



IDENTIFYING DATA

Scientific Methodology for Biological Studies

Subject	Scientific Methodology for Biological Studies			
Code	V02M123V01103			
Study programme	(*)Máster Universitario en Ciencias Biológicas: Biología Molecular, Computacional e Ambiental e Bio-Industrias			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Mandatory	1st	1st
Language	English			
Department				
Coordinator	Cordero Rivera, Adolfo Calviño Cancela, María			
Lecturers	Calviño Cancela, María Cordero Rivera, Adolfo			
E-mail	MARIA@UVIGO.ES adolfo.cordero@uvigo.es			
Web				
General description	This course aims to provide the student with the tools needed to planify and design experiments, and to identify research hypotheses. It will also introduce the main statistical approaches to analyse biological data.			

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 responsibilities.

Learning aims

Subject competences	Typology	Competences
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.	Know How	A1
Ability to manage and/or to develop basic tools for validating and analysing data by means of statistics and bioinformatics.	Know How	A3
Ability to design, evaluate and implement models of biological structures, systems and processes.	Know How	A5
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.	Know How	B1
Managing computational, laboratory, field and industrial techniques in order to obtain, process and apply the acquired information.	Know How	B2

Contents

Topic	
The scientific method	Types of concepts in Ecology. The inductive and the hypothetical-deductive methods. Limitations on experimental research when manipulation is not possible. The scale of work and ecological research
Design of experiments	Random and fixed factors. Manipulation and observation. The importance of replication, randomization and intercalation of treatments in space and time.
Frequentist methods	Advantages and disadvantages of statistical hypothesis testing. How to interpret p-values. Differences between biological and statistical significance.
The method of synthesis	The meta-analysis and related statistical methods.
Methods based on the Theory of information	Generalized linear models with different error structure. AIC and model selection.
The Bayesian methods	An introduction to its use in biological research.

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
Master Session	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	30	0	0.3	9	39
Seminars	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	0	2	4	6
Presentations / exhibitions	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	0	1	2	4
Jobs and projects	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	10	0	1	10	20
Short answer tests	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	0	1	1	2
Total hours E:							71
Work load in UVIGO ECTS credits:							2.84

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

Methodologies

	Description
Master Session	The teachers will explain the concepts of the subject in the classroom.
Seminars	In the seminars, the teachers will suggest the students different topics related to the subject for which students will have to make a research proposal describing the methodology to be used to test their research hypothesis. The teachers will explain the students how to elaborate their research proposal and how to prepare their oral presentation to other students and teachers.
Presentations / exhibitions	The students will make an oral presentation in which to explain their research proposals.

Personalized attention

	Description
Master Session	Provide guidance and solve any question that the students may have in relation to the subject.
Seminars	Provide guidance and solve any question that the students may have in relation to the subject.
Presentations / exhibitions	Provide guidance and solve any question that the students may have in relation to the subject.
Jobs and projects	Provide guidance and solve any question that the students may have in relation to the subject.
Short answer tests	Provide guidance and solve any question that the students may have in relation to the subject.

Assessment

	Description	Qualification
Master Session	The knowledge acquired by students in relation to the topics explained in the classroom will be assessed by means of a short-answers test.	30
Presentations / exhibitions	The oral presentation delivered by students will be assessed using the following criteria: organization, depth and accuracy of contents, research effort, creativity, communication aids, use of language and interaction with the audience.	30
Jobs and projects	The students will deliver a report of their research project proposal, that will be assessed using the following criteria: organization, depth and accuracy of contents, research effort, creativity and use of language.	40

Other comments and second call**Sources of information**

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Recommendations