. Springer<br>- Smith, A.M., Coupland, G., Dolan, L., Harberd, N., Jones, J., Marin, C., Sablowski, R. & (2009). Plant Biology. Garland Science.<br>- Taiz, L. y Zeiger, E. (2010). Plant Physiology, 5th Edition.. Sinauer Associates.<br>- Taiz, L., Zeiger, E., Moller, A.M. & Murphy, A. (2015). Plant Physiology and Development. Sinauer associates, Massachusets<br>- Taiz, L., Zeiger, E., Moller, A.M. & Murphy, A. (2022). Plant Physiology and Development. Oxford University Press. |
| **Complementary** | - Trigiano, R.N., Whindham, M.T. & Windham, A.S. (2007). Plant Pathology: Concepts and Laboratory Exercises. 2nd ed.. CRC Press LLC.<br>- Schumann, G.L. y D´Arcy, C.J. (2006). Essential Plant Pathology. . APS Press.<br>- Buchanan, B. B., Gruissem, W. & Jones, R. L. (2000). Biochemistry and molecular biology of plants. . ASPP<br>- Walters, D.R. (2011). Plant defense. Wiley-Blackwell.<br>- Parker, J. (2009). Molecular aspects of plant disease resistance. . Blackwell Publishing Ltd.<br>- Madhava, KV., Raghavendra, AS., Janardhan, K (2006). Physiology and Molecular Biology of Stress Tolerance. Springer<br>- Shabala, Sergey (2012). Plant Stress Physiology. Cabi<br>- Huang, B (2006). Plant Environment Interactions. CRC Taylor & Francis<br>- Mooney, HA., Winner, WE., Pell, EV (2006). Response of plants to multiple stresses. Academic Press<br><br /> |

| Recommendations |
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| Subjects that it is recommended to have taken before |
| Plant Physiology I/610G02027<br>Plant Physiology II/610G02028<br>Applied Plant Physiology /610G02029 |
| Subjects that are recommended to be taken simultaneously |
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| Subjects that continue the syllabus |
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| Other comments |
| Gender PerspectiveIn<br>this subject, the gender perspective will be taken into account, sexist<br>attitudes will not be tolerated and the values of respect and equality<br>will be promoted.Program Green Campus<br>Empower of SciencesTo help to achieve some sustainable immediate surroundings<br>and fulfil with the point 6 of the Environmental Statement of the faculty of<br>Sciences (2020), the documentary works that realise  in this matter:to. They will request <br>mostly in virtual format and computer supportb. To realise  in<br>paper:-they will not employ <br>plastic-will realise <br>impressions to double expensive-will employ  paper<br>recycled-will avoid  the<br>realisation of draftsTo Environmental Statement is available<br>in:https://ciencias.udc.es/images/Facultade/Green_Campus/Regulamento_Comit%C3%A9_Green_Campus_FCiencias.pdf |