Teaching Guide				
Identifying Data				2023/24
Subject (*)	Genomics		Code	614522006
Study programme	Mestrado Universitario en Bioinformática para Ciencias da Saúde			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	First	Optional	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Bioloxía			
Coordinador	Vila Taboada, Marta	E-mail	marta.vila.taboada@udc.es	
Lecturers	Becerra Fernandez, Manuel Vila Taboada, Marta Vizoso Vázquez, Ángel José	E-mail	manuel.becerra@udc.es marta.vila.taboada@udc.es a.vizoso@udc.es	
Web				
General description	Genomics has many subdisciplines. According to the NIH, Genomics is the study of all of a person's genes (the genome), including interactions of those genes with each other and with the person's environment. However, Genomics also deals with the genomes of other organisms as well as their evolution. Genomics includes knowledge procuded by Genetics, Molecular Biology, Biochemistry, Computer Science, Statistics, Maths, Physics and so on. Classic Genetics used to start with a mutant and then search for the gene or genes responsible for that particular phenotype. By contrast, Genomics aims at predicting the function of genes from their sequence and/or their interaction with other genes. OMIC sciences (Genomics, Proteomics, Metabolomics) are top science at the moment, particularly because of bioinformatics and the new DNA-sequencing tecnologies.			

Study programme competences	
Code	Study programme competences
A8	CE8 - Understanding the basis of the information of the hereditary material, its transmission, analysis and evolution
A9	CE9 ? To understand the benefits and the problems associated with the sequencing and the use of biological sequences, as well as knowing the structures and techniques for their processing
B1	CB6 - Own and understand knowledge that can provide a base or opportunity to be original in the development and/or application of ideas, often in a context of research
B2	CB7 - Students should know how to apply the acquired knowledge and ability to problem solving in new environments or little known within broad (or multidisciplinary) contexts related to their field of study
B5	CB10 - Students should possess learning skills that allow them to continue studying in a way that will largely be self-directed or autonomous.
B6	CG1 -Search for and select the useful information needed to solve complex problems, driving fluently bibliographical sources for the field
B7	CG2 - Maintain and extend well-founded theoretical approaches to enable the introduction and exploitation of new and advanced technologies
B8	CG3 - Be able to work in a team, especially of interdisciplinary nature
C1	CT1 - Express oneself correctly, both orally writing, in the official languages of the autonomous community
C2	CT2 - Dominate the expression and understanding of oral and written form of a foreign language
C3	CT3 - Use the basic tools of the information technology and communications (ICT) necessary for the exercise of their profession and lifelong learning
C7	CT7 ? To maintain and establish strategies for scientific updating as a criterion for professional improvement.
C8	CT8 - Rating the importance that has the research, innovation and technological development in the socio-economic and cultural progress of society

Learning outcomes

Learning outcomes	Study programme competences		
Knowledge about the molecular tools used in genomics	AJ8 AJ9		
Knowledge about structural, functional and evolutionary genomics	AJ8	BJ1 BJ2	CJ8
To set up experiments and analyse and interpret data using DNA microarrays and RNAseq		BJ6 BJ7	CJ2 CJ3
Knowledge about the mechanisms involved in the evolution of genomes and the molecular and bioinformatic tools used in that kind of studies		BJ5 BJ8	CJ1 CJ7

Contents	
Topic	Sub-topic
Introduction: from Molecular Genetics to Genomics	Molecular markers Applications ot recombinant DNA technologies PCR and real-time quantitative PCR Sanger sequencing DNA editing techniques
The Human Genome Project	Approaches for whole genome sequencing
Next Generation Sequencing (NGS)	Platforms Paired-end libraries Data files
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 RNAseq
Hands on	Introduction to the Integrative Genomics Viewer (IGV) Solving exercises using GALAXY Gene expression analysis using GALAXY Pharmacogenomic analysis using PHARMGKB

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
ICT practicals	B2 B5 B8 C3	21	42	63
Mixed objective/subjective test	A8 A9 B2 C1 C2 C3	2	8	10
Guest lecture / keynote speech	A8 A9 B1 B6 B7 C1 C2 C7 C8	21	52.5	73.5
Personalized attention		3.5	0	3.5
(*)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	Hands on: students solve exercises using their own laptop.

Mixed objective/subjective test	Assessment of the learning process. Tests may include multiple choice questions, problem solving and computer exercises. Instructors will decide whether scheduling a separate test for the computer exercises depending on the progress of the group.
Guest lecture / keynote speech	Each instructor will explain the basic contents of each topic interacting as much as possible with the students.

Personalized attention	
Methodologies	**Description**
ICT practicals	The instructors will carefully supervise the student's work during the hands-on sessions. In the event of having officially certified "part-time" students, the instructors will take the appropriate measures so that their scores are not affected.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Guest lecture / keynote speech	A8 A9 B1 B6 B7 C1 C2 C7 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	B2 B5 B8 C3	All students will have to submit several 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 minimum 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 parts or only the failed one. Evaluation criteria and methodology will be same for the first and second opportunities, except for mark "A with distinction" which will only be awarded to outstanding students passing the subject in the first opportunity. 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. In the event of having officially certified "part-time" students, the instructors will take the appropriate measures so that their scores are not affected.

Sources of information	
Basic	- Robison PN, Piro RM, Jäger M (2018). Computational Exome and Genome Analysis. CRC Press, Taylor & Francis Group - Kulkarni S, Pfeifer J (2015). Clinical Genomics. A guide to Clinical NGS. Academic Press, Elsevier - Brown TA (2018). Genomes4. Garland Science, Taylor & Francis Group - Pevsner J (2015). Bioinformatics and Functional Genomics. Wiley Blackwell
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Introduction to molecular biology/614522004 Genetics and molecular evolution/614522005
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus

Fundamentals of bioinformatics/614522008
Other comments
Do not take this course unless your level of English is B1 or higher.Due to the new UDC rules for the 2023/24 academic year, subjects with less than five students will change to "tutoring teaching". This means that in that case instructor would only lecture 15 of the 42 scheduled hours.