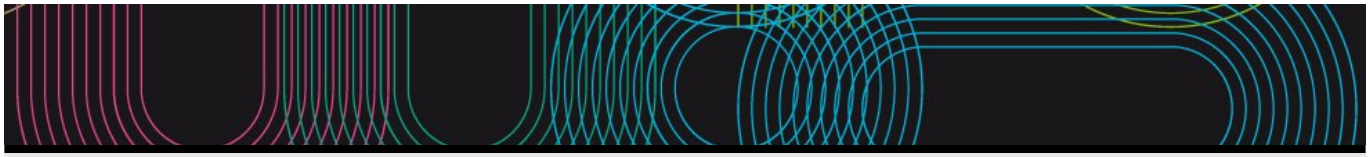

IDENTIFYING DATA

Biology: Informatic tools in biology

Subject	Biology: Informatic tools in biology			
Code	V02G031V01110			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Carvajal Rodríguez, Antonio			
Lecturers	Carvajal Rodríguez, Antonio Torres Palenzuela, Jesús Manuel Varela González, Sara			
E-mail	acraaj@uvigo.es			
Web				
General description	The aim of the subject is to enter to the student in the importance of the computational appearance in the modern Biology showing him a map of applications in the diverse fields of the same. The student will see and will practise examples that go from the use of teledetection, the systems of geographic information and mapping of territories, digital treatment of the image, the importance of the biological databases, etc. The student also will purchase notions on computer programming given his to current importance for the exert of the biologist to professional level and scientist.			

Training and Learning Results

Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A5	Students should develop the necessary learning skills to undertake further studies with a high degree of autonomy.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D2	Communicate speaking and in writing in Galician.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Know handle tools of research of information in Biology.	A1 A3 A5	B4	C1	D1 D2 D3
Know handle databases and extract useful information.	A1 A3 A5	B4		D1 D2 D3
Know technicians of teledetection and analysis of image and his application for the study of ecosystems.	A1 A3 A5	B1 B4	C1	

Know basic technicians of systems of geographic information (GIS). Cartography, use of information georeferenced, vectorial analysis, environmental maps.	A1 A3 A5	B4	C1	
Know employ technicians of basic programming in Biology.	A1 A3 A5	B1 B4	C1	
Know tools for the analysis of data in Biology.	A1 A3 A5	B1 B4	C1	D1 D2 D3

Contents	
Topic	
Research of information in Biology.	Concept of database. Main biological databases. Applications of databases in biology. Creation and management of databases.
Technicians and physical principles of the teledetection.	Teledetection, spectrum EM, processes of interaction with the matter. Resolutions, orbits and sources of data of teledetection. Spectral behaviour of the covers, measurable parameters and indexes of interest in biology.
Visual and digital treatment of image.	Corrections, Improvements and Transformations
Systems of geographic information (*GIS).	Systems of Geographic Information, Systems of Coordinates and Projections. Conservation and management of the territory. GIS In R, vectorial formats and raster, operations with layers GIS.
Notions of programming.	The computer as a working tool in biology. Biology and the programming. What is to program? What is a programming language? Reasons for programming in Biology? Introduction to programming.
Free software for the programming and the treatment of data in Biology.	Tools for an open science

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	3	6	9
Lecturing	3	6	9
Lecturing	4	8	12
Practices through ICT	16	5	21
Practices through ICT	12	5	17
Practices through ICT	12	5	17
Problem solving	0	65	65
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Classes are organised in 50-minute sessions. In most cases they will be devoted to explaining basic concepts and methods. Due to time constraints, students will be asked to do autonomous work.
Lecturing	
Lecturing	
Practices through ICT	The aim of the practical sessions on the computer is to show some of the most important computational applications in Biology, as well as to introduce the student to basic aspects of database management and programming applied to Biology.
Practices through ICT	
Practices through ICT	
Problem solving	Problem solving and exercises complement and reinforce what has been seen in theoretical and practical classes. In the learning of the different uses of computer tools for Biology, problem solving is a very important pedagogical resource.

Personalized assistance	
Methodologies	**Description**

Problem solving	The student's learning process, which complements the lectures and practicals, will be carried out through the development of non face-to-face activities and through the Moovi distance learning platform. On this platform the student will find some of the following resources: the material with the presentations of the theory classes, complementary readings, useful documents to study and complete the theory classes, the practice scripts, lists of problems and exercises to be completed in a given period of time, and self-assessment exams. The lecturers will set aside time to attend to and resolve students' doubts, both for the lectures and for the practical classes. In these activities, the teacher's function is to orient and guide the students' learning process and help them to successfully complete the corresponding autonomous work. On the first days of class, the teaching staff indicate the procedure for carrying out this personalised attention.

Assessment

	Description	Qualification		Training and Learning Results	
Lecturing	- Final examination block 1 (TD) - Attendance to the face-to-face activities	14	A1 A3 A5		C1
Lecturing	- Final examination block 2 (R) - Attendance to the face-to-face activities	13	A1 A3 A5		C1
Lecturing	- Final examination block 3 (Python) - Attendance to the face-to-face activities	13	A1 A3 A5		C1
Practices through ICT*	Teledetection (TD): - Attendance and achievement - Final Examination - Report -Resolution of problems/exercises	20	A1 A3 A5	B4	C1
Practices through ICT*	R: - Attendance and achievement - Final Examination - Report -Resolution of problems/exercises	20	A1 A3 A5	B4	C1
Practices through ICT*	Python: - Attendance and achievement - Final Examination - Report -Resolution of problems/exercises	20	A1 A3 A5	B4	C1

Other comments on the Evaluation

The subject consists of three differentiated thematic blocks, which constitute per se important tools for the performance of modern Biology:

Thematic block-1: Remote sensing and geographic information systems (TD)

Thematic block-2: Data analysis and R programming language

Thematic block-3: Introduction to programming with Python

CONTINUOUS ASSESSMENT

It is the default evaluation mode. The detailed evaluation is:

Master lesson:

Face-to-face exam block 1: 14%

Face-to-face exam block 2: 13%

Face-to-face exam block 3: 13%

Assistance to face-to-face activities

ICT-supported practices:

Block 1: 20%

Block 2: 20%

Block 3: 20%

Attendance and use

Memory

Problem solving and exercises

Presentation of exercises on the virtual platform within the established period

Control at the end of each practice

Final exam

To pass the subject it is necessary

1) Obtain a minimum final grade of 4 out of 10 (40%) in each block, both in its practical part and in the final exam. If the minimum of each block is not exceeded, the subject will not be approved.

2) Attendance at all face-to-face activities (including practices) is MANDATORY to PASS the subject, except duly justified absence for any of the officially considered reasons for exemption (illness or federated sports commitments).

3) In the practical part, the student must take a test at the end of each practice of each group. Passing this test (or completing a project if the teacher so decides because the student has not passed the practical part) will be necessary to pass the subject in addition to the final exam. The practical part (attendance to practices plus passing the test or work if applicable) will account for 20% of the total final mark in each block.

4) The final exam is broken down into three independent tests, one per block, and each block accounts for 13% (14% in block 1) of the final grade, and it is necessary to obtain a minimum of 5 points out of 10 in said exam.

5) If, and only if, the minimum grade for each block has been exceeded, the final grade for the subject is calculated as the weighted average of the grades for each block according to the formula:

FIB final mark = block 1 (0.2 practical note + 0.14 exam) + block 2 (0.2 practical note + 0.13 exam) + block 3 (0.2 practical note + 0.13 exam).

If the minimum grade is not reached in any block, the final grade is failed.

That is to say, the minimum mark of each block must be reached to calculate the final mark in the indicated way. Note that the delivery of the memory, work and / or practical exercises required by the teacher in each block is mandatory so that the non-presentation of it prevents passing the subject (the minimum grade per block will not be reached).

Students who do not take the final exam will be recorded as Not Present.

Second opportunity

All grades, except for the final exam, will be saved for the second chance in July. Therefore, if a student has not completed the practical part (does not reach the minimum grade) they will not be able to pass the second chance exam. In the case of the final exam, if a student has passed a block, it is at the discretion of the teacher to save the note for the second opportunity. In any case, the student can always present himself to raise the grade.

GLOBAL EVALUATION

The request for this evaluation option must be submitted at the time and in the manner determined by the Center, which will be published prior to the academic start.

Given the experimental nature of all the activities, attendance at them is mandatory to be eligible for this evaluation option.

Failure to attend practices, compulsory classes and seminars, without justified cause, invalidates this possibility, as well as the opportunity for extraordinary evaluation (2nd opportunity).

In the case of the global exam, if the student has attended all the activities. The overall test is divided into two parts for each thematic block: a practical part (60% of the mark) and a theoretical part (40%) of the mark.

OTHER CONSIDERATIONS

Any attempt to carry out illegal activities in the exams (copying, etc.), as well as plagiarism in the activities carried out will result in a failing in the matter.

TEACHING TIMETABLE: http://bioloxia.uvigo.es/es/docencia/horarios

EXAM TIMETABLE: http://bioloxia.uvigo.es/es/docencia/examenes

TIPS TO FACILITATE THE SUBJECT

1) For a better development of the subject, it is advisable to CAREFULLY READ the Teaching Guide (methodology and evaluation), as well as the information presented on the Moovi platform continuously by the teaching staff and/or coordinator.

2) The didactic material published on the Moovi platform will facilitate the understanding of the explanations, will improve the resolution of questions and doubts and will make it possible to make profitable the time of the master classes, practices and tutorials, so it must be read by the student.

Sources of information

Basic Bibliography

Emilio Chuvieco, **Teledetección ambiental : la observación de la Tierra desde el espacio**, 2010

Hoboken, NJ, **QGIS and generic tools**, John Wiley and Sons, Inc, 2018

David Roldán Martínez, **Bioinformática. El ADN A Un Solo Clic**, 2015

Haddock S.H.D, **Practical Computing for Biologists**, Ed. Sinauer Associates, 2011

Hadley Wickham and Jenny Bryan, **R-packages**, O Reilly, 2015

Complementary Bibliography

Hadley Wickham, **Advanced R**, O Reilly, 2019

Dr. Martin Jones, **Python for Biologists: A complete programming course for beginners**, 2013

Paruelo, J.M, **La caracterización funcional de ecosistemas mediante sensores remotos**, Ecosistemas 17(3):4-22, 2008

Kerr, J., Ostrovsky, M, **From space to species: ecological applications for remote sensing**, Trends in Ecology and Evolution 18:299-305, 2003

Rodríguez-Sánchez, F., Pérez-Luque, A.J. Bartomeus, I., Varela, S, **Ciencia reproducible: qué, por qué, cómo.**, Ecosistemas 25(2): 83-92. Doi.: 10.7818/ECOS.2016., 2016

Carey MA, Papin JA., **Ten simple rules for biologists learning to program**, Computational Biology 14:e1005871, 2018

Himelblau E., **A cartoon guide to bioinformatics by a novice coder.**, Nature [Internet]. Available from: https://www.nat, 2021

Recommendations

Subjects that are recommended to be taken simultaneously

Statistics: Biostatistics/V02G031V01107

Subjects that it is recommended to have taken before

Biology: Evolution/V02G031V01101
Physics: Physics of biological processes/V02G031V01102
Geology: Geology/V02G031V01103
Mathematics: Mathematics applied to Biology/V02G031V01104