GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2025-2026

Molecular Toolbox (C003817)

Course size *(nominal values; actual values may depend on programme)*

Credits 4.0 **Study time 110 h**

Course offerings and teaching methods in academic year 2025-2026

A (semester 1)	English	Gent	practical
			seminar
			lecture

Lecturers in academic year 2025-2026

Gheysen, Godelieve	LA25	lecturer-in-charge

Offered in the following programmes in 2025-2026	**crdts**	**offering**
International Master of Science in Agro- and Environmental Nematology	4	A

Teaching languages

English

Keywords

DNA structure, gene expression, gel electrophoresis, PCR, cloning, restriction enzyme, hybridisation, DNA sequence, DNA polymorphisms, genetic engineering.

Position of the course

Basic course in molecular biology as preparation to
- Nematode systematics and molecular phylogenetics
- Molecular aspects of plant-nematode interactions

The aim of this course is to give the student knowledge of and insight in gene structure, gene expression and the most widely used molecular techniques

Contents

1. Genes and genomes: DNA, RNA and protein structure; nuclear, chloroplast and mitochondrial DNA; transcription and its regulation; translation; genotype and phenotype; mutations and polymorphisms
2. DNA and RNA hybridisation
3. DNA synthesis: DNA replication in cells; Polymerase Chain Reaction; gel electrophoresis; cDNA and RT-PCR; Real-Time PCR or Quantitative PCR (Q-PCR); Sanger Sequencing
4. Additional molecular analysis methods: protein analysis; next generation sequencing
5. Molecular evolution and molecular identification
6. Molecular markers to analyse diversity and progeny including marker assisted selection or genomic breeding
7. Restriction enzymes, cloning, transformation, genetic engineering for research and commercial applications; RNAi; Gene editing (CRISPR)

Initial competences

Basic knowledge biology and biochemistry.

Final competences

1 Have insight into the structure of DNA, RNA, and proteins and the central dogma of molecular biology.
2 Explain the technical steps executed in the basic techniques used for molecular analysis.
3 Describe the purpose and the (dis)advantages of the basic techniques used for molecular biology.

4 Choose and justify an appropriate molecular technique for a certain purpose (routine analysis, diagnostics, experiment, ...).
5 Choose and explain a cloning and transformation technique for an application in research or agriculture

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

Seminar, Lecture, Practical

Extra information on the teaching methods

Practical exercises:
2 lab sessions: DNA-extraction, PCR, restriction, agarose gel electrophoresis, polyacrylamide gel electrophoresis for protein analysis; evaluated by participation
2 computer sessions; evaluated by small report

Study material

Type: Syllabus

Name: Molecular toolbox
Indicative price: € 20
Optional: no
Language : English
Number of Pages : 140
Oldest Usable Edition : 2024
Available on Ufora : Yes

Type: Slides

Name: ppt
Indicative price: Free or paid by faculty
Optional: no
Language : English
Number of Slides : 670
Available on Ufora : Yes

References

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Course content-related study coaching

by email or personally (after the class or on appointment)

Assessment moments

end-of-term assessment

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

Oral assessment

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

Oral assessment

Examination methods in case of permanent assessment

Participation, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

Oral examination with written preparation

Calculation of the examination mark

- 80% on examination
- 20% on participation and report of practical exercises.

Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.