| Teaching Guide | | | | |
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| Identifying Data | | | | 2024/25 |
| 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 | SpanishGalicianEnglish | | | |
| 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 |
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| Web | udconline.udc.gal | | | |
| 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 / results | |
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| Code | Study programme competences / results |
| 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 | |
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| Learning outcomes | Study programme competences / results |

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| To identify the characteristics of the computer science applications in health sciences | AJ1<br>AJ6 | BJ1<br>BJ2<br>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<br>BJ6<br>BJ7<br>BJ8 | CJ1<br>CJ2<br>CJ3<br>CJ6<br>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<br>CJ2<br>CJ3<br>CJ6<br>CJ8 |

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

| Planning | | | | |
|---|---|---|---|---|
| **Methodologies / tests** | **Competencies / Results** | **Teaching hours (in-person & virtual)** | **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 | 40 | 70 |
| Oral presentation | A1 C1 C2 C3 C6 C8 | 5 | 20 | 25 |
| Guest lecture / keynote speech | A1 A6 A7 B1 B2 B3 B5 B6 B7 B8 C1 C2 C3 C6 C8 | 20 | 20 | 40 |
| Personalized attention | | 15 | 0 | 15 |
| **(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.** | | | | |

| Methodologies | |
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| **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. |

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| 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.<br><br>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.<br><br>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 | |
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| **Methodologies** | **Description** |
| Oral presentation<br>Guest lecture / keynote speech<br>ICT practicals | To solve the most complex aspects of the course, individual or group tutorials with students will be held. |

| Assessment | | | |
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| **Methodologies** | **Competencies / Results** | **Description** | **Qualification** |
| Oral presentation | A1 C1 C2 C3 C6 C8 | The public exposition of the tutored work will be part of the final evaluation of the subject (45%). The quality of the work developed during class hours will be taken into account (30%). | 75 |
| 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. | 25 |

| Assessment comments |
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| To pass this course, the student needs to obtain a minimum percentage in each of the methodologies.<br>Plagiarism:<br>In any submission in which plagiarism is detected, the submission will be assessed a zero. Plagiarism in the objective test will be penalized in accordance with current university regulations.<br>The second opportunity exam is the same as the first opportunity exam (presentation of a project).<br>Part-time students may request from the deans/directors of the centers responsible for their degree program, or the coordinators of the master's programs, as the case may be, the academic exemption that exempts them from attending classes in those subjects, or parts of subjects, where such exemption is admitted in their course guide; however, in any case, they will be evaluated by the continuous assessment system. |

| Sources of information |
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|---|---|
| **Basic** | - Stekel, Dov. (2003). Microarray bioinformatics. Cambridge: Cambridge University Press, 2003<br>- Ohlebusch, Enno (2013). Bioinformatics algorithms : sequence analysis, genome rearrangements, and phylogenetic reconstruction. Ulm : Oldenbusch Verlag<br>- Dan E. Krane, Michael L. Raymer (2003). Fundamental concepts of bioinformatics. San Francisco, California : Benjamin Cummings<br>- Edward Keedwell and Ajit Narayanan (2005). Intelligent bioinformatics the application of artificial intelligence techniques to bioinformatics problems. Chichester : John Wiley & Sons<br>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** |
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| **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** |
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| **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.**