UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2015/16
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	Becerra Fernandez, Manuel	E-mail	manuel.becerra@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
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.
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.
B2	Skills of decision making for the problem solving: that are able to apply theoretical knowledges and practical acquired in the formulation of biological problems and the looking for solutions.
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
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.
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	AR1	BR1 BR5	
To acquire an updated view about the current scope and future perspectives of structural, functional and evolutionary genomics	AR1	BR1 BR5 BR9	CC8
To understand how genomes evolve and how molecular and bioinformatic tools are used for that purpose	AR1 AR3 AR11	BR1 BR2 BR9	

DNA microarrays: experimental set up and data analysis.	AR3	BR1 BR2 BR3	CC3

Contents	
Topic	**Sub-topic**
Structural Genomics	Mapping, sequencing, annotation and databases The Human Genome Project Next Generation Sequencing (NGS)
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. Exploring databases (e.g. ENSEMBL) and large-scale genomic projects (ENCODE, EXOME, 1000Genomes) 2. Using GENEIOUS to assemble an organelle genome from NGS-generated data 3. Gene expression analysis and microarrays

Planning				
Methodologies / tests	**Competencies**	**Ordinary class hours**	**Student?s personal work hours**	**Total hours**
Guest lecture / keynote speech	A1 A11 B1	10	18.62	28.62
Oral presentation	B5 B9	5	3	8
Events academic / information	C8	1	3	4
ICT practicals	A3 C3	10	20	30
Objective test	B2 B3	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**
Guest lecture / keynote speech	Active lecturing.
Oral presentation	Each student will have to summarize in up to 15 minutes the content of a review paper. Readings assignments will be made available three weeks in advance via MOODLE.
Events academic / information	During the term, a seminar speaker, with expertise in Genomics, is invited as a guest lecturer. Students are required to attend this seminar and read the paper assigned (via MOODLE) for this activity.
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).
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**

Guest lecture / keynote speech	A1 A11 B1	Attendance and active learning.	10
Oral presentation	B5 B9	Summarising and communication skills.	20
ICT practicals	A3 C3	Attendance and active learning. Distance learning students will be required to submit a report, so that comprehension and performance may be assessed.	10
Objective test	B2 B3	The exam will evaluate items discussed in the aforementioned activities.	50
Events academic / information	C8	Attendance and participation in the final discussion.	10

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

Sources of information	
Basic	- Lesk, Arthur M. (2012). Introduction to Genomics. Oxford University Press - 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 - Bowtell, D., Sambrook, J. (2003). DNA Microarrays. Cold Spring Harbor Laboratory Press. - Allison, David B., et al (2006). DNA microarrays and related genomics techniques design, analysis, and interpretation of experiments. Chapman & Hall/CRC - E. Rinaldis, A. Lahm. (2007). DNA microarrays: current applications. Wymondham: Horizon Bioscience
Complementary	- Straalen, Nico M. van (2006). An introduction to ecological genomics. Oxford University Press - Zhanjiang, Liu (2007). Aquaculture genome techonologies. Blackwell - Futuyama, Douglas J. (2006). Evolution. Sinauer Associates - Dale Jeremy (2008). From genes to genomes: concepst and applications of DNA technology. John Wiley & Sons - Sensen, Christoph W. (2005). Handbook of genome research genomics, proteomics, metabolism, bioinformatics, ethical & legal issues . Wiley-VCH 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

(*)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.