UCLouvain

lboe2165

2022

Evolutionary genomics and transcriptomics

4.00 credits	30.0 h + 18.0 h	Q2

This biannual learning is being organized in 2022-2023

Teacher(s)	Dennis Alice ;Page Melissa ;
Language :	English
Place of the course	Louvain-la-Neuve
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 Currently, system biology is widely used in environmental sciences. This class is a theoretical course of genomics and proteomics. It aims at teaching the students the scientific and informatics skills in order to be able to determine DNA sequences of organisms and fine-scale genetic mapping of genomic data. In addition, it gives the students scientific and technical skills in order to deeply understand scientific articles relating to environmental proteomics, and to help them to fit in research teams developing this approach.
Evaluation methods	For Prof. Melissa Page (**transcriptomic part**) is an exam made up of open and written questions For the part of Prof K. Van Doninck (**genomic part**) it is a written report (max 5 pages) which develops a genomic topic in more detail. For both parts of the practical work, a detailed report of the practical work must be submitted. It is necessary to participate in all the practical work sessions to obtain a TP rating. *Please note :* *the success of the exam with a total of 10/20 is conditioned by the success of each part (two theoretical parts, two practical parts) with a minimum of 7/20. The overall rating for the course will be the rating of the failed game if either game is rated at 7/20 or even lower.* *Partial exemptions valid for sessions of the same academic year are possible if one, but not all of the parts of the course are successful (i.e. 10/20 or more), after request and written agreement from the holders (by email).*
Teaching methods	Lectures in the classroom ; practical work with assistants in the computer room. Support ppt files on moodle UCL and UNamur platform.
Content	This course is given by two lecturers in two parts. This course has 30 hours of volume 1 and 18 hours of volume 2 : - 18 hours volume 1 + 12 hours volume 2 by Prof Van Doninck at UNamur - 12 hours of volume 1 + 6 hours of volume 2 by Prof. Melissa Page at UCLouvain This course is partially linked to the LBOE2124 Molecular Ecology course. **Transcriptomics part** (Melissa Page, UCLouvain) : **Theory :** History: Transcriptomics as one tool in the toolkit box- Why is transcriptomics such a huge success in Evolution and Ecology? Methodology : Experimental procedure - Differences between genomics and transcriptomics - Technological limitations and perspectives of transcriptomics; Another tool in the toolkit box: (e) Quantitative Trait Loci; Case studies using transcriptomics in Evolutionary Ecology with a focus on studies done with data obtained from the wild : Transcriptomics for understanding the Anthropocene, Stickleback fishes Gasterosteus aculeatus case study, Transcriptomics in butterflies, General conceptual conclusions from these case studies; Conclusions at the methodological level. **Part practical work :** analysis of an unpublished transcriptome and identification of candidate genes involved in the production of a physiological trait under sexual selection, the sex pheromone of a model butterfly. **Genomics part** (Prof. K Van Doninck, UNamur) : **Theory :** - History of genomics - Evolution of genomes - High throughput sequencing methods - Principles of genome assembly - Comparative genomics, functional genomics - Research applications genomics (conference given by Dr. Olivier Jaillon of Genoscope (France) or another researcher who does cutting-edge research in genomics). **Part practical work :** Computer tools used to : 1/ analyze a protein of interest - search for homology by Blast - localization on the genome - functional analysis by Pfam - 3D visualization by Swissmodel,

	2/ search for primers by Primer3 and search for sites of restriction by Webcutter or Nebcutter, 3/ alignment and phylogenetic analysis (ML) of genes homologous to the protein of interest, 4/ E.coli genome assembly using Illumina data (different parameters are tested), 5/ synteny analyzes in order to study the evolution of genomes.
Inline resources	Access UCLouvain's online moodle platform for course content and information on the practical organization of the course
Bibliography	• Fichiers ppt des cours; livres et documents de référence sur la plateforme en ligne moodle
Other infos	**Prerequisites :** - basic knowledge in genetics and biochemistry are necessary - the slides seen during the course serve as teaching support - scientific articles will be analyzed during the course.
Faculty or entity in charge	BIOL

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Biology of Organisms and Ecology	BOE2M	4		🔍
Master [60] in Biology	BIOL2M1	4		🔍