



## Teaching Guide

| Teaching Guide           |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |        |                  |           |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------------|-----------|
| Identifying Data         |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |        |                  | 2022/23   |
| Subject (*)              | Animal biotechnology                                                                                                                                                                                                                                                                                                                                                                                                                                  |        | Code             | 610475304 |
| Study programme          | Mestrado Universitario en Biotecnoloxía Avanzada                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |           |
| Descriptors              |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |        |                  |           |
| Cycle                    | Period                                                                                                                                                                                                                                                                                                                                                                                                                                                | Year   | Type             | Credits   |
| Official Master's Degree | 2nd four-month period                                                                                                                                                                                                                                                                                                                                                                                                                                 | First  | Optional         | 3         |
| Language                 | Spanish                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |                  |           |
| Teaching method          | Face-to-face                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |                  |           |
| Prerequisites            |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |        |                  |           |
| Department               | Bioloxía                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |                  |           |
| Coordinador              | Insua Pombo, Ana María                                                                                                                                                                                                                                                                                                                                                                                                                                | E-mail | ana.insua@udc.es |           |
| Lecturers                | Insua Pombo, Ana María                                                                                                                                                                                                                                                                                                                                                                                                                                | E-mail | ana.insua@udc.es |           |
| Web                      | masterbiotecnologiaavanzada.com/                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |           |
| General description      | This subject intends to introduce students to the basic aspects of animal biotechnology. Main aspects involve the understanding of the fundamentals of molecular tools for the study of genomes and how molecular markers allow for species identification, population analysis and development of genetic improvement programs. Also the knowledge of tools and application of technologies for chromosomal manipulation and in vitro fertilization. |        |                  |           |

## Study programme competences

| Code | Study programme competences                                                                                                                                                                                    |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A21  | Coñecer os recursos microbianos, vexetais e animais de interese biotecnolóxico así como as súas aplicacións na industria alimentaria e agropecuaria.                                                           |
| A24  | Coñecer as estratexias de produción e mellora de alimentos por métodos biotecnolóxicos.                                                                                                                        |
| B1   | Capacidade de análise e síntese (localización de problemas e identificación das causas e a súa tipoloxía).                                                                                                     |
| B2   | Capacidade de organización e planificación de todos os recursos (humanos, materiais, información e infraestruturas).                                                                                           |
| B3   | Capacidade de xestión da información (con apoio de tecnoloxías da información e as comunicacións).                                                                                                             |
| B4   | Capacidade de planificación e elaboración de estudos técnicos en biotecnoloxía microbiana, vexetal e animal.                                                                                                   |
| B5   | Capacidade de identificar problemas, buscar solucións e aplicalas nun contexto biotecnolóxico profesional ou de investigación.                                                                                 |
| B6   | Capacidade de comunicación oral e escrita dos plans e decisións tomadas.                                                                                                                                       |
| B7   | Capacidade para formular xuízos sobre a problemática ética e social, actual e futura, que propón a Biotecnoloxía.                                                                                              |
| B8   | Capacidade de comunicación eficazmente coa comunidade científica, profesional e académica, así como con outros sectores e medios de comunicación.                                                              |
| B9   | Capacidade de Traballo en equipo multidepartamental dentro da empresa.                                                                                                                                         |
| B10  | Capacidade de Traballo nun contexto de sostibilidade, caracterizado por: sensibilidade polo medio ambiente e polos diferentes organismos que o integran así como concienciación polo desenvolvemento sostible. |
| B11  | Racionamento crítico e respecto profundo pola ética e a integridade intelectual.                                                                                                                               |
| B12  | Adaptación a novas situacións legais, ou novidades tecnolóxicas así como a excepcións asociadas a situacións de urxencia.                                                                                      |
| B13  | Aprendizaxe autónoma.                                                                                                                                                                                          |
| B14  | Liderazgo e capacidade de coordinación.                                                                                                                                                                        |
| B15  | Sensibilización cara á calidade, o respecto medioambiental e o consumo responsable de recursos e a recuperación de residuos.                                                                                   |
| C4   | Acting as a respectful citizen according to democratic cultures and human rights and with a gender perspective.                                                                                                |
| C7   | Developing the ability to work in interdisciplinary or transdisciplinary teams in order to offer proposals that can contribute to a sustainable environmental, economic, political and social development.     |

## Learning outcomes

| Learning outcomes | Study programme competences |
|-------------------|-----------------------------|
|-------------------|-----------------------------|



|                                                                                                                                   |              |                                                                                                             |            |
|-----------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------------------------------------------------------------------------------------------|------------|
| Ability to identify the different biotechnological applications that animal resources have in the sector of food and agriculture. | AC21<br>AC24 | BC1<br>BC2<br>BC3<br>BC5<br>BC7<br>BC8<br>BC10<br>BC12<br>BC13<br>BC15                                      | CC4<br>CC7 |
| Ability to develop production strategies based on food improvement by biotechnological methods.                                   | AC21<br>AC24 | BC1<br>BC2<br>BC3<br>BC4<br>BC5<br>BC6<br>BC7<br>BC8<br>BC9<br>BC10<br>BC11<br>BC12<br>BC13<br>BC14<br>BC15 | CC4<br>CC7 |

| Contents                                                                        |                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic                                                                           | Sub-topic                                                                                                                                                                                                                                            |
| Genomics and its application in the exploitation of natural animal variability. | Animal biotechnology and Genomics. Physical maps and genetic maps. Sequencing of animal genomes: strategies, assembly and annotation of genes. Animal genomes. Genome variation: SNPs and structural variants.                                       |
| Breeding and marker-assisted selection                                          | Molecular makers: types, characteristics, development and analysis. Selection of quantitative traits in animals. Detection and analysis of QTLs. Use of identified genes in genetic improvement. Genome-wide association studies. Genomic selection. |
| Control of reproduction and assisted reproductive technologies in animals.      | In vitro fertilization and embryo production<br>Micromanipulation of gametes and embryos<br>Sex determination.                                                                                                                                       |
| Chromosome manipulation in fish and shellfish                                   | Poliploidy. Gynogenesis. Androgenesis. Monosex populations. Production of clones.                                                                                                                                                                    |

| Planning                       |                            |                      |                               |             |
|--------------------------------|----------------------------|----------------------|-------------------------------|-------------|
| Methodologies / tests          | Competencies               | Ordinary class hours | Student's personal work hours | Total hours |
| Guest lecture / keynote speech | A21 A24 B11 B12<br>B15     | 14                   | 21                            | 35          |
| Laboratory practice            | A21 A24 B9 C4 C7           | 4                    | 2                             | 6           |
| ICT practicals                 | A21 A24 B2 B3 B12<br>C4 C7 | 3                    | 6                             | 9           |



|                        |                                                    |   |    |    |
|------------------------|----------------------------------------------------|---|----|----|
| Supervised projects    | A21 A24 B1 B2 B6 B7<br>B8 B10 B11 B13 B14<br>C4 C7 | 0 | 12 | 12 |
| Objective test         | A21 A24 B1 B3 B4 B5<br>B6 B15                      | 2 | 10 | 12 |
| Personalized attention |                                                    | 1 | 0  | 1  |

(\*)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 | Lectures will be given by the course teachers in order to convey a general knowledge of the subject.<br>Lectures will be held by videoconference and dialogue between students and teachers will be encouraged. |
| Laboratory practice            | Visit a laboratory where biotechnology tools are used for animal reproduction                                                                                                                                   |
| ICT practicals                 | Knowledge application activity based on the use of computer resources. It will be carried out under the guidance of a teacher.                                                                                  |
| Supervised projects            | Students, in groups or individually, will write an essay about some aspect of the subject                                                                                                                       |
| Objective test                 | This test will be used to assess the knowledge acquired in this subject. It may consist of the following types of questions: multiple choice, true/false, short answer and/or association.                      |

| Personalized attention |                                                                                                                                                       |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies          | Description                                                                                                                                           |
| Supervised projects    | Custom and group tutorial sessions are possible, either in person or via videoconference, for advice on jobs and to review any subject-related issue. |

| Assessment          |                                                    |                                                                                                                                         |               |
|---------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Methodologies       | Competencies                                       | Description                                                                                                                             | Qualification |
| ICT practicals      | A21 A24 B2 B3 B12<br>C4 C7                         | The degree of understanding of analyzes carried out and the skill with bioinformatics tools used will be evaluated.                     | 25            |
| Supervised projects | A21 A24 B1 B2 B6 B7<br>B8 B10 B11 B13 B14<br>C4 C7 | Originality, degree of understanding of the topic, ability to synthesize and review and consulted literature sources will be evaluated. | 20            |
| Laboratory practice | A21 A24 B9 C4 C7                                   | Attendance and a brief report on the visit will be evaluated.                                                                           | 5             |
| Objective test      | A21 A24 B1 B3 B4 B5<br>B6 B15                      | The objective test will allow the student to demonstrate mastery of the knowledge acquired on basic issues of the subject.              | 50            |

| Assessment comments                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>To be assessed it is necessary to take the objective test.</p> <p>Preferably, first class honors will be awarded in June among students with a score of 9 or higher.</p> <p>The grade of Non Attendance (NP) will be applied to students that do not complete any of the proposed activities.</p> <p>In the case of justified exceptional circumstances, additional measures may be taken, so that the student can pass the subject.</p> |

| Sources of information |
|------------------------|
|------------------------|



|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Basic</b>         | <ul style="list-style-type: none"> <li>- Singh, B., Mal, G., Gautam, S.K., Mukesh, M. (2019). Advances in animal biotechnology. Springer</li> <li>- Piferrer, F., Felip, A., Cal, R.M. (2007). Inducción de la triploidía y la ginogénesis para la obtención de peces estériles y poblaciones monosexo en acuicultura. En Genética y genómica en acuicultura. Observatorio Español de Acuicultura, Madrid.</li> <li>- Piferrer, F., Beaumont, A., Falguière, J.C., Flajshans, Haffray, P., Colombo, L (2009). Polyploid fish and shellfish: production, biology, applications to aquaculture for performance improvement and genetic containment. Aquaculture 293: 125-156</li> </ul> <p>Consultar Campus Virtual/Moovi para fontes de información adicionais.</p> |
| <b>Complementary</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Subjects that it is recommended to have taken before                                                                                                                                                                                                                                                                                                                                                                                           |  |
| Genetic Engineering and Transgenetics /610475101                                                                                                                                                                                                                                                                                                                                                                                               |  |
| Cellular and Tissue Engineering/610475102                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| Genomics and Proteomics/610475103                                                                                                                                                                                                                                                                                                                                                                                                              |  |
| Subjects that are recommended to be taken simultaneously                                                                                                                                                                                                                                                                                                                                                                                       |  |
| Organisation and management of a laboratory/610475201                                                                                                                                                                                                                                                                                                                                                                                          |  |
| Legal and ethical aspects in Biotechnology/610475203                                                                                                                                                                                                                                                                                                                                                                                           |  |
| Analysis of foodstuff. food security and traceability /610475302                                                                                                                                                                                                                                                                                                                                                                               |  |
| Subjects that continue the syllabus                                                                                                                                                                                                                                                                                                                                                                                                            |  |
| Assisted reproduction technology/610475502                                                                                                                                                                                                                                                                                                                                                                                                     |  |
| Other comments                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
| <p>Recommendations: Students are recommended to have the necessary English level to understand scientific information sources for the proper learning of the skills of the subject. Follow the development of the course regularly. Check Moodle/Faitic and email to obtain materials and know the schedule of activities. Attend tutorials to resolve any questions or difficulties that may arise. Consult the recommended bibliography.</p> |  |

(\*)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.