UAB
Universitat Autònoma de Barcelona

Bioinformatics

Code: 104872
ECTS Credits: 6

2024/2025

Degree	Type	Year
2503852 Applied Statistics	OB	2

Contact

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Teachers

Leonardo Pardo Carrasco

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

Basic knowledge of the English language is required as part of the teaching material is in that language.

Objectives and Contextualisation

The great scientific and technological advances that have occurred in recent decades in the fields of biology and computer science, as well as the development of powerful computer systems, fast internet connections and large information databases throughout the world, have allowed researchers an easily access to an enormous amount of unprecedented biological data. This course introduces students to the field of Bioinformatics, a specialty that uses computer databases to store, retrieve, and aid in the understanding of biological information. This specialty is an emerging field of science that deals with the development of various analytical methods and tools for the study of biological data in an efficient and rigorous manner.

During the course, the basic concepts of Bioinformatics and Computational Biology will be introduced, as well as the main methods for analyzing information from genomic and protein sequences, as well as for managing pharmacological data. The practical sessions will complement this knowledge, allowing students to become familiar with the details and the use of the main tools and online resources of the specialty.

Learning Outcomes

1. CM14 (Competence) Propose the statistical model needed to analyse data sets belonging to real studies.
2. KM17 (Knowledge) Recognise the statistical models for the analysis of data with different structures and complexities that frequently appear in different fields of application.
3. KM18 (Knowledge) Recognise the language of applications of economics and finances, biomedical science and engineering, provided by research and innovation in the field of statistics.
4. KM18 (Knowledge) Recognise the language of applications of economics and finances, biomedical science and engineering, provided by research and innovation in the field of statistics.
5. SM18 (Skill) Refine the information available for subsequent statistical processing.
6. SM19 (Skill) Analyse complex data, whether this is due to their characteristics or their size.

Content

1. Introduction to Bioinformatics
2. Concepts of Molecular Biology
3. Bioinformatics Databases
4. Introduction to Genomics
5. Main Genomic Projects. The Human Genome Project
6. Genetic Variations and Phenotypes
7. Introduction to the Comparison of Biological Sequences
8. Sequence Alignments and Databases Searches
9. Concepts of Pharmacology. Chemoinformatics
10. Proteomics

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical classes	26	1.04	
Theory classes	26	1.04	
Type: Supervised			
Tutoring	10	0.4	
Type: Autonomous			
Study	83	3.32	

The course is organized in sessions of two hours. Each session consists of a theoretical part (theory classroom) that will introduce the new concepts followed by a practical part (computer room) where the students will work on the implementation of concepts explained in the theoretical part. In each session the teacher will indicate the students some tasks to do autonomously, such as reading articles or sending reports. The material used by the teachers will be available on the Virtual Campus of the course.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Presentation class exercises	30	1	0.04	CM14, KM17, KM18, SM18, SM19
Theoretical-practical exam 1	35	2	0.08	CM14, KM17, KM18, SM19
Theoretical-practical exam 2	35	2	0.08	CM14, KM17, KM18, SM19

- Theoretical-practical test 1 (35%)

- Theoretical-practical test 2 (35%)

- Practical exercises (30%)

- Final recovery exam for those students who have not passed the subject through continuous assessment. To participate in this exam, students must have been previously evaluated in a set of activities that account for at least two-thirds of the total grade for the subject. The final exam will cover the entire course syllabus, and the minimum passing grade will be 5 points.

Bibliography

- Lesk A.M. *Introduction to Bioinformatics.* Oxford University Press 2005.
- Attwood, T.K., Parry-Smith, D.J.*, Introducción a la Bioinformática.* Pearson Education, 2002.
- Foulkes A.S. *Applied Statistical Genetics with R. For Population-based Association Studies.*Springer Dordrecht Heidelberg London New York. ISBN 978-0-387-89553-6
- Gonzalez JR, Cáceres A. *Omic association studies with R and Bioconductor*. Chapman and Hall/CRC, ISBN 9781138340565, 2019.
- Selzer PM, Koch O, Marhöfer RJ. Applied Bioinformatics: An Introduction. Cham: Springer International Publishing, 2018.
- Lee JK. Statistical Bioinformatics: A guide for life and biomedical science researchers. Hoboken, N.J.: Wiley-Blackwell, 2010.
- Baxevanis AD, Bader GD, Wishart DS. Bioinformatics: A practical guide to the analysis of genes and proteins. Fourth edition. ed. Hoboken, NJ: Wiley, 2020.

Software

R: https://www.r-project.org/

Rstudio: https://www.rstudio.com/

Datawarrior: https://openmolecules.org/datawarrior/

PyMol: https://pymol.org/2/

LigandScout: http://www.inteligand.com/

Language list

Name	Group	Language	Semester	Turn
(PLAB) Practical laboratories	1	Catalan/Spanish	first semester	afternoon
(TE) Theory	1	Catalan/Spanish	first semester	afternoon