



IDENTIFYING DATA

Programming for Bioinformatics

Subject	Programming for Bioinformatics			
Code	V02M123V01111			
Study programme	(*)Máster Universitario en Ciencias Biológicas: Biología Molecular, Computacional e Ambiental e Bio-Industrias			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	1st	1st
Language				
Department				
Coordinator	Carvajal Rodríguez, Antonio			
Lecturers	Carvajal Rodríguez, Antonio Rodríguez Liñares, Leandro Vila Sobrino, Xosé Antón			
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Web				
General description				

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
Ability to manage and/or to develop basic tools for validating and analysing data by means of statistics and bioinformatics	know Know How	A3 B1 B2 B3 B4

Contents

Topic	
Programming in C/C++ and Python	C/C++ Python
Introduction to object oriented programming in biology	Classes and Objects.
Linux shell scripting	Bash, shell programming
Network protocols	ssh, sftp
Python/BioPython (Numpy/scipy, Matplotlib)	scientific computing with Python, tools for biological computation
High Performance computing	OpenMP

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 type="checkbox"/>	20	0	1	20	40
Troubleshooting and / or exercises	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10	0	9.8	98	108
Troubleshooting and / or exercises	<input type="checkbox"/>	<input checked="" type="checkbox"/>	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
Master Session	Introduction of a biological problem that can be solved by computer programming. Introduction of some programming concepts.
Troubleshooting and / or exercises	The student has to develop some programs/scripts for solving the given tasks.

Personalized attention

	Description
Master Session	Interaction with the student

Assessment

	Description	Qualification
Troubleshooting and / or exercises	Solving problems and programming exercises	90
Troubleshooting and / or exercises	Final programming exercise	10

Other comments and second call

Sources of information

Steven H.D. Haddock, Practical Computing for Biologists, 1 edition (22 April 2011), Sinauer Associates

Arnold Robbins and Nelson H. F. Beebe, Classic shell scripting : [automate yor Unix tasks], , O'Reilly, 2005

Wes McKinney, Python for Data Analysis. Data Wrangling with Pandas, NumPy, and IPython, 1 edition (1 Nov 2012), O'Reilly Media

Recommendations

Subjects that continue the syllabus

Systems Biology/V02M123V01212

Structural Biology/V02M123V01211

Molecular Evolution/V02M123V01210

Knowledge Discovery/V02M123V01113

Computational Genomics/V02M123V01209

Statistical and Mathematical Methods in Bioinformatics/V02M123V01112
