Teaching Guide				
Identifying Data				2020/21
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	BioloxíaDepartamento profesorado máster			
Coordinador	Bernal Pita da Veiga, María de los Ángeles	E-mail	angeles.bernal@udc.es	
Lecturers	Bernal Pita da Veiga, María de los Ángeles Castro Castro, Antonio Manuel Folgueira Otero, Mónica Insua Pombo, Ana Maria Rioboo Blanco, Carmen Yañez Sanchez, Julian	E-mail	angeles.bernal@udc.es antonio.castro@udc.es m.folgueira@udc.es ana.insua@udc.es carmen.rioboo@udc.es 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.			
Contingency plan	In the event that circumstances limit or prevent the access to the facilities of the Faculty, a hybrid or nonattendance teaching method would be adopted, respectively, with the following specifications. 1. Modifications in the contents. Contents would not be modified in any case. 2. Methodologies * Teaching methodologies that are maintained The methodologies described will be maintained in both modalities. * Teaching methodologies that change If necessary, synchronous means of communication (MSTeams, ..) will be used in teaching activities that involve face-to-face teaching method. Practical sessions in the laboratory will be adapted to the circumstances; if necessary, they will be replaced partial (in the hybrid model) or totally (in the non-attendance modality) by non-attendance activities (video viewing, case studies, data analysis and interpretation, ...) 3. Mechanisms for personalized attention to students. Personalized attention will be limited to telematic means (email, Moodle, MSTeams, ...) 4. Modifications in the evaluation. Criteria and methodologies for evaluation will be maintained in both modalities. * Evaluation observations: Assessments will be carried out electronically in both modalities 5. Modifications to the bibliography or webography. If necessary, complementary sources or means of free access would be provided.			

Study programme competences	
Code	Study programme competences
A1	Skills of working in a sure way in the laboratories knowing operation handbooks and actions to avoid incidents of risk.
A2	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.

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.
C1	Adequate oral and written expression in the official languages.
C3	Using ICT in working contexts and lifelong learning.
C8	Valuing the importance of research, innovation and technological development for the socioeconomic and cultural progress of society.
C9	Ability to manage times and resources: developing plans, prioritizing activities, identifying critical points, establishing goals and accomplishing them.

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.	AR2		
To design, plan and conduct experiments regarding the techniques learned.	AR1 AR2	BR3 BR4	
Adequate oral and written expression in the official languages Using ICT in working contexts and lifelong learning Ability to manage times and resources: developing plans, prioritizing activities, identifying critical points, establishing goals and accomplishing them			CC1 CC3 CC8 CC9

Contents	
Topic	Sub-topic
Microscopy and image analysis	Fundamentals, techniques and applications of light and electron microscopy. 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. Quantification of cellular parameters. Contamination. Cytotoxicity. 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	A2	14	28	42
Laboratory practice	A2 A1 A13 B3 B4	28	42	70
Supervised projects	A2 B3 B4 C1 C3 C8 C9	0	19	19
Mixed objective/subjective test	A2 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. 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	A2 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	A2 A1 A13 B3 B4	Attendance, skill in scheduled tasks and knowledge of the potential risks in laboratory practices will be assessed.	20
Supervised projects	A2 B3 B4 C1 C3 C8 C9	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

Basic	CULTIVOS CELULARESBasra, 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 & Francis, 2nd edition.Collin, H.A. e Edwars, 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 breeeding. 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. & Freshney, R.I. (2006). Culture of cells for tissue engineering. Wiley-Liss, Inc.TÉCNICAS DE MICROSCOPÍA E ANÁLISE DE IMAXEWatt, Ian M. (1996). The principles and practice of electron microscopy. Cambridge University PressHoppert, M. (1998). Electron microscopy in microbiology. Bios Scientific PublishersBozzola, 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 PublishersRobin 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 PressHerman, B. (1998). Fluorescence microscopy. Bios Scientific PublishersDonat-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 FLUXOOrmerod, 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 CITOXENÉTICASCzepulkowski, 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. Spinger, New YorlLiehr, 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., Schwarzacher, 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.
Complementary	- Artigos científicos sobre temas relacionados coa materia proporcionados a través da plataforma Moodle.- Páxinas webXeralPubMed: http://www.ncbi.nlm.nih.gov/pubmedCultivos Celulares-http://www.cultek.com/aplicaciones.asp?P=Aplicacion_Cultivos_Celulares&opc=introduccionCitometría-Cytometry: http:www3.interscience.wiley.com/cgi-bin/jhome/33945Microscopía e Análise de imaxehttp://zeiss-campus.magnet.fsu.edu/index.htmlhttp://www.microscopyu.com/tutorials/http://www.olympusfluoview.com/index.htmlhttp://w3.uniroma1.it/MEDICFISIO/microscopy.htmhttp://rsbweb.nih.gov/ij/index.htmlhttp://www.invitrogen.com/site/us/en/home/support/Research-Tools/Fluorescence-SpectraViewer.html

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.