UCLouvain

lgbio2010

2019

Bioinformatics

In view of the health context linked to the spread of the coronavirus, the methods of organisation and evaluation of the learning units could be adapted in different situations; these possible new methods have been - or will be - communicated by the teachers to the students.

5 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Dupont Pierre ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	• Introduction to molecular biology • Searching methods in biological databases • Sequence comparisons, sequence alignment algorithms • Motif search • Hidden Markov models • Gene expression measurement technology • Transcriptome analysis methods • Inference of interaction networks • Phylogeny
Aims	1 With respect to the AA referring system defined for the Master in biomedical engineering, the course contributes to the development, mastery and assessment of the following skills : • AA1.1, AA1.2, AA1.3 • AA2.2, AA2.4 • AA4.3 • AA5.3 At the end of this course, students will be able: - to master the basic concepts of molecular biology for appropriate use of bioinformatics tools, - to design and develop tools or methods for database management, information extraction and data mining, - to formulate informed decisions between the many computational methods that are available for solving biological questions, - to carry out a collaborative project aiming at the resolution of a bioinformatics problem and taking benefit from complementary student's education and expertise, - to use the information available in major sequence databases (Genbank, Uniprot) with a critical mind and with discernment, - to master a software environment such as R (Bioconductor). - - - - *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** The final grade consists of • 25% for computing projects implemented in groups during the semester • 75% for the final exam The projects cannot be re-implemented for the second session. Hence, the project grade is fixed at the end of the semester. The final exam is, by default, a written exam (on paper or, when appropriate, on a UCLouvain computer).
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Lectures and computing projects. The projects are made in groups of 2 students to implement, possibly to adapt, concrete algorythms covered in the course lectures. The R language is recommended to implement these projects. An R tutorial is included at the beginning of the first project.

Content	• Overview of basic concepts in molecular biology • Search in biological databases • Sequence comparison, pairwise and multiple sequence alignments • Hidden Markov models • Phylogenetic tree inference algorithms • Gene expression analysis methods (transcriptomics) • Biomarker selection • Predictive modeling • Survival data analysis
Inline resources	Moodle http://moodleucl.uclouvain.be/course/view.php?id=8915
Bibliography	Recommended textbooks - Ouvrages complémentaires conseillés : - *Biological Sequence Analysis : Probabilistic Models of Proteins and Nucleic Acids,* R. Durbin et al., Cambridge University Press, 1998. - *Inferring Phylogenies*, J. Felsenstein, Sinauer Associates; 2nd ed., 2003. - *Bioinformatics, Sequence and Genome Analysis*, D. Mount, Cold Spring Harbord Laboratory Press, 2nd ed., 2004. - *Introduction to Computational Genomics : a case-study approach*, N. Cristianini M. Hand, Cambridge University Press, 2007.
Faculty or entity in charge	GBIO

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Data Science Engineering	DATE2M	5		🔍
Master [120] in Biomedical Engineering	GBIO2M	5		🔍
Master [120] in Computer Science and Engineering	INFO2M	5		🔍
Master [120] in Mathematical Engineering	MAP2M	5		🔍
Master [120] in Statistic: Biostatistics	BSTA2M	5		🔍
Master [120] in Computer Science	SINF2M	5		🔍
Master [120] in Data Science: Information Technology	DATI2M	5		🔍