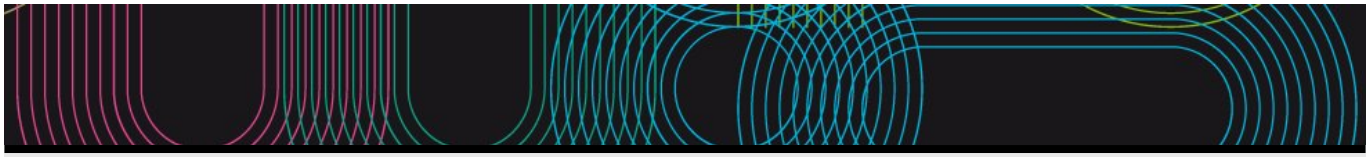

IDENTIFYING DATA				
Marine genetic resources				
Subject	Marine genetic resources			
Code	V10G060V01907			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Sanjuan López, Andrés			
Lecturers	Sanjuan López, Andrés			
E-mail	asanjuan@uvigo.es			
Web				
General description	The ""Marine Resources"" appear with frequency in the curricular profile of the graduated in Sciences of the Sea. They are hence one of the fundamental objects of academic study during the career, and of professional management after her. This rol central of the biota marine owes to studied from industrial perspectives, technological, physical-chemical oceanographic and biological (biochemical, physiology, genetic, ecology, etc.). The Genetic ""approach"" is crucial in the management of the biological resources so much since it ponto of natural sight (genetic preservation) how of the sua exploitation well was merely extractiva (pesquerias and marisqueo) or by means of crop to different levels of producción (acuicultura). ¿That it would serve to elaborate a complex plan of exploitation of a resource that include studies of economic feasibility, technical and sociological, yes when putting in practice it realized that the resource lacks of the sufficient genetic diversity to adapt to environmental changes, to design strategies of genetic selection or simply to keep in the his excellent reproductive?. The Genetic plays so a central paper in the management of resources, whose knowledge no can obviate given the current eases stop the analysis of the genomes.			

Competencies	
Code	
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
C2	To know and understand the essential facts, concepts, principles and theories related to oceanography
C5	Basic knowledge of research methodology in oceanography
C6	Ability to identify and understand the problems in the field of oceanography
C8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
C10	To know the problems and the basic principles of sustainability in relation to the use and exploitation of the marine environment
C12	To be able to operate the instrumental techniques applied to sea
C14	To recognize and analyze new problems and to propose problem-solving strategies
C15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
C17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
C18	To transmit writing, verbal and graphical information for audiences of various types
C20	To find and evaluate marine resources of various kinds
C24	To participate and carry out training and outreach programs on the marine and coastal environments
C32	Quality control of seafood
C33	Fisheries control
C36	aquariology
D6	Problem management and solving skills
D11	Ability to learn independently and continuously

Learning outcomes			
Expected results from this subject	Training and Learning Results		
To. Specific: Cognitive (know): Comprise the concepts and the basic processes of the genetic variability, of the genetic differentiation interpoboacional and of the evolution and divergence of the species in quantitative genetic characters and qualitative	A5	C1 C2 C5 C6 C8 C10 C12 C14 C15 C17 C18 C20 C24 C32 C33 C36	D6 D11
To. Specific: Procedimentales/Instrumental (know do): Make genetic analyses; Carry out genetic advice: Analyse and characterise biological samples; Make phylogenetic analyses. Obtain and organise information, design experiments and interpret results. Apply the molecular technicians to practical cases of management of the marine genetic resources	A3	C1 C2 C10 C12 C17 C18 C20 C24 C32 C33 C36	
To. Specific: Actitudinales (be): Autonomous; Able to design experiments	A5	C20 C36	D11
B. Transversal/Generic: - Personal: critical Reasoning; Work in team - Others: capacity to apply the theoretical knowledges in the practice; use of Internet like media and like source of information	A4		D6 D11

Contents	
Topic	
Subject 1. Introduction	Presentation and analysis of the program. Taking of decisions on the process of learning and the system of evaluation of the course. Evaluation of the level of genetic knowledge of the students. Review of basic genetic concepts.
Subject 2. The genetic variability. The Mendelian Traits.	Genetic Variability and Classes of Hereditary Characters. Mendelian Genetics. Dominance Relationships and Multiple Alleles. Gene Interactions and Lethal Alleles. Selection of Mendelian Characters in Aquaculture.
Subject 3. Quantitative characters.	Genetic analysis of the Continuous Traits. The biometrical methods in Quantitative Genetics. Heritability. Response to Selection and Application in Aquaculture.
Subject 4. Genetic Structure of Populations and Molecular Markers.	The Discrete Genetic Variability.The Ideal Population. Non Random Mating and Inbreeding. Measuring Genetic Variation at Protein and DNA Levels. Allozyme Polymorphisms. RFLPs. PCR. Minisatellites and Microsatellites. Sequences of DNA Sequence Variation.
Subject 5. Populational Genetic Structure and Evolutionary agents	Agents that Change Gene Frequencies in Populations. Mutation. Migration. Random Genetic Drift. Natural Selection.
Subject 6. Populational Genetic Structure and Management of Marine Genetic Resources.	Populational Genetic Structure. Genetic management of Fisheries and the Biological Stock Concept. Genetic Management in Aquaculture: Exploitation and Aquaculture Stocks. Conservation Genetics and Marine Biodiversity. Genetics and Biological Invasions.
Practice 1. Experimental Genotyping of Populations by PCR. Identification of species.	DNA Extraction. DNA Amplificacion PCR. Molecular separation using Agarose Electrophoretic Migration. Visualisation of PCR Products. Interpretation of genotypes and Record of data.
Practice 2. Experimental Genotyping of Populations by PCR-RFLP. Populational analysis or authentication of Fishery Products.	DNA Extraction. PCR of a mitochondrial gene. Digestión of PCR Products with Restriction Enzymes. Electrophoretic Migration. Interpretation of the Electrophoretic Patterns. Populational analyses or Identification of species for each Fishery Product.

Practice 3. Bioinformatic Analyses of intra e interspecific populational genetic data.	Tabulation of the genetic data obtained in the Laboratory or in the International Databases. Molecular Phylogenetic Inference employing Genetic Distances and Phylogenetic Methods.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	18	21.6	39.6
Practices through ICT	5	7	12
Laboratory practical	15	18	33
Problem solving	12	14.4	26.4
Mentored work	1	8	9
Objective questions exam	1	5	6
Problem and/or exercise solving	2	10	12
Essay questions exam	2	10	12

*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 will present the conceptual foundations of each subject. The student has to complete each subject consulting the bibliographic resources and webs corresponding to each subject.
Practices through ICT	The professor will prepare a guide of each one of the practices. The students will make diverse practices with distinct computer applications and with data facilitated by the professor or achieved by the students.
Laboratory practical	The professor will prepare a guide of each one of the practices. The students will make several experiments that will allow to obtain products of PCR and patterns electroforéticos of PCR and PCR-RFLP products of individuals of distinct populations, species or fishery products.
Problem solving	Problems resolved in the classroom and practical cases adapted to each theoretical concept, technic or biological situation of the resources.
Mentored work	Individual work or in group on subjects or articles related with the subjects. The professor will propose a list of the subjects or articles, although it admits the suggestion of the same by the students. Identification of the subject and of the materials, preparation and presentation.

Personalized assistance

Methodologies	Description
Practices through ICT	There will be a personalised attention according to the needs of each student.
Lecturing	In the case of questions or explanations by part of the students, there will be a personalised attention according to the needs of each student
Laboratory practical	There will be a personalised attention according to the needs of each student
Mentored work	There will be a personalised attention according to the needs of each student
Problem solving	There will be a personalised attention according to the needs of each student

Assessment

	Description	Qualification	Training and Learning Results	
Practices through ICT	Correct execution of the analytical process alone based on a series of data previously provided by the teacher or obtained from international databases. A report will be sent with the Tables, Figures, statistical tests, relevant hypotheses and conclusions.	10	C12 C18 C32 C33	D6 D11
Mentored work	Realization of a written work on a subject or articles previously agreed with the tutor. The interaction with the tutor and the rest of the group will be taken into account, if applicable, the interest and depth of the approach, clarity and precision in the concepts and developments carried out.	10	C12 C18 C32 C33	D6 D11
Objective questions exam	Tests to strengthen the concepts, clarify the differences between different concepts or processes or laws, to perform simple data calculations or significance tests.	10	A3 A4 A5 C1 C2 C8 C14 C32 C33 C36	D6 D11

Problem and/or exercise solving	Resolution of 50% of the written partial or final exam, consisting of problems, or practical cases with simple mathematical applications	35	C1 C2 C8 C14 C32 C33 C36	D6 D11
Essay questions exam	Resolution of 50% of the written partial or final exam, consisting of questions of more or less long development, laws, demonstrations, exhibition of models, etc.	35	C1 C2 C8 C14 C32 C33 C36	D6 D11

Other comments on the Evaluation

The contents imparted, incluided lectures, experimental and informatic practises and seminars, will be evaluate in the control proofs and in the partial and final examinations.
Date, time and place of exams will be published in the official web of Marine Sciences Faculty: http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3
Along course, but mainly in the first 6 weeks will realize at least 2 short proofs of 30 min each (no eliminatory of subject). These marks, joint the appreciations of the active participation in the class in the resolution of problems, and in the experimental and informatic practices will be about 10 % of the Final Qualification. The assessment of the report of the Informatic Application to distinct data, and of other work will be other 10 % of the Total. An examination or partial proof will be realize for the first half of the course that will be subject to elimination. At the end of the course a final examination will include the two halves of the course. These last examinations will consist in distinct definitions, demonstrations, exercises, problems and developmental questions.

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

Sources of information

Basic Bibliography

Hedrick, P.W., **Genetics of Populations**, 4th, Jones & Bartlet Publ, 2011

Pandian, T.J, Strüssmann, C.A. & Marian, C. (Eds.), **Fish Genetics and Aquaculture Biotechnology**, Oxford & IB Publi./Science Publish, 2005

Fontdevila, A. & Moya, A., **Introducción a la genética de poblaciones**, Ed. Sintesis, 1999

Complementary Bibliography

Avise, J., **Molecular Markers: Natural Hist ory and Evolution**, Chapman & Hall, 1994

Recommendations

Other comments

The students that take this subject, would have previous knowledges on the nature of the hereditary material (DNA), his transmission, mutation, and expression (Biology, first course of the degree), on the calculation of probabilities, test of of significance (as Tests of X2), and on concepts and calculations of correlation, regression and analysis of variance.
It is required of the students a responsible and honest behaviour.
It is considered inadmissible any form of fraud (as Copy or Plagiarism) to change the level of knowledge or skill reached by a person in any type of proof, test, report or work designed with this purpose. This fraudulent behaviour will be sanctioned with the firmness and rigour that establishes the valid rule.

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===
In front of the uncertain and unpredictable evolution of the sanitary alert caused by the **COVID- 19, the University establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face

stage or no totally face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a way but agile and effective when being known in advance (or with a wide *antelación) by the students and the *profesorado through the tool normalised and institutionalised of the educational guides **DOCNET.

=== ADAPTATION OF The METHODOLOGIES ===
* educational Methodologies that keep :
The indicated in the guide, except the derivatives of the does not witness in the common classrooms, like the practices of laboratory.

* Educational methodologies that modify :
they will employ the resources of the Remote Virtual classroom for the teaching and debate of the on-line classes, *asi like the Platform *FAITIC of the University of of Vigo for the access to documents of theory (the presentations in format PDF, distinct texts, articles, problems resolved with detail or no, test type "test", etc.). It will require the presentation of some problems and individual works in concert with the professor.
The students will be able to execute the distinct reports, works or exercises by manual writing (with photo or scan of the pertinent pages) or in digital format with a processor of text and insertion, yes proceeds, of the diagrams or figures.
You practise them of laboratory, of not being possible to make them of face-to-face way, will adapt with distinct computer programs, *videos and experimental calculations (these last will remit to the professor).

* Mechanism no face-to-face of attention to the students (*tutorías)
The *tutorias will make in group in day and hour (1-2 *h) by week *ce agreement with the students. Individually, it will attend by email, or by telephone, or by "*Skype".

* Modifications (if it proceeds) of the contents to give
keep as in the guide.

* Additional bibliography to facilitate to car-learning
As in the guide, and including some bibliographic material in format "pdf", and *videos and computer programs.

* Other modifications

=== ADAPTATION OF The EVALUATION ===
keep the percentages proposed, with the exception of the type of presentation of the same (see. To continuation)

* Proofs already made
Proof *XX: [previous Weight 00%] [Weight Proposed 00%]
...

* Pending proofs that keep
Proof *XX: [previous Weight 00%] [Weight Proposed 00%]
...

* Proofs that modify
[previous Proof] =&**gt; [new Proof]

* New proofs:
The different works, problems resolved, calculations of experimental process, Test of control, etc., made by writing along the course will be sent by post *electronico to the professor with limit of date of reception of each one. The final exercise will make by writing and with sequential access to each fourth part of the examination in the platform *FAITIC and the answer will be envoy to the professor before a suitable time (*p.And., 25 *m), that to continuation (5 *m afterwards) will facilitate the access to the following batch of questions or problems in the platform *FAITIC, and *asi until the total of the examination. Alternatively it will employ the Resources of the Remote Virtual Classroom of the University of Vigo.
The students will be able to execute the distinct reports, works or exercises by writing manually (with photo or scan of the pertinent pages) or in digital format with a processor of text and insertion, yes proceeds, of the diagrams or figures.

* Additional information