BASIC DETAILS:

Subject:	GENÉTICA DE POBLACIONES		
Id.:	33717		
Programme:	DOBLE GRADO EN FARMACIA Y BIOINFORMÁTICA. PLAN 2019		
Module:	CIENCIAS DE LA VIDA		
Subject type:	OBLIGATORIA		
Year:	3	**Teaching period:**	Segundo Cuatrimestre
Credits:	3	**Total hours:**	75
Classroom activities:	33	**Individual study:**	42
Main teaching language:	Inglés	**Secondary teaching language:**	Castellano
Lecturer:	PINO OTIN, ROSA (T) ROIG MOLINA, FRANCISCO JOSE	**Email:**	rpino@usj.es fjroig@usj.es

PRESENTATION:

Population genetics is the science that deals with the principles and processes that explain biological evolution and includes the great conceptual revolution introduced by Charles Darwin that puts the population in the focus of evolution - individuals that interbreed, forming a community of genetic exchange- where evolution is essentially a process of a cumulative and irreversible change in the proportions of different variants of genes in populations over time. Population genetics is the biological discipline that provides the theoretical principles of evolution

Population genetics allows the student to understand the process of the evolution of different life forms and their phylogenetic diversification through the calculation of the forces that act on the distribution of alleles in populations of living beings, including humans. This subject will analyze the processes that cause alleles to change in frequency from generation to generation. We will work with Mendelian populations starting from basal models such as those of Hardy-Weigner to which the effect of different forces such as genetic mutations, migration between populations, genetic recombination, genetic drift or natural selection will be applied and it will be calculated its effect on allelic distribution. The subject covers both the dynamics of the populations of organisms but also at the molecular level.

Finally, the applications of population genetics on genetic diseases, agriculture or the conservation of species and ecosystems will be seen.

PROFESSIONAL COMPETENCES ACQUIRED IN THE SUBJECT:

General programme competences	G03	Cooperate to achieve common results through teamwork in a context of integration, collaboration and empowerment of critical discussion.
	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	E12	Apply the principles and techniques of protein computational modelling to predict their biological function, their activity or new therapeutic targets (Structural Bioinformatics, Computational Toxicology).
	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.
	E15	Infer the evolutionary history of genes and proteins through the creation and interpretation of phylogenetic trees.
	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.
	E19	Explain the main biochemical reactions by applying the principles of chemical kinetics and thermodynamics.
	E20	Relate the overall functioning of the organism with the basic mechanisms at the cellular and molecular level.
	E21	Apply computational and data processing techniques for the integration of physical, chemical and biological concepts and data for the description and/ or prediction of the activity of a substance in a given context.

PRE-REQUISITES:

Basic knowledge of genetics and molecular biology is required.

SUBJECT PROGRAMME:

Subject contents:

1 - GENETICS OF MENDELIAN POPULATIONS
1.1 - Genetic Diversity
1.2 - Genes and Populations: Hardly-Weinberg Law
1.3 - Mutation
1.4 - Migration
1.5 - Genetic Drift
1.6 - Natural Selection
2 - MOLECULAR GENETIC OF POPULATIONS
2.1 - Molecular population genetics
2.2 - Population genetics and evolutionary biology
2.3 - Population genetics: applications and repercussions
3 - Population Genetics Data Analysis: Computer tools

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

The master class will be used mainly for the transmission of contents in a time occupied mainly by oral presentation and ICT support. Each of the topics will be exposed in a synthetic way, so that the student must delve into the different subjects to through the bibliographic search and the resolution of practical cases individually or in groups. During master class, the teacher may require student participation. Summaries will be made, diagrams of what exposed in each session and will be oriented towards autonomous learning and the best way to overcome the different activities proposed throughout the course. The explanations will be complemented with a short **projection (about 5 minutes) of audiovisuals** that can visually contribute aspects of interest.

Throughout the sessions, communication between teacher and students will be present at all times; Multiple questions will be posed to the students, who must be participatory and

professor will solve all those doubts that arise in situ.

Practical cases and problems.

The contents of the subject must be able to be applied to specific cases through problems. The student will be provided with a set of problems and cases to solve.

Part of these cases will be solved in class to provide the student with the basic tools applied to population genetics

The rest will be proposed in the PDU and the student will have one week to deliver the resolution. These cases will also be corrected in class so that students can see if they have made a mistake at any point.The tasks will include **research proposals and search for information complementary** to

that taught in class.

A **continuous evaluation** will be carried out throughout the course, combining the problems to be solved in class and the problems proposed through the PDU as individual work.

Learning based on proyects:

The students will carry out the reconstruction a population genetics analysis using the tools explained at class.
The work will be presented in the form of a scientific article and the execution of the analyzes will be presented in markdown format, preferably written in English. The starting data for the work may be provided by the teacher or selected by the students with the help of the teacher. This work will represent 35% of the final grade The work will be in electronic format and presented in class virtually

Tutoring sessions

During these sessions, the student will be able to ask the professors, both in person and through the university teaching platform, all those doubts that could not be answered.

solved during the theoretical classes. Likewise, during this time the student may request a specific extension bibliography on a specific topic and / or any other type of

information related to the subject.

Student work load:

Teaching mode	Teaching methods	Estimated hours
Classroom activities	Master classes	13
	Practical exercises	2
	Practical work, exercises, problem-solving etc.	7
	Films, videos, documentaries etc.	2
	Other practical activities	2
	Assessment activities	7
Individual study	Individual study	13
	Individual coursework preparation	13
	Research work	9
	Compulsory reading	7
	Total hours:	75

ASSESSMENT SCHEME:

Calculation of final mark:

Written tests:	20	%
Individual coursework:	25	%
Final exam:	55	%
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:

HEDRICH, Philip W. Genetics of populations.Jones and Bartlett Publishers.Third Ed. 2005
HARTI, Daniel L.A primer of population genetics.Sinauer Associates. Third Edition 1999
NIELSEN Rasmus, SLATKIN Montgomery. An Introduction to population Genetics. Sinauer Associates.2013
PIERCE, Benjamin A. Genetics. Macmillan international.Seventh edition.2020
DAWKINS, Richard. Evolution: the greatest show on Earth. Espasa. fourth Edition 2009
DELIBES,Miguel. Vida, la naturaleza en peligro. Temas de Hoy. 2001

Recommended bibliography:

Recommended websites: