UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				**2022/23**
Subject (*)	Genomics		**Code**	610441015
Study programme	Máster Universitario en Bioloxía Molecular, Celular e Xenética			
Descriptors				
Cycle	**Period**	**Year**	**Type**	**Credits**
Official Master's Degree	2nd four-month period	First	Optional	3
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	BioloxíaDepartamento profesorado máster			
Coordinador	Vila Taboada, Marta		**E-mail**	marta.vila.taboada@udc.es
Lecturers	Becerra Fernandez, Manuel		**E-mail**	manuel.becerra@udc.es
	Vila Taboada, Marta			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	Ability to draft, represent, analyze, interpret and present technical documentation and relevant data in the field of the branch of knowledge of the master's degree in the native language and at least in another International diffusion language.
B9	Skills of preparation, show and defense of a work.
C2	Ability to know and use appropriately the technical terminology of the field of knowledge of the master, in the native language and in English, as a language of international diffusion in this field
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.

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
	Paired-end libraries
	Introduction to data analysis
Whole Genome Sequencing	Annotation
	Comparative genomics
Metagenomics	Metabarcoding
Clinical genomics	Amplicon-seq
	Panel-seq
	Exome-seq
	Pharmacogenomics
Single Nucleotide Polymorphisms (SNPs)	Genome wide association studies (GWAS)
	Digital genetic testing
Functional genomics	Transcriptome analysis: microarrays and NGS (RNA-seq)
Computer lab	1. Using GALAXY for analysis of NGS data.
	2. Gene expression analysis using GALAXY.
	3. Farmacogenomic analysis using PHARMKGB.
	4. Introduction to the Intregative Genomics Viewer (IGV).

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
ICT practicals	A3 A11 B1 B5 B9 C2 C3	7	21	28
Guest lecture / keynote speech	A3 A11 B1 C8	14	28	42
Objective test	A3 A11 B1 C8	2	0	2
Personalized attention		3	0	3

(*)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 7-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).
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
ICT practicals	Instructors will typically be available via email/MS TEAMS. Students can arrange for in-person tutoring sessions.

Assessment			
Methodologies	Competencies	Description	Qualification
Objective test	A3 A11 B1 C8	In order to pass the subject, all students will have to take a multiple choice test and/or short-answer questionnaire.	70
ICT practicals	A3 A11 B1 B5 B9 C2 C3	Attendance to computer labs is mandatory. All students will have to submit two reports following the guidelines provided by each instructor. In these reports, students will answer questions and/or solve exercises using their own computer and the software introduced during the computer labs.	30

Assessment comments
Students scoring at least 50 (out of 100) points but not reaching the aforementioned thresholds (ICT practicals: 15 out of 30 points; Objective test; 28 out of 70 points) will be awarded a 4.5 (out of 10) score. When resitting, they can choose to take both exams or only the failed one. Mark "A with distinction" will only be awarded to outstanding students passing the subject in May. Students will be scored as "ABSENT" (Non presentado) only when not involved in any of the assessed activities. 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. Implications of PLAGIARISM in the qualification: the current UDC regulations will be applied.

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 - Bowtell, D., Sambrook, J. (2003). DNA Microarrays. Cold Spring Harbor Laboratory Press. - E. Rinaldis, A. Lahm. (2007). DNA microarrays: current applications. Wymondham: Horizon Bioscience - McLachlan, G. J., Do, K-A., Ambroise, C (2004). Analyzing Microarray Gene Expression Data. Wiley-Interscience. John Wiley & Sons - Brown, T. A. (2018). Genomes4. Garland Science - Pevsner, J. (2015). Bioinformatics and Functional Genomics. Wiley Blackwell - Kulkarni, S., Pfeifer, J. (2015). Clinical Genomics. A guide to Clinical NGS. Academic Press, Elsevier - Robison, P.N., Piro, R.M., Jäger, M. (2018). Computational Exome and Genome Analysis. CRC Press, Taylor & Francis Group
Complementary	- Sensen, Christoph W. (2005). Handbook of genome research genomics, proteomics, metabolism, bioinformatics, ethical & legal issues . Wiley-VCH - 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

Cellular Techniques/610441001
Molecular Techniques/610441002
Genetic Variation Mechanisms/610441005
Regulation of gene expression/610441006
Bioinformatics and Biomolecular models /610441021
Subjects that are recommended to be taken simultaneously
Proteomics/610441014
Chromosomes. structure. function and evolution /610441016
Human Genetics/610441017
Genetic Toxicology /610441018
Subjects that continue the syllabus
Project/610441023
Other comments
Do not take this subject if your level of English is lower than B1.Green
Campus Faculty of Sciences ProgramTo help
achieve a sustainable immediate environment and comply with point 6 of the
"Environmental Declaration of the Faculty of Sciences (2020)", the
documentary works to be carried out in this subject will be requested in
virtual format and computer support.