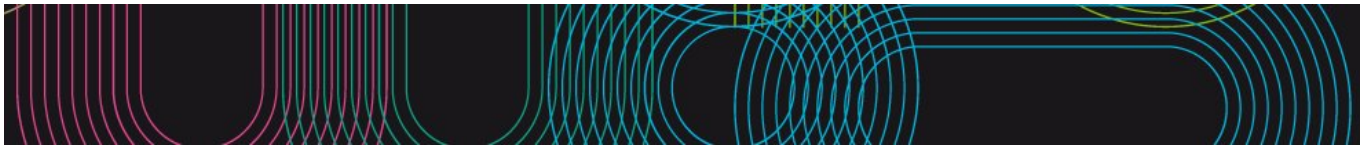

IDENTIFYING DATA				
Statistical and Mathematical Methods in Bioinformatics				
Subject	Statistical and Mathematical Methods in Bioinformatics			
Code	V02M123V01112			
Study programme	(*)Máster Universitario en Ciencias Biolóxicas: Bioloxía Molecular, Computacional e Ambiental e Bio-Industrias			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	1st	1st
Language	English			
Department				
Coordinator	de Uña Álvarez, Jacobo			
Lecturers	de Uña Álvarez, Jacobo Faro Rivas, Jose Manuel Olivieri Cecchi, David Nicholas Saavedra González, María Ángeles			
E-mail	sencorreo@uvigo.es			
Web	http://webs.uvigo.es/biologicalsciences/			
General description	The goal of this subject is to provide the student with a number of statistical and mathematical tools to investigate biological issues in a quantitative way			

Competencies		
Type A	Code	Competences Specific
	A1	(*)To know the scientific method and the correct use of the scientific terminology as well as to acknowledge the contribution that scientific research provides to the overall knowledge and professional practice.
	A2	(*)Ability to describe and to analyse biological diversity, the mechanisms determining the interactions with the biotic and abiotic environment and being able to select those which might have technical applications.
	A3	(*)Ability to manage and/or to develop basic tools for validating and analysing data by means of statistics and bioinformatics.
	A4	(*)To know the ethical and legal aspects governing the collection and the handling of biological samples, organisms and habitats.
	A5	(*)Ability to design, evaluate and implement models of biological structures, systems and processes.
	A6	(*)To learn the sampling techniques and the instrumental methodologies, in the field and laboratory, for their application in the Biological Sciences
	A7	(*)To have an integrated view of the R&D processes and their possible transfer to the industrial sector. Planning and supervising facilities together with managing their human and economic resources.
	A8	(*)Ability to classify, evaluate, conserve, restore and manage natural and productive systems. Developing and implementing land management and sustainability plans.
	A9	(*)To understand and know how to apply quality control systems and safety protocols in any biological laboratory of the public or private sector.

	A10	(*)To acquire the professional ability to teach and spread Biology and to offer expertise advice for elaborating scientific, technical and socioeconomic biology reports. Address environmental consulting.
	A11	(*)To perform an individual Master Project (critical and in-depth study) under the supervision of a tutor in a research or working environment demonstrating that skills have been acquired.

Type B	Code	Competences Transversal
	B1	(*)Dissemination of results and conclusions of the biological studies, in oral and written English, through complex presentations that address ideas related with R&D in Biology.
	B2	(*)Managing computational, laboratory, field and industrial techniques in order to obtain, process and apply the acquired information.
	B3	(*)Disseminating and broadcasting ideas in contexts both academic and non-specialised.
	B4	(*)Reflecting on social and ethical responsabilities.

Learning aims

Subject competences	Typology	Competences
Ability to manage and/or to develop basic tools for validating and analysing data by means of statistics and bioinformatics. Ability to design, evaluate and implement models of biological structures, systems and processes. To learn the sampling techniques and the instrumental methodologies, in the field and laboratory, for their application in the Biological Sciences Managing computational, laboratory, field and industrial techniques in order to obtain, process and apply the acquired information.	know Know How	A3 A5 A6 B2

Contents

Topic	
Multivariate analysis	Principal components Cluster analysis Discriminant analysis Factorial analysis
Multifactor experimental design and multifactor ANOVA	Multifactor experimental design Multifactor ANOVA
Models for sequential (serial) dependence	ARIMA
Markov Chain Monte Carlo	Markov Chain Monte Carlo Sequential Monte Carlo Simulations with Monte Carlo methods
Introduction to modeling dynamical systems in biology	Dynamical systems

Planning

	Personalized attention	Assessment	Ordinary class hours A	Face-to-face hours outside the classroom Guided academic environment B	Student's work factor C	Outside the classroom hours D	Total hours (A+B+D) E
Practice in computer rooms	☒	☒	10	0	9.8	98	108
Master Session	☐	☒	20	0	1	20	40
Short answer tests	☐	☒	2	0	0	0	2
Total hours E:							150
Work load in UVIGO ECTS credits:							6

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

Methodologies

	Description
Practice in computer rooms	The studens will learn to perform the statistical and numerical analysis with an appropriate software
Master Session	The main concepts and methods will be explained with the help of illustrative examples

Personalized attention	
	Description
Practice in computer rooms	Problems arising when solving the proposed exercises will be solved in a personalized manner

Assessment		
	Description	Qualification
Master Session	Students' performance will be assessed at each Master Session	10
Practice in computer rooms	Students' performance will be assessed at each practice session	40
Short answer tests	Final written exam	50

Other comments and second call

Sources of information

James M. Lattin, J. Douglas Carroll, Paul E. Green, Analyzing multivariate data, 2003, Thomson Learning

Paul S.P. Cowpertwait and Andrew V. Metcalfe, Introductory time series with R, ,

David J.C. MacKay, Information Theory, Inference, and Learning Algorithms, ,

Rob J. de Boer, http://www-binf.bio.uu.nl/rdb/books.html, ,

http://www.r-project.org/, The R project for Statistical Computing, ,

Recommendations

Subjects that continue the syllabus

Systems Biology/V02M123V01212
Structural Biology/V02M123V01211
Molecular Evolution/V02M123V01210
Knwledge Discovery/V02M123V01113
Computational Genomics/V02M123V01209

Subjects that it is recommended to have taken before

Progrmming for Bioinformatics/V02M123V01111