



Teaching Guide

| Teaching Guide | | | | |
|--------------------------|---|--------|--|-----------|
| Identifying Data | | | | 2019/20 |
| 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 | Face-to-face | | | |
| Prerequisites | | | | |
| Department | Ciencias Biomédicas, Medicina e FisioterapiaCiencias da Computación e Tecnoloxías da InformaciónComputación | | | |
| Coordinador | Munteanu , Cristian Robert | E-mail | c.munteanu@udc.es | |
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| 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. | | | |

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 |
| Oral presentation | Public presentation of the supervised work |
| Supervised projects | Practical work on the theoretical content of the course |
| Objective test | Exam on the theoretical content and supervised work carried out throughout the course. This test could be replaced by the supervised work. |
| Guest lecture / keynote speech | Theoretical lessons in the classroom |



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

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

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|----------------------|--|
| Basic | <ul style="list-style-type: none"> - Stekel, Dov. (2003). Microarray bioinformatics. Cambridge: Cambridge University Press, 2003 - Ohlebusch, Enno (2013). Bioinformatics algorithms : sequence analysis, genome rearrangements, and phylogenetic reconstruction. Ulm : Oldenbusch Verlag - Dan E. Krane, Michael L. Raymer (2003). Fundamental concepts of bioinformatics. San Francisco, California : Benjamin Cummings - Edward Keedwell and Ajit Narayanan (2005). Intelligent bioinformatics the application of artificial intelligence techniques to bioinformatics problems. Chichester : John Wiley & Sons 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 & 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: http://biopython.org/DIST/docs/tutorial/Tutorial.html |
| Complementary | |

Recommendations

Subjects that it is recommended to have taken before



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| Subjects that are recommended to be taken simultaneously |
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| 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.