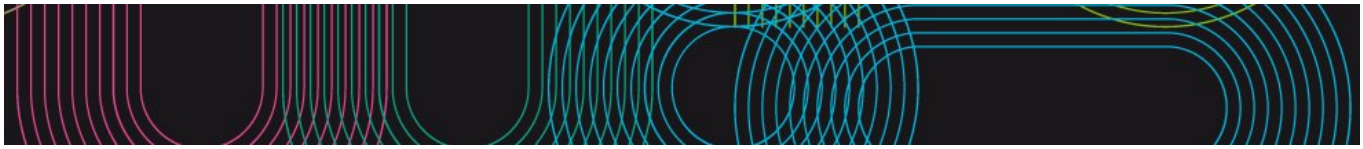

IDENTIFYING DATA				
Systems Biology				
Subject	Systems Biology			
Code	V02M123V01212			
Study programme	(*)Máster Universitario en Ciencias Biolóxicas: Bioloxía Molecular, Computacional e Ambiental e Bio-Industrias			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	1st	2nd
Language	English			
Department				
Coordinator	Rodriguez Banga, Julio García Lourenco, Analia María			
Lecturers	Balsa Canto, Eva Fernández Villaverde, Alejandro García Lourenco, Analia María Otero Muras, Irene Rodriguez Banga, Julio Rodríguez García, Miriam			
E-mail	julio@iim.csic.es analia@uvigo.es			
Web				
General description	The aims of the subject are: (1) describe cellular systems at the component and interconnections level, (2) modeling molecular networks, (3) simulating and generating hypothesis about cellular processes.			

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	know Know How	A3
Ability to design, evaluate and implement models of biological structures, systems and processes.	know 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 Know How	B1
Managing computational, laboratory, field and industrial techniques in order to obtain, process and apply the acquired information.	know Know How	B2
Disseminating and broadcasting ideas in contexts both academic and non-specialised.	know Know How	B3

Contents

Topic	
Systems Biology	Basic principles
Genome-scale model reconstructions	Methods and resources
Graph theory	Principles and application to biological networks
Dynamic modeling	Principles and tools
Modeling metabolism, cell signaling and gene expression	Case studies
Applications in medicine and biotechnology	Case studies
Synthetic Biology	Basic principles

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
Classroom work	☒	☒	10	0	0	0	10
Autonomous troubleshooting and / or exercises	☒	☒	0	0	0	108	108
Master Session	☐	☒	20	0	0.5	10	30
Multiple choice 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
Classroom work	Students do computational work with the professor

Autonomous troubleshooting and / or exercises	Students do computational work on their own.
Master Session	The professor explains main concepts and tools included in the subject contents.

Personalized attention	
	Description
Classroom work	Professors will be in touch with the students online (forum, discussion list, chat) to answer their questions. Professors will also help students in person if necessary.
Autonomous troubleshooting and / or exercises	Professors will be in touch with the students online (forum, discussion list, chat) to answer their questions. Professors will also help students in person if necessary.
Multiple choice tests	Professors will be in touch with the students online (forum, discussion list, chat) to answer their questions. Professors will also help students in person if necessary.

Assessment		
	Description	Qualification
Master Session	Students are expected to participate actively in the discussions maintained in the classroom	5
Classroom work	Students are expected to participate actively in the discussions maintained in the classroom	5
Autonomous troubleshooting and / or exercises	Students will write a report on their computational assignments	60
Multiple choice tests	Students will carry out an exam on the items discussed in the course	30

Other comments and second call

Sources of information

Alon, U., An Introduction to Systems Biology: Design Principles of Biological Circuits, CRC Press, 2006

Junker, Björn H. and Falk Schreiber , Analysis of Biological Networks, Wiley Series in Bioinformatics, 2008

Klipp, E., Herwig, R., Kowald, A., Wierling, C., & Lehrach, H. , Systems biology in practice: concepts, implementation and application, Wiley-Blackwell, 2008

Recommendations

Subjects that it is recommended to have taken before

Structural Biology/V02M123V01211
Molecular Evolution/V02M123V01210
Knwledge Discovery/V02M123V01113
Computational Genomics/V02M123V01209
Statistical and Mathematical Methods in Bioinformatics/V02M123V01112
Progrmming for Bioinformatics/V02M123V01111