Teaching Guide				
Identifying Data				2016/17
Subject (*)	Xenómica		Code	610441014
Study programme	Mestrado Universitario en Bioloxía Molecular , Celular e Xenética			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optativa	3
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Bioloxía Celular e Molecular			
Coordinador	Vila Taboada, Marta	E-mail	marta.vila.taboada@udc.es	
Lecturers	Becerra Fernandez, Manuel Vila Taboada, Marta	E-mail	manuel.becerra@udc.es marta.vila.taboada@udc.es	
Web				
General description	Genomics applies recombinant DNA, Sanger DNA sequencing and Next Generation Sequencing methodology, and bioinformatics to sequence, assemble, and analyze genomes. Diciplines in genomics emcompass several areas of study, including structural and functional genomics, comparative genomics, and metagenomics, and have led to an "omics" revolution in modern biology.			

Study programme competences	
Code	Study programme competences
A3	Skills of understanding the functioning of cells through the structural organization, biochemistry, gene expression and genetic variability.
A11	Skills of understanding the structure, dynamics and evolution of genomes and to apply tools necessary to his study.
B1	Analysis skills to understand biological problems in connection with the Molecular and Cellular Biology and Genetics.
B5	Correct oral and written communication on scientific topics in the native language and at least in another International diffusion language.
B9	Skills of preparation, show and defense of a work.
C2	Skills of dominating the oral form expression and compression and written of a foreign language.
C3	Skills of Using basic tools of the information technologies and communications (ICT) necessary to the exercise of his profession and for the apprenticeship over his life.
C8	Considering the importance that the investigation has, the innovation and the technological development in the socioeconomic advance and cultural of the society.

Learning outcomes			
Learning outcomes	Study programme competences		
To learn the basics of the different molecular techniques used in genomics, with particular emphasis in NGS	AR3 AR11		CC3
To acquire an updated view about the current scope and future perspectives of structural, functional and evolutionary genomics	AR3 AR11	BR1 BR5 BR9	CC2 CC8
To understand how genomes evolve and how molecular and bioinformatic tools are used for that purpose	AR3 AR11	BR1 BR5 BR9	CC2 CC8
DNA microarrays: experimental set up and data analysis.	AR3 AR11		

Contents	
Topic	Sub-topic

Next Generation Sequencing (NGS)	Platforms and applications
Structural Genomics	Mapping, sequencing, annotation and databases The Human Genome Project
Comparative Genomics	How do genomes evolve?
Genomes of Prokaryotes	Metagenomics
Genomes of Eukaryotes	Taxonomy Paleogenomics Medicine
Functional Genomics	DNA microarrays: methodology, types of platforms, experimental set up, data analysis
Computer lab	1. Using GALAXY (https://usegalaxy.org/) for genomic analysis 2. Gene expression analysis and microarrays

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
ICT practicals	A3 A11 B1	7	14	21
Oral presentation	B5 B9 C2 C3 C8	1.55	6.2	7.75
Guest lecture / keynote speech	A3 A11 B1 C8	14	28	42
Objective test	A3 A11 B1 C8	2	0	2
Personalized attention		2.38	0	2.38
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
ICT practicals	OUr 10-hour, computer lab curriculum was developed to accompany the lecture course in Genomics. The students work on their own web-based investigations and present their results to each other (active learnning).
Oral presentation	Students may hold a 10-minute speech about a genomic issue previously agreed with the instructors.
Guest lecture / keynote speech	The instructors explain the main contents of each topic interacting as much as possible with the students.
Objective test	Written exam.

Personalized attention	
Methodologies	Description
Oral presentation ICT practicals	Instructors will typically be available via email. Students can arrange for in-person tutoring sessions.

Assessment			
Methodologies	Competencies	Description	Qualification
Oral presentation	B5 B9 C2 C3 C8	Student may hold a 10-minute speech about an interesting topic within the field of Genomics. They will try to answer any question from the audience. Distance learning students unable to attend this activity will have a maximum score of 85 in their objective test.	15
Objective test	A3 A11 B1 C8	The exam will evaluate items discussed in the aforementioned activities.	70
ICT practicals	A3 A11 B1	Attendance is mandatory. Distance learning students will be required to follow certain guidelines/tutorials on their own and finally answer a questionnaire, so that comprehension and performance may be assessed.	15

Assessment comments

Mark "A with distinction" will only be awarded to outstanding students passing the subject in June.

In the case of exceptional circumstances, lecturers may assist the
student to improve his/her learning process and/or catch up on missed work/assessments.
The student is responsible for liaising with his/her lecturer to organise this
assistance by e.g. applying for: an extended deadline to present his/her work or taking an exam in a different
date. The coordinator can request evidence about the reason for such an
application.

Sources of information	
Basic	- Allison, David B., et al (2006). DNA microarrays and related genomics techniques design, analysis, and interpretation of experiments. Chapman & Hall/CRC - Lesk, Arthur M. (2012). Introduction to Genomics. Oxford University Press - Bowtell, D., Sambrook, J. (2003). DNA Microarrays. Cold Spring Harbor Laboratory Press. - E. Rinaldis, A. Lahm. (2007). DNA microarrays: current applications. Wymondham: Horizon Bioscience - Campbell, A.M & Heyer, L.J. (2007). Discovering Genomics, Proteomics & Bioinformatics. Pearson Benjamin Cummings - McLachlan, G. J., Do, K-A., Ambroise, C (2004). Analyzing Microarray Gene Expression Data. Wiley-Interscience. John Wiley & Sons

Complementary	- Sensen, Christoph W. (2005). Handbook of genome research genomics, proteomics, metabolism, bioinformatics, ethical & legal issues . Wiley-VCH - Futuyama, Douglas J. (2006). Evolution. Sinauer Associates - Straalen, Nico M. van (2006). An introduction to ecological genomics. Oxford University Press - Zhanjiang, Liu (2007). Aquaculture genome techonologies. Blackwell - Dale Jeremy (2008). From genes to genomes: concepst and applications of DNA technology. John Wiley & Sons RECURSOS EN INTERNET: Biological database compilation at NAR: http://nar.oupjournals.org/content/vol29/issue1DOE Joint Genome Institut. Why sequence them? http://www.jgi.doe.gov/sequencing/why/index.htmlEMBL (European Molecular BIology Laboratory), Bioinformatics. http://www-db.embl.de/jss/servlet/de.embl.bk.emblGroups.EmblGroupsOrg/serv_0?t=0ExPASy (Expert Protein Analysis System). http://us.expasy.org/GeneMark: http://opal.biology.gatech.edu/GeneMark/GenomeNet (Kyoto University Bioinformatics Center).http://www.genome.jp/Genoscope. Le séquençage des génomes. http://www.genoscope.cns.fr/externe/Francais/Sequencage/GOLD (Genomes Online Database). http://www.genomesonline.org/Human genome: advanced annotation tutorial.http://www.mad-cow.org/00/annotation_tutorial.htmlHuman Genome Project Information.http://www.ornl.gov/sci/techresources/Human_Genome/home.shtmlIañez Pareja, E. (1997). Introducción a los Proyectos Genoma. http://www.ugr.es/~eianez/Biotecnologia/genoma-2.htmlKEGG (Kyoto Encyclopedia of Genes and Genomes). http://www.genome.jp/kegg/kegg2.htmlNacional Human Genome Research Institute: http://www.genome.gov/NCBI (National Center for Biotechnology Information). http://www.ncbi.nlm.nih.gov/The Sanger Institute.http://www.sanger.ac.uk/TIGR (The Institute for Genomic Research). http://www.tigr.org/tRNAscan-SE 1.21. http://www.genetics.wustl.edu/eddy/tRNAscan-SE/The WWW Virtual Library: Model Organisms: http://www.ceolas.org/VL/mo/

Recommendations
Subjects that it is recommended to have taken before
Técnicas Celulares/610441001
Técnicas Moleculares/610441002
Mecanismos de xeración da variación xenética/610441005
Regulación da expresión xénica/610441006
Bioinformática e Modelado de Biomoléculas/610441020
Subjects that are recommended to be taken simultaneously
Proteómica/610441013
Cromosomas: Estructura. Función e Evolución/610441015
Xenética Humana/610441016
Toxicología Xenética/610441017
Subjects that continue the syllabus
Traballo de Máster/610441022
Other comments