GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2024-2025

Gene Technology (I700233)

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

Credits 4.0 **Study time 120 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 1)	English	Gent	independent work
			practical
			lecture

Lecturers in academic year 2024-2025

Boudolf, Véronique	LA25	staff member
Kyndt, Tina	LA25	lecturer-in-charge
Briers, Yves	LA25	co-lecturer
Van Damme, Els	LA25	co-lecturer

Offered in the following programmes in 2024-2025	crdts	offering
Bachelor of Science in Bioscience Engineering Technology	4	A
Linking Course Master of Science in Biochemical Engineering Technology	4	A

Teaching languages

English

Keywords

Cloning vectors, expression vectors, cDNA and genomic libraries, DNA, RNA and protein analysis techniques, PCR applications, molecular markers, gene isolation, gene and genome analysis

Position of the course

Gene technology is, on the one hand, used for targeted modification of organisms, and therefore the desired DNA fragment needs to be cloned. On the other hand, a multitude of molecular techniques are being used to investigate living organisms and to identify individuals or characteristics. A diversity of techniques have been optimized and novel techniques are constantly developed. In this course, these techniques are explained and their applications are illustrated. Next to basic concepts also more recent trends are explained.

Contents

Introduction
Gene technology and molecular diagnostics
Prokaryotic and eukaryotic genomes
Gene expression
DNA hybridization
Probe technology, detection methods
in situ hybridization
colony hybridization
macro and microarray (chip) technology
PCR and qPCR
Basic principles
problems concerning specificy, accuracy and contaminations
technical variants of PCR
non-PCR amplification methods
(semi)quantitative PCR, real-time PCR and digital droplet PCR
applications

Recombinant DNA
enzymes used for recombinant DNA
restriction enzyme-based DNA assembly
non-restriction enzyme-based DNA assembly
synthesis and cloning of cDNA and cDNA libraries
genomic libraries
analysis of clones
Sequencing
Sanger sequencing
Cloning vectors and applications
basic structure of a vector
expression vector for production of proteins
examples of recombinant proteins: enzymes, therapeutics, vaccines, etc.
Analysis of genetic variation via DNA polymorphisms
Introduction to molecular markers
molecular marker analysis across the genome
specific DNA regions for specific applications
applications of molecular markers in plant or animal breeding
comparison of different markers for different applications
marker-assisted selection or biotechnology?

Initial competences

- Insight in the structure of DNA, RNA and proteins
- Knowledge about gene expression (transcription and translation)

Final competences

1 Have knowledge on genome structure and genetic diversity on molecular level
2 Use of techniques for analysis of DNA, RNA and proteins, with interpretation of results
3 Have insight in genome structure, gene structure, gene expression and regulation of gene expression
4 Be able to look up and analyse DNA sequences in databases, and be able to look up data in other scientific databases
5 execute tasks on DNA and gene analysis in a scientific framework
6 Be able to choose the most appropriate molecular technique for analysis of a problem
7 Be able to recognize and know the function of the most important elements of a DNA vector
8 To work concisely in a molecular lab and be able to critically analyse the results
9 Be able to explain and compare the pro's and con's of different molecular analysis tools
10 Know the correct terminoloyg of molecular genetics and recombinant DNA technology
11 Be able to collobarate in a group for the execution of experiments and theoretical exercises
12 Orally present a group work to colleagues and experts

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, Practical, Independent work

Extra information on the teaching methods

The practical exercises consist of two parts.
In part I, we use PCR-RFLP on isolated DNA of epithelial cells to determine blood type.
In part II, a cloning experiment is executed in silico and in vitro, using electroporation-transformation and analysis via blue-white screening and PCR.

Study material

Type: Handbook

Name: Practicum manual
Indicative price: € 2
Optional: no
Language : English
Author : Yves Briers, Veronique Boudolf, Margaux Vanhaverbeke
Number of Pages : 40
Online Available : Yes
Additional information: The student must bring the electronically provided material printed to the practical session

Type: Syllabus

Name: Course notes theory Gene technology
Indicative price: Free or paid by faculty
Optional: no
Language : English
Number of Pages : 140
Available on Ufora : Yes
Online Available : Yes

Type: Slides

Name: Theory Gene technology
Indicative price: Free or paid by faculty
Optional: no
Language : English
Number of Slides : 600
Available on Ufora : Yes
Online Available : Yes

References

Course content-related study coaching

through e-mail or personally (after making an appointment)

Assessment moments

end-of-term and continuous assessment

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

Written assessment with open-ended questions

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

Examination methods in case of permanent assessment

Oral assessment, Participation, Written assessment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Calculation of the examination mark

75% on exam, 25% on report of excersises and participation. The practical score is composed of permanent evaluation (5%), a theoretical excercise (10%) and presentation/defense (10%).
Practical exercises are obligatory. Students that echew from this part can be scored as 'inssufficient' for the course.
In case of legal absence, students do no need to catch up, but can get some extra theoretical questions to be answered.
Illegal absence will lead to a total score of maximum 9/20, regardless of the scores for the theoretical exam. If a student scores less than 9/20 on either theory or practicals, this student cannot pass and will receive the lowest non-pass score.
When the student does not participate in the evaluation of one of the course modules, or gets a score below 8/20 (not rounded) for one or more course modules, he/she can not succeed for the course.