BASIC DETAILS:

Subject:	GENÓMICA		
Id.:	33293		
Programme:	GRADUADO EN BIOINFORMÁTICA. PLAN 2019 (BOE 06/02/2019)		
Module:	CIENCIAS DE LA VIDA		
Subject type:	OBLIGATORIA		
Year:	2	**Teaching period:**	Segundo Cuatrimestre
Credits:	6	**Total hours:**	150
Classroom activities:	66	**Individual study:**	84
Main teaching language:	Inglés	**Secondary teaching language:**	Castellano
Lecturer:		**Email:**	

PRESENTATION:

Genomics is the science that studies the structure, content and evolution of genomes.

The human genome decodification represented a historic landmark which opened the doors to studies in comparative genomics, evolution of humans, genotype-phenotype association studies and for the discovery of genes or genetic regions, their functions and relation to illnesses or risks. The development of genome sequencing technichs has lead to an acceleration of the knowledge in this field. Moreover, the appearence of new generation sequencing methods, allowed the production of a huge amount of genetic data and the need of bioinformatic tools to analyze and interpret them.

The main objectives of this course are to understand the diversity and complexity of genomes, to broaden the vision of genomics and the molecular and bioinformatic techniques used as well as their current applications, to show the potential applications of genomics, transcriptomics and proteomics data, and to learn the experimental and computational methods used in the so-called "omics" sciences.

PROFESSIONAL COMPETENCES ACQUIRED IN THE SUBJECT:

General programme competences	G04	Reason critically based on information, data and lines of action and their application on relevant issues of a social, scientific or ethical nature.
	G05	Communicate professional topics in Spanish and / or English both orally and in writing.
	G07	Choose between different complex models of knowledge to solve problems.
	G08	Recognise the role of the scientific method in the generation of knowledge and its applicability to a professional environment.
	G10	Apply creativity, independence of thought, self-criticism and autonomy in the professional practice.
Specific programme competences	E13	Apply omics technologies for the extraction of statistically significant information and for the creation of relational databases of biodata that can be updated and publicly accessible to the scientific community.
	E16	Plan linkage and association studies for medical and environmental purposes.
	E17	Induce complex relationships between samples by applying statistical and classification techniques.
	E18	Apply statistical and computational methods to solve problems in the fields of molecular biology, genomics, medical research and population genetics.
Learning outcomes	R01	Identify genetic polymorphisms.
	R02	Plan experimental designs for genomic and proteomic analysis.
	R03	Interpret results of experimental analysis techniques.
	R04	Apply functional genomics to the pharmaceutical environment.

PRE-REQUISITES:

To get a good use of the subject and to achieve a good progress, students must have basic knowledge of molecular biology and genetic.

Good skills in English to allow the understanding of the explained subject as well as the active participation in the activities, classes and works raised in the subject, are necessary

SUBJECT PROGRAMME:

Observations:

Each block will be presented in the classroom exposing the fundamental concepts.

At the same time, seminars and workshops will be carried so that students can secure the learned concepts. Also clinical cases will be exposed.

The practical lessons and the seminars will be programmed related to the theoretical agenda. This is intended to deepen and provide a practical insight from the contents explained.

Subject contents:

1 - Introduction to Genomics
1.1 - The brief history of genomics:Genomics: From The Human Genome Proyect towards 1.000,000 Genomes Proyect.
1.2 - Genetics vs Genomics.
1.3 - Basic concepst on Genomics. Structure. Coding and no conding regions
1.4 - The viral genome. The procariotic genome.
1.5 - The eucariotic genome
1.6 - DNA Sequencing technology. First steps. Sanger sequencing.
1.7 - NGS: sequence by synthesis and pyrosequencing. The hatching of genomics.
2 - Human Genomics
2.1 - Human genome structure.
2.2 - Genetic variants: Types and transmission. Consequences.
2.3 - How to study the human genome. Different approaches: from a single mutation to WGS.
2.4 - Bioinformatics: analitycal procedure-> sequencing, assembling, variant anotation and clinical interpretation . Sources, softwares, DDBB
2.5 - Clinical cases: How to choose the best way. Gene, panel, CES, WES or WGS. Familial approach.
2.6 - Germinal vs somatic studies. Genomics and monitorization: cancer and organ transplantation
2.7 - Informed consent. Genetic counselling. Ethical issues.
3 - Metagenomics
3.1 - Concept of species. Identifying different species.
3.2 - Metagenomics and agrifood industry.
3.3 - Metagenomics and healthcare.
3.4 - Metagenomics and forensics.
4 - Other “omic” sciences
4.1 - Transcriptomics.
4.2 - Proteomics.
4.3 - Methylomics.
4.4 - Metabolomics.

Subject planning could be modified due unforeseen circumstances (group performance, availability of resources, changes to academic calendar etc.) and should not, therefore, be considered to be definitive.

TEACHING AND LEARNING METHODOLOGIES AND ACTIVITIES:

Teaching and learning methodologies and activities applied:

Theoretical sessions: Transmission of content throu

Tutoring sessions of optional assistance: in these se

Practice sessions that will have the objective of sho

Student work load:

Teaching mode	Teaching methods	Estimated hours
Classroom activities	Master classes	30
	Other theory activities	4
	Practical exercises	10
	Practical work, exercises, problem-solving etc.	6
	Coursework presentations	4
	Other practical activities	2
	Assessment activities	4
	Extra-curricular activities (visits, conferences, etc.)	6
Individual study	Tutorials	2
	Individual study	36
	Individual coursework preparation	10
	Group cousework preparation	4
	Research work	12
	Compulsory reading	10
	Recommended reading	6
	Other individual study activities	4
	Total hours:	150

ASSESSMENT SCHEME:

Calculation of final mark:

Written tests:	25	%
Individual coursework:	25	%
Group coursework:	15	%
Final exam:	25	%
Test a través de PDU:	10	%
TOTAL	100	%

*Las observaciones específicas sobre el sistema de evaluación serán comunicadas por escrito a los alumnos al inicio de la materia.

BIBLIOGRAPHY AND DOCUMENTATION:

Basic bibliography:

Brown T. A. Genomes 3, 3rd edition. Oxford. .(2007)
Gregory T. R. The evolution of the genome. Elsevier.(2006).
Hartwell L., Fischer J., Aquadro C., Goldberg M. y Hood L. Genetics: from genes to genomes, 5th edition. McGraw-Hill.(2014).
Lesk A. M. Introduction to Genomics. Oxford University Press.(2007).
Klug W. S., Cummings M. R., Spencer C. A. y Palladino M. A. Concepts of Genetics, 11th edition Pearson Education, Inc. (10th edición traducida al castellano).(2014).

Recommended bibliography:

Ginsburg G y Willard H. Genomic and personalized medicine, 2nd Edition. Elsevier.(2013).
Pierce B. A. Genetics: A conceptual approach, 5th edition. W. H. Freeman and Co. (3ª edición traducida al castellano en Editorial Médica Panamericana).(2014).

Recommended websites:

PubMed	https://www.ncbi.nlm.nih.gov/pubmed
Genetics home reference	https://ghr.nlm.nih.gov/
Pharmgkb	https://www.pharmgkb.org/
Ensembl	http://www.ensembl.org/
Leiden Open Variation Database	https://www.lovd.nl/
Human Gene Mutation Database	http://www.hgmd.cf.ac.uk/ac/index.php
ClinVar	https://www.ncbi.nlm.nih.gov/clinvar/
European Society of Human Genetics	eshg.org
American College of Medical Genetics and Genomics	https://www.acmg.net/

* Guía Docente sujeta a modificaciones