GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2020-2021

Molecular Genetics II (C003182)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

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

Credits 4.0 Study time 115 h Contact hrs 42.5 h

Course offerings and teaching methods in academic year 2020-2021

A (semester 1)	Dutch	Gent	seminar: coached exercises	7.5 h
			practicum	15.0 h
			lecture	20.0 h
			online seminar: coached exercises	0.0 h
			online lecture	0.0 h

Lecturers in academic year 2020-2021

De Jaeger, Geert	WE09	lecturer-in-charge

Offered in the following programmes in 2020-2021	crdts	offering
Bachelor of Science in Biology	4	A
Master of Science in Teaching in Science and Technology (main subject Biology)	4	A
Preparatory Course Master of Science in Biology	4	A

Teaching languages

Dutch, English

Keywords

Forward and reverse Genetics, laws of heredity for genetic analysis, pedigree analysis, gene mapping, gene interactions, genomics and functional genomics, transgene technology, gene regulation in eukaryotes, epigenetics, genome and chromosome mutations.

Position of the course

The student gets acqainted with the genetical principles that underlie gene analysis in eukaryotes. In a research focused manner, the different steps are presented in forward genetics, from gene identification, over gene mapping, towards the study of gene interactions. Besides, complementary methods in reverse genetics and functional genomics are discussed. All this gets illustrated with concrete examples from genetic research on model organisms and human. Further, chromosomal mutations and their impact on human disease and breeding is discussed. Finally we focus on regulation of gene expression and epigenetics.

Contents

- Single gene inheritance: Mendel’s first law, gene discovery based on segregation ratios, sex-linked inheritance, pedigree analysis
- Independent assortment of genes: Mendel’s second law, applications in breeding, polygenetic inheritance, cytoplasmic inheritance
- Gene mapping in eukaryotes: linkage, mapping based on recombination frequency, molecular markers, map-based cloning
- Gene interactions: allelic interactions, genes in the same pathway, epistasis, analysis of double mutants, penetrance and expressivity
- Reverse genetics in yeast, mouse, Arabidopsis, C. elegans and fruitfly: transgene technology, knock-out, RNAi, overexpression technology, CRISPR-CAS
- Functional genomics: cDNA-AFLP, micro array, yeast 2-hybrid, ChIP on chip.
- Genomic mutations in eukaryotes: euploidy, aneuploidy, deletions, inversions and translocations, gene dosage.

- Regulation of gene expression in eukaryotes: transcription factors, chromatin, epigenetics.

Initial competences

Basic knowledge cell biology, biochemistry and molecular genetics. Topics in Molecular Genetics I, teached in 2nd bachelor, are known.

Final competences

1 The student has profound insight in genetical principles of eukaryotes.
2 The student uses genetic terms in a correct manner.
3 The student can apply genetic principles in advanced genetic exercises.
4 The student can systematically perform basic molecular genetic experiments in a small team.
5 The student is able to collect data with diverse biological techniques and integrate them for functional gene analysis.
6 The student is able to apply basic statistics on genetic problems.
7 The student has basic knowledge of genome wide techniques and transgene technology and can apply them in a theoretical and practical research setting.
8 The student is able to report, describe and discuss genetic data and experimental results.
9 The student is aware of the socio-economic dimension of genetic engineering and the public discussion.

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, practicum, seminar: coached exercises, online lecture, online seminar: coached exercises

Extra information on the teaching methods

20h lectures, 7,5h guided exercises, 15h practical work
Because of COVID19, modified working methods can be rolled out if necessary

Learning materials and price

Introduction to Genetic Analysis by Griffiths et al., 11th edition.
ISBN-10: 1-4641-8804-1 (price: 60 EUR)

References

Course content-related study coaching

Apart from the theoretical courses, the students have always the opportunity to ask particular or general questions to the lecturers concerning particular parts of the course. This can be done by using email or in a personal discussion with the lecturers.

Evaluation methods

end-of-term evaluation and continuous assessment

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

Written examination

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

Written examination

Examination methods in case of permanent evaluation

Report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is not possible

Extra information on the examination methods

Students are evaluated on theoretical knowledge and understanding, and genetic problems have to be solved. It is also evaluated whether students can apply the genetic tools in a theoretical research setting. Details on amount and type of questions will be explained during the lectures and on Ufora.

Calculation of the examination mark

The written exam holds 16 of the 20 points, divided in 10 points for theoretical questions and 6 points for solving genetic problems. The remaining 4 points go to the

practicum report. To pass this course one has to participate in the practicum, obtain at least 5/10 for theoretical questions, and at least 5/10 on the integration of the practicum report and the solving of genetic problems. Students with unjustified absence on the practicum or a score of less then 4/10 on one of both components will obtain a score that is at maximum the highest non-deliberative quotation (7/20). Students with a score of at least 4/10 but less then 5/10 on one of both components, and a total that is at least 10/20 will obtain the highest failing mark (9/20). The score on the theoretical questions or the score on the genetic problems and the practicum report can be transferred to the second chance exam on the condition that at least a score of 7/10 is obtained.