



## IDENTIFYING DATA

### Plant Production

|                     |  |          |      |            |
|---------------------|--|----------|------|------------|
| Subject             | Plant Production   |          |      |            |
| Code                | V02G030V01909  |          |      |            |
| Study programme     | Grado en Biología  |          |      |            |
| Descriptors         | ECTS Credits   | Choose   | Year | Quadmester |
|                     | 6  | Optional | 4th  | 1st        |
| Teaching language   | Spanish  |          |      |            |
| Department          |  |          |      |            |
| Coordinator         | Barreal Modroño, M. Esther   |          |      |            |
| Lecturers           | Barreal Modroño, M. Esther<br>Canchaya Sanchez, Carlos Alberto<br>Gallego Veigas, Pedro Pablo  |          |      |            |
| E-mail              | edesther@uvigo.es  |          |      |            |
| Web                 | <a href="http://bioloxia.uvigo.es/es/">http://bioloxia.uvigo.es/es/</a>  |          |      |            |
| General description | The subject will provide the student with skills in four areas: plant production systems and good practices, plant breeding and reproduction techniques (plant biotechnology), plant safety and health, legislation and regulations. The subject includes master classes, seminars, case studies in cooperative learning, and practical laboratory classes.<br><a href="http://bioloxia.uvigo.es/gl/docencia/horarios">http://bioloxia.uvigo.es/gl/docencia/horarios</a> |          |      |            |

## Skills

|      |  |
|------|--|
| Code |  |
| A1   | Students should prove understanding and knowledge in this study field that starts in the Secondary Education and with a level that, even though it is supported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field. |
| A2   | Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field. |
| A3   | Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.  |
| A4   | Students should be able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).  |
| A5   | Students should develop the necessary learning skills to undertake further studies with a high degree of autonomy  |
| B2   | Ability of reading and analyzing scientific papers and having critical assessment skills to understand data collection, deducing the main idea from the least relevant ones and basing on the corresponding conclusions.   |
| B3   | Acquisition of general knowledge about the basic subjects of biology, both at theory and experimental level, without dismissing a higher specialization in subjects that are oriented to a concrete professional area.   |
| B4   | Ability in handling experimental tools, both scientific and computer technology equipment that support the search for solutions to problems related to the basic knowledge of biology and with those of a concrete labour context.   |
| B7   | Collection of information about issues of biologic interest, analysis and emission of critical opinions and reason them including the reflection about social and/or ethical aspects related to the issue.   |
| B10  | Development of analytic and abstraction skills, the intuition and the logical and rigorous thought through the study of biology and its uses.  |
| B11  | Ability to communicate in detail and clearly: knowledge, methodology, ideas, issues and solutions to all audiences (not only qualified but unskilled in Biology).  |
| B12  | Ability to identify their own educational necessities in the biology field and in concrete labour areas and to organize their learning with a high grade of autonomy in any context.   |
| C3   | Identifying, analysing and characterizing biological samples, including those of human origin, and possible anomalies.   |
| C4   | Isolating, analysing and identifying biomolecules, viruses, cells, tissues and organs.   |
| C5   | Growing microorganisms, cells, tissues and organs.   |
| C7   | Manipulating and analysing genetic data and carrying out genetic counseling  |
| C10  | Analysing and assessing the adaptation of living beings to the environment.  |
| C16  | Growing, producing, transforming, improving biological resources as well as getting profits.   |

|     |  |
|-----|--|
| C17 | Identifying and obtaining natural biological products  |
| C18 | Producing, transforming, controlling and preserving Agro-Food products.  |
| C19 | Identifying, addressing and communicating Agro-Food and environmental risks.                                   |
| C20 | Designing, using and supervising biotechnological processes.   |
| C21 | Processing and interpreting bioassays and biological diagnoses.  |
| C23 | Developing, managing and using biological control techniques.  |
| C24 | Designing biological process models.   |
| C25 | Gathering background information, develop experimental work and analysing data results                         |
| C29 | Helping and evaluating scientific, technical, ethical, legal and socioeconomically aspects related to Biology. |
| C31 | Knowing and handling technical and scientific apparatus.   |
| C32 | Knowing and handling basic or specific key concepts and terminology  |
| C33 | Understanding the social projection of Biology.  |
| D1  | Development of capacity of analysis and synthesis  |
| D2  | Acquisition of the organization and planning capacity for tasks and time                                       |
| D3  | Development of oral and writing communication abilities  |
| D4  | Acquisition of foreign language knowledge related to the study field   |
| D5  | Use of computer resources related to the study field   |
| D6  | Research and interpreting of information from different sources  |
| D7  | Resolution of issues and decision making in an effective way   |
| D8  | Development of the ability of independent learning   |
| D9  | Ability to work in collaboration or creating groups with an interdisciplinary character                        |
| D10 | Development of the critical thinking   |
| D11 | Adquisition of an ethical agreement with the society and the profession  |
| D12 | Respectful behaviour to diversity and multiculturalism   |
| D13 | Sensitivity for environmental issues   |
| D14 | Adquisition of abilities in the interpersonal relationships  |
| D15 | Development of creativity, initiative and entrepreneurial spirit   |
| D16 | Acceptance of a quality commitment   |
| D17 | Development of the self-criticism ability  |

### Learning outcomes

| Expected results from this subject                        | Training and Learning Results |                        |                                       |   |
|---|-------------------------------|------------------------|---------------------------------------|---|
| To know the main plant production systems                 | A1                            | B10<br>B12             | C16<br>C18<br>C32                     | D6<br>D8<br>D12<br>D13<br>D14<br>D16                      |
| To understand plant reproduction and improving techniques | A1                            | B10<br>B12             | C16<br>C17<br>C18<br>C32              | D6<br>D8<br>D10<br>D14<br>D15<br>D16                      |
| To know the basic concepts in plant biotechnology         | A1<br>A5                      | B3<br>B10              | C16<br>C17<br>C18<br>C32              | D6<br>D8<br>D10<br>D13<br>D14<br>D15<br>D16               |
| To know the basic principles of plant safety and hygiene  | A1<br>A5                      | B2<br>B3<br>B10<br>B12 | C7<br>C16<br>C17<br>C18<br>C19<br>C32 | D6<br>D8<br>D10<br>D11<br>D12<br>D13<br>D14<br>D15<br>D16 |

|   |          |                        |   |   |
|---|----------|------------------------|---|---|
| To know the legislation and regulations in plant production   | A5       | B3<br>B10<br>B12       | C7<br>C16<br>C17<br>C18<br>C19<br>C20<br>C29<br>C32     | D5<br>D6<br>D10<br>D11<br>D12<br>D13<br>D14<br>D15<br>D16                             |
| To apply knowledge of plant production to isolate, identify, manage and analyze specimens and samples of biological origin, as well as to characterize their cellular and molecular constituents. | A2<br>A3 | B2<br>B4<br>B7         | C3<br>C4<br>C5<br>C7<br>C23<br>C25                      | D2<br>D5<br>D6<br>D7<br>D8<br>D10<br>D14<br>D15<br>D16<br>D17                         |
| To analyze and interpret the adaptations of living beings to the environment  | A2<br>A5 | B3<br>B4<br>B10        | C3<br>C4<br>C5<br>C10<br>C23                            | D1<br>D6<br>D7<br>D10<br>D13<br>D14<br>D15<br>D16<br>D17                              |
| To apply knowledge and technology relating to plant production in aspects related to the production, harvesting, analysis and diagnosis of biological processes and resources                     | A2<br>A4 | B4<br>B10<br>B11       | C3<br>C4<br>C5<br>C7<br>C19<br>C23<br>C25               | D5<br>D6<br>D7<br>D8<br>D10<br>D14<br>D15<br>D16                                      |
| To obtain information, perform experiments and interpret results  | A3       | B2<br>B7<br>B10        | C5<br>C7<br>C20<br>C21<br>C23<br>C24<br>C25<br>C31      | D1<br>D2<br>D3<br>D4<br>D5<br>D6<br>D7<br>D8<br>D9<br>D10<br>D14<br>D15<br>D16<br>D17 |
| To apply knowledge of plant production to advise, supervise and assess scientific-technical, ethical, legal and socio-economic aspects related to living beings and the environment               | A3<br>A5 | B2<br>B3<br>B7<br>B10  | C3<br>C4<br>C5<br>C7<br>C19<br>C23<br>C25<br>C29<br>C33 | D2<br>D3<br>D5<br>D6<br>D7<br>D8<br>D11<br>D12<br>D15<br>D16<br>D17                   |
| Understanding the social projection of plant production and its impact on professional practice   | A3       | B2<br>B7<br>B10<br>B12 | C7<br>C19<br>C20<br>C33                                 | D6<br>D10<br>D11<br>D13<br>D15<br>D16<br>D17  |

|   |          |                         |                        |                              |
|---|----------|-------------------------|------------------------|------------------------------|
| To know and manage the concepts, terminology and scientific-technical instrumentation related to plant production | A2<br>A4 | B4<br>B10<br>B11<br>B12 | C5<br>C7<br>C20<br>C31 | D2<br>D4<br>D5<br>D15<br>D16 |
|---|----------|-------------------------|------------------------|------------------------------|

## Contents

|  |  |
|--|--|
| Topic  |  |
| Block 1: Production systems (Plant Physiology Area).           | Topic 1. Basis of Plant Production.  |
| Block 1: Production systems (Plant Physiology Area).           | Topic 2. Plant Production Techniques   |
| Block 2: Plant Breeding (Genetic Area)                         | Topic 3. Fundamentals of Plant Breeding  |
| Block 2: Plant Breeding (Genetic Area)                         | Topic 4. Fundamentals of Genomic Selection   |
| Block 3: Plant Biotechnology (Plant Physiology Area)           | Topic 5. Introduction to Plant Biotechnology   |
| Block 3: Plant Biotechnology (Plant Physiology Area)           | Topic 6. Genetic transformation of plants  |
| Block 4: Plant health and legislation.(Plant Physiology Area)  | Topic 7. Plant Health  |
| Block 4: Plant health and legislation. (Plant Physiology Area) | Topic 8. Intellectual property and standards.  |
| Practice   | 1. Water stress and plant production<br>2. Introduction to adventitious morphogenesis<br>3. Poor plant nutrition and its impact on yield |

## Planning

|   | Class hours | Hours outside the classroom | Total hours |
|---|-------------|-----------------------------|-------------|
| Introductory activities                               | 1           | 0                           | 1           |
| Lecturing   | 23          | 46                          | 69          |
| Problem solving                                       | 6           | 6                           | 12          |
| Seminars  | 6           | 6                           | 12          |
| Laboratory practical                                  | 12          | 24                          | 36          |
| Objective questions exam                              | 1           | 7                           | 8           |
| Report of practices, practicum and external practices | 0           | 4                           | 4           |
| Case studies  | 0           | 8                           | 8           |

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

## Methodologies

|                         | Description  |
|-------------------------|--|
| Introductory activities | A class will be dedicated to the presentation of the subject and the teaching guide, with an explanation of the evaluation procedure and indication of the deadlines for the work.   |
| Lecturing               | The master sessions are 50-minute lessons, to explain and develop the contents of Plant production. They must be completed with autonomous work of the student consulting books of text and further reading, mainly scientific articles. |
| Problem solving         | Cooperative learning is formulated based on problems and cases.  |
| Seminars                | Seminar methodology is formulated with collaborative work and presentation of teamwork for the agricultural systems section.   |
| Laboratory practical    | These are mandatory laboratory practices consisting of familiarization of students with basic plant culture techniques and plant biotechnology.  |

## Personalized assistance

| Methodologies        | Description   |
|----------------------|---|
| Lecturing            | Throughout the term, teachers will be available in person at their offices during tutoring hours. It is recommended to make an appointment by mail to avoid crowds, you wait and/or the teacher has a busy schedule that day. |
| Problem solving      | Consultations can be made by e-mail or through the TEMA platform, in addition to being able to use face-to-face tutorials   |
| Seminars             | Tasks will be carried out to solve problems and exercises that will be dealt with in the same seminar.  |
| Laboratory practical | The laboratory sessions will include a temporary space to perform tasks that will serve as training for the realization of the practice report.   |

| Assessment  |   | Qualification | Training and Learning Results      |                                     |   |   |
|---|---|---------------|------------------------------------|-------------------------------------|---|---|
|   | Description   |               |                                    |                                     |   |   |
| Objective questions exam                              | The final exam will consist of objective questions related to the learning achieved.  | 30            | A1<br>A3<br>A5<br>B10<br>B12       | B2<br>B3<br>B4<br>C18<br>C19        | C7<br>C16<br>C17<br>C18<br>C19<br>C32   | D1<br>D3<br>D6<br>D8<br>D12   |
| Report of practices, practicum and external practices | Presentation of a final report in which the methodology, materials, data obtained, statistical analysis, graphic representation and discussion of the results obtained will be presented, including all the literature consulted. | 40            | A3<br>A4<br>A5<br>B7<br>B10<br>B11 | B2<br>B3<br>B4<br>C10<br>C16<br>C17 | C3<br>C4<br>C5<br>C10<br>C16<br>C17<br>C19<br>C20<br>C21<br>C23<br>C24<br>C25<br>C31<br>C33 | D2<br>D4<br>D5<br>D6<br>D7<br>D9<br>D10<br>D11<br>D13<br>D14<br>D15<br>D16<br>D17 |
| Case studies  | The evaluation of the seminars will be done through collaborative work (plant physiology) and problem solving of individual form (Genetics) together with the delivery of a small report or an objective test.                    | 30            | A1<br>A5<br>B10<br>B12             | B2<br>B3<br>C19<br>C29<br>C32       | C3<br>C19<br>C29<br>C32   | D1<br>D3<br>D6<br>D8<br>D17   |

#### Other comments on the Evaluation

It will be essential to obtain at least 35% of the total assessment from each part, in order to compensate. If you do not exceed this limit, you will have to exceed this part in the second call. In the case of the practices, once passed, the note is kept for the next course.

The dates of the exams are indicated in the following link:

<http://bioloxia.uvigo.es/es/docencia/examenes>

#### Sources of information

##### Basic Bibliography

Parker, R, **La Ciencia de las Plantas**, 1ª, Editorial Paraninfo, 2000

Ferreira, JJ; Ordás, A y Pérez M, **La genética de los caracteres cuantitativos en la mejora vegetal del siglo XXI**, 1ª, Sociedad Española de Genética y Sociedad Española, 2012

David P. Clarck y Nanette J. Pazdernik, **Biotechnology**, 2ª, Elsevier, 2016

Anis M. y Ahmad N., **Plant tissue culture: propagation, conservation and crop improvement**, 1ª, Springer, 2016

Caballero, A., **Genética Cuantitativa**, 1ª, Editorial Síntesis, 2017

##### Complementary Bibliography

Cubero, JL, **Introducción a la mejora genética vegetal**, 2ª, Ediciones Mundi Prensa, 2002

Casal, I; García-López, JL; Guisán, JM y Martínez Zapater, JM, **La Biotecnología Aplicada a la Agricultura**, 1ª, Eumedia S.A., 2000

Varshney, RK y Tuberosa, R, **Genomics-Assisted Crop Improvement**. Springer, 1ª, Springer, 2007-2010

#### Recommendations

##### Subjects that continue the syllabus

Drafting and execution of projects/V02G030V01801

Final Year Dissertation/V02G030V01991

##### Subjects that are recommended to be taken simultaneously

Quality management and control/V02G030V01911

Animal production/V02G030V01907

Microbial Production/V02G030V01908

##### Subjects that it is recommended to have taken before

Genetics I/V02G030V01404

Plant physiology I/V02G030V01503

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## Contingency plan

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### Description

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#### === EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

#### === ADAPTATION OF THE METHODOLOGIES ===

##### MIXED TEACHING:

\* Teaching methodologies that are maintained:

There are no changes in the teaching methodologies mentioned in the guide.

\* Teaching methodologies that are modified:

Although there are no changes in the teaching methodology to be applied, the duration and content of the practice will be adjusted to ensure the cleaning and disinfection of each work station and of the material used during the practice, as well as to ensure proper hand hygiene before entering and leaving the laboratory.

\* Non-presential mechanism of attention to the students (tutorials):

Tutoring sessions will be developed through various methods of communication with students under modality of previous appointment by:

- E-mail.

- Through remote campus.

\* Modifications (if applicable) of the contents to be taught:

The contents will be developed in an integral way according to the teacher's planning.

\* Additional bibliography to facilitate self-learning

#### === ADAPTATION OF THE EVALUATION ===

\* Tests already carried out

Examination of objective questions. [Previous weight 30%] [Proposed weight 30%]

Internship report. [Previous weight 40%] [Proposed weight 40%]

Case studies. [Previous weight 30%] [Proposed weight 30%]

\* Pending evidence that remains. No change.

Examination of objective questions. [Previous weight 30%] [Proposed weight 30%]

Internship report. [Previous weight 40%] [Proposed weight 40%]

Case studies. [Previous weight 30%] [Proposed weight 30%]

\* Tests that are modified

There are no plans to modify any tests.

\* New tests

None

\* Additional information

Evaluable internship activities will be delivered through the tele-education platform enabled by UVIGO or through email.

#### === ADAPTATION OF METHODOLOGIES ===

##### NON-ATTENDANCE TEACHING:

\* Teaching methodologies that are maintained:

The teacher will present the conceptual foundations of each of the theoretical sessions, as well as the guidelines of the protocols to be developed in the practices under the non-presential modality and through the use of the remote Campus.

\* Teaching methodologies that are modified:

The practice sessions will be carried out in a non-presential way through the remote Campus, or through a simulation of the same with the help of videos previously made by the teacher with audio support and different photographic material; or a PowerPoint presentation documented by the teacher will be provided for the adequate monitoring of the practice. During each session, real data of the practice will be provided so that the student can carry out the analysis of these and the interpretation of the results necessary for the preparation of the final practice report

Detailed instructions for the preparation of this report will be provided and will be available at the

The tele-education platform enabled by UVIGO all the necessary documentation for its realization.

\* Non-presential mechanism for attending to students (tutorials):

The tutoring sessions will be developed through various methods of communication with students under the appointment modality:

- E-mail with the teachers involved.

- Group, work group or individual tutoring, if necessary, through a remote campus.

\* Modifications (if applicable) of the contents to be taught:

The contents are developed in an integral way according to the teaching planning.

\* Additional bibliography to facilitate self-learning:

=== ADAPTATION OF THE ASSESSMENT ===

\* Tests already carried out.

Examination of objective questions. [Previous weight 30%] [Proposed weight 30%]

Internship report. [Previous weight 40%] [Proposed weight 40%]

Case studies. [Previous weight 30%] [Proposed weight 30%]

\* Pending evidence that remains. No change.

Examination of objective questions. [Previous weight 30%] [Proposed weight 30%]

Internship report. [Previous weight 40%] [Proposed weight 40%]

Case studies. [Previous weight 30%] [Proposed weight 30%]

\* Tests that are modified

There are no plans to modify any tests.

\* New tests

None

\* Additional information

Evaluable activities will be delivered through the tele-education platform enabled by UVIGO or through e-mail.

Information will be provided well in advance about the platform to be used for the test of objective questions (Faitic, Moodle, Remote Campus, etc.) and about the rules to be followed for its realization.

July call: no change in the evaluation planned for this call. The tests will be carried out in a non-presential way through remote campus, using the tools provided by UVIGO (Faitic, virtual classrooms, etc.).

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