



CE3C
centre for ecology, evolution
and environmental changes



**Ciências
ULisboa**
Faculdade
de Ciências
da Universidade
de Lisboa



Bioinformatics analysis of biological sequences

Lecturers: Teresa Nogueira (cE3c; INIAV- Instituto Nacional de Investigação Agrária e Veterinária)

Note: This course is online

Calendar: January 6^h-10th 2025

Duration: 36 hours (contact hours)

Schedule: 9h-12h30 and 14h-17h30, Monday-Thursday; 9h-13h and 14h-18h Friday

Objectives: Acquire knowledge regarding bioinformatic tools available to perform analysis of DNA and protein sequences, as well as autonomy and critical thinking in the use of those tools. Develop skills in the use of bioinformatics software freely available on the Internet and interpret the biological meaning of the results.

Overview

Nucleic acids are the molecular base of life through their unique ability to store and proliferate genetic information from DNA to proteins, through RNA. Besides storing genetic information, nucleic acids are also involved in other biological functions such as enzymatic catalysis and transcriptional regulation. There are thousands of totally sequenced genomes freely available. The number keeps on growing as at least one genome sequence is released every day. Large-scale sequencing requires bioinformatics analysis, whose algorithms will be the aim of this course, and that underlie the generation of reliable databases. Among the widely used tools for data mining is software designed for analysing and comparing amino acids and nucleotide sequences, allowing for identification and exploration of similarities. Additionally, algorithms form the basis for generating trustworthy sequence databases. Intelligent analysis of these databases facilitates the extraction of valuable information and scientific insights.

At the end of this course, participants, including researchers, molecular biology students, and health professionals, will be equipped to engage in data mining of nucleic acids and protein sequences. This skill set empowers them to uncover biological knowledge and implement innovative laboratory techniques in molecular biology, research, or diagnostics.

General Plan:

1. Nucleic acids and DNA Sequencing Technologies
2. Transforming Raw Data into Annotated Genomes
3. Molecular evolution and biological meaning of sequence alignment
4. Exploring Phylogeny
5. Aligning nucleotide and protein sequences
6. Functional and structural analysis of protein sequences
7. Analysis and discussion of case studies

Participants have to be present at 85% of the contact hours (this means that they can miss one half-day), and actively participate in all activities.

This course can give credits to PhD programmes at FCUL or of programmes with partnership from FCUL and other institutions with 6h-7h of contact hours per ECT, as a function of specific requirements. **For these students additionally to the exercises done during the week the delivery of a written report done after the course is mandatory.** For programmes with less hours of contact per ECT (6h/ECT, getting 6 ECTs from the course) students need to do an additional assignment (summary report). If needed 1 or 2 additional hours of contact may be added. Such report(s) are also advised for other students requesting creditation of the course in their institutions.

Location: by videoconference, link to provide before the start of the course

Nº (min, max) students: 10 – 20

Directed to: PhD or MSc students, postdocs, clinical analysts, and other professionals working in Biology, Biochemistry, and related topics.

Minimal formation of students: bachelor degree in Biology, Biochemistry, or related areas.

Fee: Free for 1st year PhD students in Doctoral programmes at FCUL (e.g. Biologia), Biodiversity, Genetics and Evolution (BIODIV UL; UP), Biology and Ecology of Global Changes (BEAG UL, UA) and Sustainability Science (UL, several institutions), when the course counts credits for their formation, in which case the delivery of a final report done after the course is mandatory; the course is also free for more advanced PhD students of the BIODIV programme (ULisboa or UPorto); 30 € for more advanced PhD students of cE3c; 60 € for PhD students of the PEERS network (CFE); 105 € for FCUL Master students and unemployed; 160 € for BTI, BI and other PhD students; 230 € for Professional and postdocs.

When the maximum number of students is reached, 10 vacancies will be available for non-paying 1st year PhD students mentioned above, being, by order of preference students from: 1) cE3c; 2) BIODIV (not from cE3c); 3) FCUL (not from cE3c); 4) Sustainability Science (not from cE3c or FCUL); 5) BEAG (not from cE3c or FCUL).

Deadline for applications: December 13th 2024

How to apply

Candidates should fill in a FORMULARY that will be available after the call is open.

This formulary is strictly confidential, as explained in the introduction, and the data are required because the cE3c Advanced Courses are also offered as part of the PRR programme of FCUL.

When filling the formulary mind to:

- 1) FILL ALL THE MANDATORY FIELDS
- 2) UPLOAD CV AND MOTIVATION LETTER, both mandatory; use the names as instructed there
- 3) If you want to resume later SAVE the formulary, otherwise you will need to fill everything again
- 4) At the end SUBMIT the formulary before exiting

For any doubts please contact the cE3c coordinator of the cE3c courses Margarida Matos (mmmatos@fc.ul.pt) or the teacher Teresa Nogueira (teresainogueira@gmail.com)