



## Teaching Guide

| Teaching Guide           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                                             |           |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------------------------------------|-----------|
| Identifying Data         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                                             | 2019/20   |
| Subject (*)              | Cellular and Tissue Engineering                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        | Code                                        | 610475102 |
| Study programme          | Mestrado Universitario en Biotecnoloxía Avanzada                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |        |                                             |           |
| Descriptors              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                                             |           |
| Cycle                    | Period                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Year   | Type                                        | Credits   |
| Official Master's Degree | 1st four-month period                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | First  | Obligatory                                  | 3         |
| Language                 | SpanishGalicianEnglish                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |                                             |           |
| Teaching method          | Face-to-face                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |        |                                             |           |
| Prerequisites            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                                             |           |
| Department               | BioloxíaCiencias Biomédicas, Medicina e FisioterapiaDepartamento profesorado másterFisioterapia, Medicina e Ciencias Biomédicas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                                             |           |
| Coordinador              | Arufe Gonda, María del Carmen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | E-mail | maria.arufe@udc.es                          |           |
| Lecturers                | Arufe Gonda, María del Carmen<br>Bernal Pita da Veiga, angeles<br>Doménech García, María Nieves                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | E-mail | maria.arufe@udc.es<br>angeles.bernal@udc.es |           |
| Web                      | masterbiotecnologiaavanzada.com/                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |        |                                             |           |
| General description      | <p>EN LA DOCENCIA DE LA MATERIA PARTICIPAN TAMBIÉN LA SIGUIENTE PROFESORA DEL INIBIC (INSTITUTO DE INVESTIGACIÓN BIOMÉDICA DE A CORUÑA):</p> <p>Mª Nieves Doménech García</p> <p>Esther Rendal Vázquez</p> <p>La ingeniería celular y tisular constituye un área emergente en la citología e histología humana de nuestros días. Surge como resultado de la progresiva aplicación biotecnológica de las células vegetales y animales, así como de los nuevos tejidos construidos a partir de conocimiento derivado del desarrollo embrionario, de los novedosos modelos desarrollados in vitro, y de la unión de ambos tipos de aproximaciones. Se trata de un área en expansión que asentada en los conocimientos básicos de la citología e histología tiene por objetivo cultivar, conservar, caracterizar y modificar células vegetales y/o animales y construir tejidos nuevos, funcionalmente activos, a partir de células procedentes de cultivos desarrollados previamente y de biomateriales de distinta naturaleza que sirven como soporte o andamiaje.</p> |        |                                             |           |

## Study programme competences

| Code | Study programme competences                                                                                                                                                                                    |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A1   | Saber buscar e analizar a biodiversidade de microorganismos, plantas e animais así como seleccionar os de maior interese biotecnolóxico (aplicado).                                                            |
| A2   | Ter unha visión integrada do metabolismo e do control da expresión xénica para poder abordar a súa manipulación.                                                                                               |
| A3   | Coñecer as aplicacións biotecnolóxicas dos microorganismos, plantas e animais e saber manipularlos de cara á súa aplicación biotecnolóxica.                                                                    |
| A4   | Coñecer e saber usar as técnicas de cultivo e a enxeñaría celular.                                                                                                                                             |
| A5   | Coñecer os principios da xenómica e a proteómica.                                                                                                                                                              |
| 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.                                                                                 |
| 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.                                                                                                                               |
| B13  | Aprendizaxe autónoma.                                                                                                                                                                                          |
| B15  | Sensibilización cara á calidade, o respecto medioambiental e o consumo responsable de recursos e a recuperación de residuos.                                                                                   |



|    |                                                                                                                                                                                 |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C3 | Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida. |
| C5 | Entender a importancia da cultura emprendedora e coñecer os medios ao alcance das persoas emprendedoras.                                                                        |
| C6 | Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.                                               |
| C7 | Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.                                                                                                |
| C8 | Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.                                   |

| Learning outcomes                                                           |                                 |                                                 |                          |
|-----------------------------------------------------------------------------|---------------------------------|-------------------------------------------------|--------------------------|
| Learning outcomes                                                           | Study programme competences     |                                                 |                          |
| Handling the main techniques to obtain and maintain different cell cultures | AC1<br>AC3                      | BC1<br>BC3<br>BC15                              | CC3<br>CC6<br>CC7<br>CC8 |
| Handling equipment for the cellular and molecular techniques                | AC1<br>AC2<br>AC3<br>AC4<br>AC5 | BC1<br>BC3<br>BC5                               | CC3<br>CC6<br>CC7<br>CC8 |
| To use different techniques protocols                                       | AC3<br>AC4                      | BC1<br>BC2<br>BC3<br>BC4<br>BC5<br>BC10<br>BC13 | CC3<br>CC8               |
| Know the applications of the various techniques in cell culture             | AC3<br>AC4<br>AC5               | BC10<br>BC11<br>BC13                            | CC3<br>CC5<br>CC7<br>CC8 |

| Contents                                                                                    |                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic                                                                                       | Sub-topic                                                                                                                                                                       |
| Introduction to the cellular crop animal. Generalities on the technicians of cellular crop. | Introduction to the cellular crop animal. Methods of isolation of cells from blood or tissues. Work in sterile situations. Generalities on the technicians of cellular culture. |
| Methods of conservation and characterisation of cellular cultures.                          | Methods of culture, of growth, of differentiation and of freezing. Methods of characterisation of cellular cultures                                                             |
| Analysis and phenotypic of the cells.                                                       | Histomorphological analysis of the cells. Phenotypic by immunohistochemistry. Phenotyping by Cytometry of flow                                                                  |
| Introduction in the engineering tissue: concept and perspectives.                           | Introduction in the engineering tissue. Supports and biomaterials. Clinical applications. Therapeutic perspectives                                                              |
| Plant cell cultures                                                                         | In vitro cultures of plant material. Basic methodology. Cellular cultures. Plant regeneration                                                                                   |

| Planning              |              |                      |                               |             |
|-----------------------|--------------|----------------------|-------------------------------|-------------|
| Methodologies / tests | Competencies | Ordinary class hours | Student's personal work hours | Total hours |



|                                                                                                                                 |                                                  |    |    |    |
|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----|----|----|
| Laboratory practice                                                                                                             | A1 A3 A4 B1 B2 B3<br>B4 B5 B10 C3 C5 C6<br>C7 C8 | 8  | 8  | 16 |
| Multiple-choice questions                                                                                                       | A1 A2 A3 A4 A5 B10<br>B11 B13 B15                | 2  | 10 | 12 |
| Workbook                                                                                                                        | B1 B3 B7 C6 C7 C8                                | 1  | 2  | 3  |
| Guest lecture / keynote speech                                                                                                  | B1 B3 B5                                         | 14 | 28 | 42 |
| 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                                                                                                                               |
| Laboratory practice            | They develop technicians of current use in biomedic investigation, that complement the knowledges given in the session magistral.         |
| Multiple-choice questions      | Examination type test, in which each question consists in 4 affirmations of which only one is correct.                                    |
| Workbook                       | Reading of a notable scientific article and related with the matter given                                                                 |
| Guest lecture / keynote speech | Participatory theoretical class, favouring the exchange of opinions, the debate and the answer of the questions formulated by the student |

| Personalized attention |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Laboratory practice    | Treat of a group reduced of students, it is possible the resolution of doubts and the follow-up individualize during the same process of learning.<br>In particular, the magistral session is participatory, favouring the exchange of opinions, the interchange of ideas and the answer of the questions formulated.<br>The practices of laboratory are revised at all times by the teachers and, if necessary, by the group of investigation in which it integrates the student. |

| Assessment                |                                                  |                                                                                                                                    |               |
|---------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Methodologies             | Competencies                                     | Description                                                                                                                        | Qualification |
| Laboratory practice       | A1 A3 A4 B1 B2 B3<br>B4 B5 B10 C3 C5 C6<br>C7 C8 | They develop technicians of current use in biomedical investigation, that complement the knowledges given in the magistral session | 50            |
| Multiple-choice questions | A1 A2 A3 A4 A5 B10<br>B11 B13 B15                | Examination type test, in which each question consists in 4 affirmations of which only one is correct.                             | 50            |

| Assessment comments                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------|
| To pass the matter, it is necessary to obtain as a whole a minimum of 5 on 10 and, in each methodology evaluated, a minimum of 2,5 on 5. |

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



|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Basic         | <p>R. Ian Freshney. Culture of animal cells. A manual of Basic Research. Ed. Wiley-Liss and sons. Inc. Publications. New York Irving L., Weissman and Judith A. Shizuru. The origins of the identification and isolation of hematopoietic stem cells, and their capability to induce donor-specific transplantation tolerance and treat autoimmune diseases. Blood, Vol112, Number 9 Tizianao Barberi and Lorenz Studer. Methods in enzymology. Vol. 418. Differentiation of embryonic stem cells. Cap. 12: Mesenchymal Cells. Ferraris. Histologia, Embriologia E Ingeniería Tisular (Spanish Edition), 2009. Ed. Medica Panamericana. Benítez Burraco, A. 2005. Avances recientes en Biotecnología vegetal e ingeniería genética de plantas. Editorial Reverté. Loyola-Vargas, VM e Vázquez-Flota, F. 2006. Plant cell culture protocols- Humana Press 2 Edition. Trigiano, R.N. e Gray, DJ. 2004. Plant development and biotechnology. CRC</p> <p><a href="http://campus.usal.es/~histologia/">http://campus.usal.es/~histologia/</a></p> |
| Complementary |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

| Recommendations                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Subjects that it is recommended to have taken before                                                                                                                                      |
| Genetic Engineering and Transgenetics /610475101                                                                                                                                          |
| Subjects that are recommended to be taken simultaneously                                                                                                                                  |
|                                                                                                                                                                                           |
| Subjects that continue the syllabus                                                                                                                                                       |
| Vegetal biotechnology/610475303                                                                                                                                                           |
| Animal biotechnology/610475304                                                                                                                                                            |
| Other comments                                                                                                                                                                            |
| Since it splits of the bibliography recommended for this matter finds in English, is advisable to have knowledges of this language, at least, to level of understanding of texts written. |

(\*)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.