



## Teaching Guide

| Teaching Guide           |                                                                                                                                                                       |        |                                                                                                                                         |           |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Identifying Data         |                                                                                                                                                                       |        | 2018/19                                                                                                                                 |           |
| Subject (*)              | Cellular Techniques                                                                                                                                                   |        | Code                                                                                                                                    | 610441001 |
| Study programme          | Mestrado Universitario en Bioloxía Molecular , Celular e Xenética                                                                                                     |        |                                                                                                                                         |           |
| Descriptors              |                                                                                                                                                                       |        |                                                                                                                                         |           |
| Cycle                    | Period                                                                                                                                                                | Year   | Type                                                                                                                                    | Credits   |
| Official Master's Degree | 1st four-month period                                                                                                                                                 | First  | Obligatory                                                                                                                              | 6         |
| Language                 | SpanishGalicianEnglish                                                                                                                                                |        |                                                                                                                                         |           |
| Teaching method          | Face-to-face                                                                                                                                                          |        |                                                                                                                                         |           |
| Prerequisites            |                                                                                                                                                                       |        |                                                                                                                                         |           |
| Department               | Bioloxía                                                                                                                                                              |        |                                                                                                                                         |           |
| Coordinador              | Rioboo Blanco, Carmen                                                                                                                                                 | E-mail | carmen.rioboo@udc.es                                                                                                                    |           |
| Lecturers                | Bernal Pita da Veiga, angeles<br>Castro Castro, Antonio Manuel<br>Folgueira Otero, Mónica<br>Insua Pombo, Ana Maria<br>Rioboo Blanco, Carmen<br>Yañez Sanchez, Julian | E-mail | angeles.bernal@udc.es<br>antonio.castro@udc.es<br>m.folgueira@udc.es<br>ana.insua@udc.es<br>carmen.rioboo@udc.es<br>julian.yanez@udc.es |           |
| Web                      | https://campusvirtual.udc.es/moodle/                                                                                                                                  |        |                                                                                                                                         |           |
| General description      | Experimental subject focused on microscopy (including image analysis), plant and animal cell culture, flow cytometry and cytogenetic techniques.                      |        |                                                                                                                                         |           |

## Study programme competences

| Code | Study programme competences                                                                                                                                                                                              |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A1   | Skills of using usual techniques and instruments in the cellular, biological and molecular research: that are able to use techniques and instruments as well as understanding potentials of their uses and applications. |
| A2   | Skills of working in a sure way in the laboratories knowing operation handbooks and actions to avoid incidents of risk.                                                                                                  |
| A13  | Skills to become a professional in health, pharmacy, veterinary, animal production, biotechnology or food sectors.                                                                                                       |
| B3   | Skills of management of the information: that are able to gather and to understand relevant information and results, obtaining conclusions and to prepare reasoned reports on scientific and biotechnological questions  |
| B4   | Organization and work planning skills: that are able to manage the use of the time as well as available resources and to organize the work in the laboratory.                                                            |

## Learning outcomes

| Learning outcomes                                                                                                                                                               | Study programme competences |     |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----|--|
| To understand the theoretical foundations on which microscopy (including image analysis), (plant and animal) cell culture, flow cytometry and cytogenetic techniques are based. | AR1                         |     |  |
|                                                                                                                                                                                 | AR2                         |     |  |
| To acquire basic skills in the management and use of instrumental and units required for the development of cellular techniques.                                                | AR1                         |     |  |
|                                                                                                                                                                                 | AR2                         |     |  |
|                                                                                                                                                                                 | AR13                        |     |  |
| To know the applications of the different cellular techniques.                                                                                                                  | AR1                         |     |  |
| To design, plan and conduct experiments regarding the techniques learned.                                                                                                       | AR1                         | BR3 |  |
|                                                                                                                                                                                 | AR2                         | BR4 |  |

## Contents

| Topic                         | Sub-topic                                                                                                                                                                                                               |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microscopy and image analysis | Fundamentals, techniques and applications of light and electron microscopy.<br>Fluorescence and confocal scanning microscopy: advanced techniques and applications. Introduction to image processing and image analysis |



|                                |                                                                                                                                                                                                                                                   |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (Animal & Plant) cell cultures | Introduction to cell cultures. Types of cell cultures. Cell culture requirements.<br>Quantification of cellular parameters. Contamination. Cytotoxicity.<br>In vitro cultures of plant tissues. Callus. Cultivation of plant cells in suspension. |
| Flow cytometry                 | General principles and methods of cytometry. Sample preparation and standardization of analysis procedures. Functional analysis of cells.                                                                                                         |
| Cytogenetic techniques         | Chromosome preparation and karyotype. Conventional in situ hybridization. Advanced techniques of fluorescence in situ hybridization (FISH).                                                                                                       |

| Planning                                                                                                                        |                 |                      |                               |             |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|-------------------------------|-------------|
| Methodologies / tests                                                                                                           | Competencies    | Ordinary class hours | Student's personal work hours | Total hours |
| Guest lecture / keynote speech                                                                                                  | A1              | 14                   | 28                            | 42          |
| Laboratory practice                                                                                                             | A1 A2 A13 B3 B4 | 28                   | 42                            | 70          |
| Supervised projects                                                                                                             | A1 B3           | 0                    | 19                            | 19          |
| Mixed objective/subjective test                                                                                                 | A1 B3           | 2                    | 15                            | 17          |
| Personalized attention                                                                                                          |                 | 2                    | 0                             | 2           |
| (*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students. |                 |                      |                               |             |

| Methodologies                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Guest lecture / keynote speech  | Teacher will present the theoretical and practical contents of the subject (of the different techniques currently used in Cell Biology).                                                                                                                                                                                                                                                                                                                                                                      |
| Laboratory practice             | Practical sessions represent an indispensable part of the course, in which practical aspects and applications of the different cellular techniques will be approached. Practical sessions will be developed in concrete laboratories and places: laboratories of the Faculty of Sciences, Laboratories of Biomedical Research Institute (INIBIC), Scientific Research Support Services (SAI) of UDC.<br>Students will develop laboratory protocols and attend demonstrations about the use of research units. |
| Supervised projects             | Students must carry out works, resolve problems and/or questions about specific aspects of the techniques used.                                                                                                                                                                                                                                                                                                                                                                                               |
| Mixed objective/subjective test | It will consist of a written exam with questions-test and/or short answer questions about theoretical and practical contents and applications of the cellular techniques.                                                                                                                                                                                                                                                                                                                                     |

| Personalized attention |                                                                                                                                                           |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies          | Description                                                                                                                                               |
| Supervised projects    | Students (individually or in small groups) may consult their doubts about the contents and activities of the subject via phone and/or electronic support. |

| Assessment                      |                 |                                                                                                                                                                                                                                              |               |
|---------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Methodologies                   | Competencies    | Description                                                                                                                                                                                                                                  | Qualification |
| Mixed objective/subjective test | A1 B3           | The acquisition of knowledge about the theoretical foundations and applications, clarity of explanations, ability to integrate and link information handled and the ability to interpret data and solve problems will be taken into account. | 50            |
| Laboratory practice             | A1 A2 A13 B3 B4 | Attendance, skill in scheduled tasks and knowledge of the potential risks in laboratory practices will be assessed.                                                                                                                          | 20            |
| Supervised projects             | A1 B3           | The ability to design (and plan) experiments, interpretate data and solve problems will be assessed.                                                                                                                                         | 30            |

| Assessment comments |
|---------------------|
|---------------------|



In order to be evaluated, students must attend to practical sessions.

In July there is the opportunity to retake only the tests. The January's score of supervised projects and practices are maintained.

Preferably, first class honors will be awarded in January.

Full-time and part-time students will be evaluated following this qualification guideline.

## Sources of information

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Basic</b></p>         | <p>CULTIVOS CELULARES Basra, A.S. (2000). Plant growth regulators in agriculture and horticulture. Their role and commercial uses. Ed. Food Products Press. Benítez Burraco, A. (2005). Avances recientes en Biotecnología vegetal e ingeniería genética de plantas. Editorial Reverté. Boulton, A.A. e col. (1992). Practical cell culture techniques. Humana Press. Butler, M. (2008). Animal cell culture and technology. Taylor &amp; Francis, 2nd edition. Collin, H.A. e Edwards, S. (1998). Plant cell culture. Guilford Bios Scientific Publishers. Davis, J.M. (2011). Animal cell culture. Essential methods. Wiley-Blackwell. Doyle, A. e Griffiths, J.B. (2000). Cell and tissue culture for medical research. John Wiley and Sons. Fedoroff, S. e Richardson, A. (1992). Protocols for neural cell culture. Humana Press. Freshney, R.I. (2010). Culture of animal cells. A manual of basic technique and specialized applications. Wiley-Liss, Inc. 6ª Edition. Hammond, J., McGarvey, P., Yusibov, V. (1999). Plant Biotechnology. New products and Applications. Springer Verlag. Loyola-Vargas, V.M. e Vázquez-Flota F. (2006). Plant cell culture protocols. Humana Press. 2nd Edition. Pollard, J.W. e Walker, J.M. (1997). Basic cell culture protocols. Humana Press. Shaw, A.J. (1996). Epithelial cell culture. A practical approach. Oxford University Press. Taji, A., Kumar, P., Lakshmanan, P. (2002). In vitro plant breeding. Food Products Press. Trigiano, R.N. e Gray, D.J. (2004). Plant development and biotechnology. CRC Press. Tzfira, T. e Citovsky, V. (2006). Agrobacterium-mediated genetic transformation of plants: biology and biotechnology. Curr. Opin. Biotechnol. 17:147-154. Vunjak-Novakovic, G. e Freshney, R.I. (2006). Culture of cells for tissue engineering. Wiley-Liss, Inc. TÉCNICAS DE MICROSCOPÍA E ANÁLISE DE IMAGEM Watt, Ian M. (1996). The principles and practice of electron microscopy. Cambridge University Press. Hoppert, M. (1998). Electron microscopy in microbiology. Bios Scientific Publishers. Bozzola, John J. (1999). Electron microscopy : principles and techniques for biologists. Jones and Bartlett Publishers. Dykstra, Michael J. (2003). Biological electron microscopy theory, techniques, and troubleshooting. Kluwer Academic/Plenum Publishers. Robin Harris. (1991). Electron microscopy in biology a practical approach. Oxford University Press. Hunter, Elaine Evelyn. (1984). Practical electron microscopy a beginner's illustrated guide. Praeger, cop. Slayter, Elizabeth M. (2000). Light and electron microscopy. Cambridge University Press. Herman, B. (1998). Fluorescence microscopy. Bios Scientific Publishers. Donat-P. Häder. (1992). Image analysis in biology. CRC Press, cop. Pertusa, JF. (2003). Técnicas de Análisis de imagen. Aplicaciones en Biología. Publicaciones de la Universidad de Valencia. CITOMETRÍA DE FLUXO Ormerod, M.G. (2009). Flow Cytometry: A Basic Introduction. 2a Ed. IRL Practical Approach series. Oxford University Press. Shapiro, H.M. (2004). Practical flow cytometry. Wiley-Liss. 4a ed. New York. TÉCNICAS CITOXENÉTICAS Czepulkowski, B. (2001). Analyzing chromosomes. BIOS Scientific Publishers, Oxford. Gosden, J.R. (1994). Chromosome analysis protocols. Humana Press, Totowa (New Jersey). Kianian, S.F., Kianian P.M.A. (2016). Plant cytogenetics: methods and protocols. Springer, New York. Liehr, T. (2006). Multicolor FISH in human cytogenetics. Karger, Basel. Liehr, T. (2009). Fluorescence in situ hybridization (FISH)-application guide. Springer-Verlag, Berlin. Leitch, A.R., Schwarzbacher, T., Jackson, D. (1994). In situ hybridization: a practical guide. Bios Scientific Publishers, Oxford. Verma, R.S. e Babu, A. (1989). Human chromosomes: manual of basic techniques. Pergamon Press, New York.</p> |
| <p><b>Complementary</b></p> | <p>- Artigos científicos sobre temas relacionados coa materia proporcionados a través da plataforma Moodle. - Páxinas web Xeral PubMed: <a href="http://www.ncbi.nlm.nih.gov/pubmed">http://www.ncbi.nlm.nih.gov/pubmed</a> Cultivos Celulares-<a href="http://www.cultek.com/aplicaciones.asp?P=Aplicacion_Cultivos_Celulares&amp;opc=introduccionCito">http://www.cultek.com/aplicaciones.asp?P=Aplicacion_Cultivos_Celulares&amp;opc=introduccionCito</a> metría-Cytometry: <a href="http://www3.interscience.wiley.com/cgi-bin/jhome/33945">http://www3.interscience.wiley.com/cgi-bin/jhome/33945</a> Microscopía e Análise de imaxe <a href="http://zeiss-campus.magnet.fsu.edu/index.html">http://zeiss-campus.magnet.fsu.edu/index.html</a> <a href="http://www.microscopyu.com/tutorials">http://www.microscopyu.com/tutorials</a> <a href="http://www.olympusfluoview.com/index.html">http://www.olympusfluoview.com/index.html</a> <a href="http://w3.uniroma1.it/MEDICFISIO/microscopy.htm">http://w3.uniroma1.it/MEDICFISIO/microscopy.htm</a> <a href="http://rsbweb.nih.gov/ij/index.html">http://rsbweb.nih.gov/ij/index.html</a> <a href="http://www.invitrogen.com/site/us/en/home/support/Research-Tools/Fluorescence-SpectraViewer.html">http://www.invitrogen.com/site/us/en/home/support/Research-Tools/Fluorescence-SpectraViewer.html</a></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |



| Recommendations                                          |
|----------------------------------------------------------|
| Subjects that it is recommended to have taken before     |
|                                                          |
| Subjects that are recommended to be taken simultaneously |
|                                                          |
| Subjects that continue the syllabus                      |
|                                                          |
| Other comments                                           |
|                                                          |

(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.