



## Teaching Guide

Teaching Guide				
Identifying Data				2020/21
Subject (*)	Fundamentals of bioinformatics		Code	614522008
Study programme	Mestrado Universitario en Bioinformática para Ciencias da Saúde			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	First	Obligatory	6
Language	English			
Teaching method	Hybrid			
Prerequisites				
Department	Ciencias da Computación e Tecnoloxías da InformaciónComputaciónFisioterapia, Medicina e Ciencias Biomédicas			
Coordinador	Munteanu , Cristian Robert	E-mail	c.munteanu@udc.es	
Lecturers	Fernández Lozano, Carlos Munteanu , Cristian Robert	E-mail	carlos.fernandez@udc.es c.munteanu@udc.es	
Web	moodle.udc.es			
General description	This course will provide concepts on the basic principles of genome annotation, sequence analysis, processing tools of molecular information, tools for drug design and evaluation of toxicity, biological databases, omics and epigenetics, the Human Genome, Exposome and Variome projects, and bioinformatics applications in clinical practice.			
Contingency plan	1. Modifications in the contents. No changes are made  2. Methodologies. *Teaching methodologies that are maintained. The same methodologies are maintained except for the evaluation mechanism and the teaching which would change from classroom to online through Teams.  *Teaching methodologies that are modified  3. Mechanisms for personalized attention to students Use of Moodle to provide the material to the students. Use of the Moodle forum to communicate all those events of the subject (modifications, deliveries of practices, etc.). Synchronous teaching in class time and asynchronous through Teams. Tutoring through Teams chat. Tutorials through e-mail.  4. Modifications in the evaluation *Evaluation observations: The evaluation mechanisms are maintained, with the change from classroom to online Teams sessions.  *Evaluation observations:  5. Modifications to the bibliography or webgraphy No changes are made.			

## Study programme competences

Code	Study programme competences
A1	CE1 - Ability to know the scope of Bioinformatics and its most important aspects
A6	CE6 - Ability to identify software tools and most relevant bioinformatics data sources, and acquire skill in their use
A7	CE7 - Ability to identify the applicability of the use of bioinformatics tools to clinical areas.
B1	CB6 - Own and understand knowledge that can provide a base or opportunity to be original in the development and/or application of ideas, often in a context of research



B2	CB7 - Students should know how to apply the acquired knowledge and ability to problem solving in new environments or little known within broad (or multidisciplinary) contexts related to their field of study
B3	CB8 - Students to be able to integrate knowledge and deal with the complexity of making judgements from information that could be incomplete or limited, including reflections on the social and ethical responsibilities linked to the application of their skills and judgments
B5	CB10 - Students should possess learning skills that allow them to continue studying in a way that will largely be self-directed or autonomous.
B6	CG1 -Search for and select the useful information needed to solve complex problems, driving fluently bibliographical sources for the field
B7	CG2 - Maintain and extend well-founded theoretical approaches to enable the introduction and exploitation of new and advanced technologies
B8	CG3 - Be able to work in a team, especially of interdisciplinary nature
C1	CT1 - Express oneself correctly, both orally writing, in the official languages of the autonomous community
C2	CT2 - Dominate the expression and understanding of oral and written form of a foreign language
C3	CT3 - Use the basic tools of the information technology and communications (ICT) necessary for the exercise of their profession and lifelong learning
C6	CT6 - To assess critically the knowledge, technology and information available to solve the problems they face to.
C8	CT8 - Rating the importance that has the research, innovation and technological development in the socio-economic and cultural progress of society

Learning outcomes			
Learning outcomes		Study programme competences	
To identify the characteristics of the computer science applications in health sciences		AJ1 AJ6	BJ1 BJ2 BJ3
To be able to develop a research project in the field of biomedical informatics according to ethical and security health data requirements		AJ7	BJ5 BJ6 BJ7 BJ8 CJ1 CJ2 CJ3 CJ6 CJ8
To know how to identify fields of application of information technologies and communications to improve the delivery of health services to citizens		AJ7	CJ1 CJ2 CJ3 CJ6 CJ8

Contents	
Topic	Sub-topic
Basic principles for Genome Annotation Sequence analysis Processing tools of molecular information Tools for drug design and evaluation of toxicity Biological databases Omics and epigenetics: genomics, proteomics, transcriptomics Projects: Human Genome, Variome, Exposome Bioinformatics applications in clinical practice	.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours



ICT practicals	A1 A6 A7 B1 B2 B3 B5 B6 B7 B8 C1 C2 C3 C6 C8	30	30	60
Oral presentation	A1 C1 C2 C3 C6 C8	5	5	10
Supervised projects	A1 C1 C2 C3 C6 C8	10	10	20
Objective test	A1 A6 A7 B1 B2 B3 B5 B6 B7 B8 C1 C2 C3 C6 C8	1	14	15
Guest lecture / keynote speech	A1 A6 A7 B1 B2 B3 B5 B6 B7 B8 C1 C2 C3 C6 C8	20	20	40
Personalized attention		5	0	5

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

Methodologies	
Methodologies	Description
ICT practicals	Laboratory practice can be face-to-face or through computer platforms such as TEAMS.
Oral presentation	Public presentation of the supervised work can be face-to-face or through computer platforms such as TEAMS.
Supervised projects	Practical work on the theoretical content of the course can be face-to-face or through computer platforms such as TEAMS.
Objective test	Exam on the theoretical content and supervised work carried out throughout the course if there is no supervised work. It can be face-to-face or through computer platforms such as TEAMS.
Guest lecture / keynote speech	In the theory sessions, the teacher describes the objectives and contents of the subject, to give a particular view of the subject to be dealt with and to relate it to others within the subject.  Then the corresponding topic is developed in the form of a lecture session, using the technical tools available, emphasizing certain issues in which the student must deepen his self-learning.  The master sessions can be face-to-face or through computer platforms such as TEAMS. It is also possible to include explanatory videos of different parts of the theoretical contents.

Personalized attention	
Methodologies	Description
Supervised projects Objective test Oral presentation Guest lecture / keynote speech ICT practicals	To solve the most complex aspects of the course, individual or group tutorials with students will be held.

Assessment			
Methodologies	Competencies	Description	Qualification
Supervised projects	A1 C1 C2 C3 C6 C8	The proposed work on the subject will be part of the evaluation.	30
Objective test	A1 A6 A7 B1 B2 B3 B5 B6 B7 B8 C1 C2 C3 C6 C8	If deemed necessary, a test on the theoretical and practical content of the course (including the topics of the lectures and publicly exposed supervised projects) may be conducted. The teacher can distribute points of this test among other methods if deemed appropriate.	30
Oral presentation	A1 C1 C2 C3 C6 C8	The public presentation of the supervised work will be part of the final assessment.	30
ICT practicals	A1 A6 A7 B1 B2 B3 B5 B6 B7 B8 C1 C2 C3 C6 C8	The quality and delivery in time of the practices will be assessed.	10



## Assessment comments

To pass this course, the student needs to obtain a minimum percentage in each of the methodologies.

## Sources of information

Basic	<ul style="list-style-type: none"><li>- Stekel, Dov. (2003). Microarray bioinformatics. Cambridge: Cambridge University Press, 2003</li><li>- Ohlebusch, Enno (2013). Bioinformatics algorithms : sequence analysis, genome rearrangements, and phylogenetic reconstruction. Ulm : Oldenbusch Verlag</li><li>- Dan E. Krane, Michael L. Raymer (2003). Fundamental concepts of bioinformatics. San Francisco, California : Benjamin Cummings</li><li>- Edward Keedwell and Ajit Narayanan (2005). Intelligent bioinformatics the application of artificial intelligence techniques to bioinformatics problems. Chichester : John Wiley &amp; Sons</li></ul> <p>Graph-based Processing of Macromolecular Information, Current Bioinformatics 10(5): 606-631 (2016), DOI: 10.2174/1574893610666151008012438   Cristian R. Munteanu, Vanessa Aguiar-Pulido, Ana Freire, Marcos Martínez-Romero, Ana B. Porto-Pazos, Javier Pereira, Julian Dorado   onlineRRegrs: An R package for Computer-aided Model Selection with Multiple Regression Models, Journal of Cheminformatics 7(1), 1-16, doi:10.1186/s13321-015-0094-2 (2015)   Georgia Tsiliki, Cristian R. Munteanu, Jose A Seoane, Carlos Fernandez-Lozano, Haralambos Sarimveis, Egon L. Willighagen   GitHub  10.5281/zenodo.21946   online Bio-AIMS Collection of Chemoinformatics Web Tools based on Molecular Graph Information and Artificial Intelligence Models, Combinatorial Chemistry &amp; High Throughput Screening 18(8):735-50 (2015)   Cristian R. Munteanu, Humberto González-Díaz, Rafael García, Mabel Loza, Alejandro Pazos   online S2SNet: A Tool for Transforming Characters and Numeric Sequences into Star Network Topological Indices in Chemoinformatics, Bioinformatics, Biomedical, and Social-Legal sciences, Current Bioinformatics 8(4), 429-437 (2013)   Cristian R. Munteanu, Alexandre L Magalhães, Aliuska Duardo Sánchez, Alejandro Pazos, Humberto González-Díaz   onlineTutorial Biopython: <a href="http://biopython.org/DIST/docs/tutorial/Tutorial.html">http://biopython.org/DIST/docs/tutorial/Tutorial.html</a></p>
Complementary	

## Recommendations

### Subjects that it is recommended to have taken before

### Subjects that are recommended to be taken simultaneously

### Subjects that continue the syllabus

## Other comments

Materia impartida en inglés

(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.