

Course Specifications

From the academic year 2016-2017 up to and including the

Phylogenetics (C003311)

Course size (nominal values; actual values may depend on programme)
Credits 4.0 Study time 120 h Contact hrs 32.0 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	English	lecture	15.0 h
		self-reliant study activities	15.0 h
		seminar: practical PC room classes	20.0 h

Lecturers in academic year 2018-2019

De Clerck, Olivier	WE11	lecturer-in-charge
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Offered in the following programmes in 2018-2019

	crdts	offering
International Master of Science in Agro- and Environmental Nematology	4	A
Master of Science in Biochemistry and Biotechnology	4	A
Master of Science in Biology	4	A
Exchange programme in Biochemistry and Biotechnology (master's level)	4	A
Exchange Programme in Biology (master's level)	4	A

Teaching languages

English

Keywords

Molecular evolution, phylogeny, evolution

Position of the course

The students learn how to reconstruct and interpret genealogical relationships between organisms or genes and how to interpret these from an evolutionary perspective. The emphasis is on nucleic acids and protein sequences. The student will study the basic principles of molecular evolution, alignment of homologous sequences, the various analytical methods and their underlying principles. The student learns to analyze data (own data or sequences from databases). There will be attention for comparative phylogenetic methods which will focus on ancestral state reconstruction, historical biogeography and diversification analysis.

Contents

- Why Phylogenetics Matters
- The Biology of Linear Molecules (DNA and Proteins)
- Evolutionary Principles
- Populations and Trees
- Databases
- Homology and Pairwise Alignment
- Multiple Alignments and Constructing Phylogenetic Matrices
- Tree Building
- Robustness and Rate Heterogeneity in Phylogenetics
- Bayesian Analysis
- Incongruence
- Adapting Population Genetics to Genomics
- Detecting Natural Selection in Genomes
- A Phylogenetic Perspective of Biological Diversity: Tree of Life, DNA Barcoding and Metagenomics

Initial competences

Basic knowledge of genetics, systematics, taxonomy and evolution

Final competences

- 1 Students will acquire insights in molecular evolution and the reconstruction of genealogical relations of organisms based on phylogenetic principles.
- 2 From a practical point of view students are able to apply the most important phylogenetic techniques and interpret them correctly. This knowledge is essential for successfully accomplishing research projects in which relationships between organisms occupy a central place.
- 3 Student understand the theoretical foundations of phylogenetic analyses (parsimony, distance methods, maximum likelihood, bayesian analyses).
- 4 Students are capable to compile a dataset of DNA sequences from public databases.
- 5 Students are exposed to Next Generation Sequencing data, assembly of the individual reads and annotation using BLAST.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, self-reliant study activities, seminar: practical PC room classes

Extra information on the teaching methods

Exercises will take place in PC-classes under supervision of teachers and assistants. They are designed to introduce the student to the various software programs used to infer phylogenies. Students also carry out an 'independent work' where they apply their theoretical knowledge on a self-selected casus.

Learning materials and price

- Textbook: De Salle & Rosenfield. 2012. Phylogenomics: a primer. Garland Publishing. 352 pages. (70 Euro)
- Presentation slides (pdf)
- Supplementary literature (pdf)

References

De Salle & Rosenfield. 2012. Phylogenomics: a primer. Garland Publishing. 352 pages.

Course content-related study coaching

Opportunity for questioning the lecturers during the orals, and outside these via email, personal contact and in an electronic teaching environment.

Evaluation methods

end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Oral examination

Examination methods in case of periodic evaluation during the second examination period

Oral examination

Examination methods in case of permanent evaluation

Report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

Single evaluation for theory and practicals. Oral exam with written preparation.

Calculation of the examination mark

3/4 oral exam + 1/4 assignment