



IDENTIFYING DATA

Marine Genomics

Subject	Marine Genomics			
Code	V02M098V01214			
Study programme	Máster Universitario en Biología Marina			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	#EnglishFriendly Spanish English			
Department				
Coordinator	Presa Martínez, Pablo			
Lecturers	Canchaya Sanchez, Carlos Alberto García Souto, Daniel Presa Martínez, Pablo			
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Web	http://http://bioloxia.uvigo.es/es/estudios/master-en-biologia-marina/			
General description	<p>The last decade has witnesses an important development of methodologies for genomic sequencing, which have lead to an exponential knowledge increase of genomes. Those new technologies are also intensively applied to marine biota. This subject aims to approach the student to those technological advances in order to acquire the necessary knowledge to confront the scientific and industrial oportunities of applied marine genomics in the 21st century.</p> <p>English Friendly subject: International students may request from the teachers:</p> <p>a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.</p>			

Training and Learning Results

Code	
A1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
A5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
B3	Aprendizaje de diversas técnicas y métodos analíticos tanto en el medio natural como en el laboratorio
B6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad
C2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
C4	Conocimiento y búsqueda del potencial interés económico y biotecnológico de los organismos marinos
C8	Conocimiento y manejo de la metodología de investigación, de las técnicas muestreo e instrumentales y de análisis de datos aplicados al medio marino
D1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
D2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
D4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma

Expected results from this subject

Expected results from this subject	Training and Learning Results
That the student knew the structure of the genomes in its distinct levels of organisation and the variation in the structural elements that generate molecular diversity.	A1 D1 D4

That the student knew the new technics of genome sequencing of high performance for the study of the genomes of marine organisms and thier applications.	A1 A5 B3 B6 C8 D1 D4
That the student identified the strategies for sequencing genomes of reference and the mechanisms to achieve it: assembling, annotation and mapping.	A1 A5 B3 B6 C8 D1 D2 D4
That the student knew the applications of genomics in the study of marine biodiversity, evolution and management of fisheries and aquaculture.	B6 C2 C4 D1

Contents

Topic	
The organisation of marine genomes	The nuclear and mitochondrial genome. Chromosomes, genes and repetitive components of a genome. Karyotypes and size of marine genomes. Nucleotide variants and structural variantes in a genome. Genomic databases.
Applications of the NGS techniques to the analysis of marine genomes	New generation of high performant sequencing techniques. Modalities of genome sequencing and transcriptome sequencing. Strategies of sequencing for the identification of variants in a genome. Applications of genomic sequencing to the study of marine organisms.
Sequencing of genomes of reference	Strategies for sequencing a genome of reference. Scaffolding and assessment of quality of an assemblage (value of the parameter N50). Construction of genomic maps with data NGS. Annotation of a genome of reference. Calculation of the size of a genome by means of the k-mers abundance. Projects and databases of marine genomes of reference.
Applications of genomics to the study of the marine life	Biodiversity and biogeography. Change induced and adaptative evolution. Marine genomics and aquaculture.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	17	30	47
Problem solving	2	10	12
Presentation	2	9	11
Problem and/or exercise solving	2	2	4
Debate	1	0	1

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	The professor introduces the basic technical concepts to approach the genomic methodologies. He presents the materials and the specific bibliography for matter enrichment and discusses on applied cases in science and industry.
Problem solving	Each conceptual development implements exercises of qualification by resolution of technical problems associated to the genomic methodologies. Daily exercises constitute the continuous evaluation of the subject.

Personalized assistance

Methodologies	Description
Lecturing	Attention in real time to the doubts of understanding.
Problem solving	Physical and virtual assistance on the explanation and execution of digital processes be means of group and individual tutorship.
Tests	Description

Presentation	Personalised attention for the selection and methodological approach to deep in an applied genomic study.
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Assessment		Qualification	Training and Learning Results			
	Description					
Presentation	Selection, strategy of analysis, methodology of presentation and dissertation, of a practical case study.	40	A1	B3	C2 C4	D1 D2 D4
Problem and/or exercise solving	The daily duties help to apprehend the methodologies treated in the subject. Students execute autonomous work, corrected digitally with feedback from the teacher and group reviewing in the classroom.	40	A5	B6	C8	D1 D4
Debate	Positioning and argumentation of the student on the methodologies, applications and social repercussions of marine genomics. It demands participatory assistance, reflection and argumentation.	20				D1 D2 D4

Other comments on the Evaluation

The first evaluation date of the course which corresponds with the lecture and defence of the practical case is due on 24 April 2024 (10-12h); the second date is due on 27 of June 2024 (12-14h). The qualifications obtained along the course represent 60% of the final mark and will be kept across testing dates.

Sources of information

Basic Bibliography

Arthur M. Lesk, **Introduction to Genomics**, Tercera Edición, Oxford University Press, 2017

T. A. Brown, **Genomes 4**, Cuarta Edición, Garland Science, 2017

Complementary Bibliography

Recommendations

Other comments

The complementary bibliography will be proposed by the professor along the course, and will consist in an up to date list of articles, texts, links, and scientific blogs, that will serve as material of enlargement and work. The physical face-to-face classes will be simultaneously given in the classrooms of videoconference of the Máster in Marine Biology by the Faculties of Biology of UVI (classroom A6) of USC (classroom Sir David Attenborough) and the Faculty of Sciences of UDC (classroom of videoconference MBM). It is advisable the participatory assistance to all the classes of the course and the fulfillment of the commitments towards the group of work regarding schedules, deliveries and processes.