



## Genome Analysis (1002616)

Wegens Covid19 kan mogelijk afgeweken worden van de onderwijs- en evaluatievormen. Dergelijke afwijkingen zullen via Ufora worden gecommuniceerd.

**Cursusomvang** *(nominale waarden; effectieve waarden kunnen verschillen per opleiding)*

Studiepunten 5.0 Studietijd 150 u Contacturen 50.0u

### Aanbodsessies in academiejaar 2021-2022

A (semester 2) Engels Gent

### Lesgevers in academiejaar 2021-2022

De Meyer, Tim LA26 Verantwoordelijk lesgever

### Aangeboden in onderstaande opleidingen in 2021-2022

	stptn	aanbodsessie
Master of Science in Bioscience Engineering: Cell and Gene Biotechnology	5	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: cel- en genbiotechnologie (niveau master-na-bachelor)	5	A

### Onderwijsstalen

Engels

### Trefwoorden

Genome analysis, high-throughput data analysis, omics, next-generation sequencing, microarrays, RNA-seq

### Situering

Many recent methods in molecular biology generate huge amounts of data. This course aims at familiarizing students with these data, how to process and statistically analyze them using state-of-the-art methods, and where/how to find or deposit this type of data. Ethical implications, including scientific integrity and sustainability, are discussed.

### Inhoud

The following methods and concepts will be discussed and illustrated for common omics data, such as microarrays, RNA-seq ChIP-seq, bisulfite sequencing, single-cell methods, ...

- Omics data repositories and databases, ethical considerations/sustainability
- Multiple hypothesis testing: family-wise error rate / false discovery rate
- Data preprocessing for omics data: alignment (conceptual), background correction, summarization, data normalization, quality control
- Relevant data formats, bv. FASTQ, GTF/GFF, SAM/BAM, ...
- Moderated statistical methods for hypothesis testing
- Gene set analysis / pathway analysis
- Evolution of omics technologies and their (dis)advantages for specific applications
- Capita selecta (may vary from year to year): bulk-segregant analysis, GWAS, proteomics, data integration and visualization, genotyping

The course focuses on conceptual insight in concrete problems and solutions and their application rather than the statistical/mathematical/software implementation.

### Begincompetenties

Genetics and molecular biology, solid knowledge of basic data analytical methods (e.g. ANOVA, regression, GLM, PCA)

### Eindcompetenties

- 1 able to find relevant omics datasets
- 2 able to solve common research questions with appropriate data-analytical methods, using the R and Bioconductor software environment

- 3 have basic insight in several important methods for preprocessing and analysis of omics datasets
- 4 have insight in different omics technologies and their (dis)advantages, also from an ethical point of view
- 5 report scientifically on omics data analysis
- 6 work in a team in a constructive and responsible manner

#### **Creditcontractvoorwaarde**

Toelating tot dit opleidingsonderdeel via creditcontract is mogelijk na gunstige beoordeling van de competenties

#### **Examencontractvoorwaarde**

Dit opleidingsonderdeel kan niet via examencontract gevolgd worden

#### **Didactische werkvormen**

Demonstratie, Online groepswerk, Online hoorcollege, Groepswerk, Online werkcollege: pc-klasoeferingen, Hoorcollege, Online demonstratie, Werkcollege: pc-klasoeferingen

#### **Toelichtingen bij de didactische werkvormen**

Online teaching methods only as back up, cf. COVID19 measures.

#### **Leermateriaal**

Annotated slides, scientific papers

#### **Referenties**

#### **Vakinhoudelijke studiebegeleiding**

During the practical sessions in the PC classes, the students are coached by an assistant. Q&A sessions are organized to solve practical problems with the assignment. For non-assignment related questions, students may communicate with the lecturer/assistant by E-mail, which may lead to an appointment if required.

#### **Evaluatiemomenten**

periodegebonden en niet-periodegebonden evaluatie

#### **Evaluatievormen bij periodegebonden evaluatie in de eerste examenperiode**

Openboekexamen

#### **Evaluatievormen bij periodegebonden evaluatie in de tweede examenperiode**

Openboekexamen

#### **Evaluatievormen bij niet-periodegebonden evaluatie**

Mondeling examen, Peer-evaluatie, Werkstuk

#### **Tweede examenkans in geval van niet-periodegebonden evaluatie**

Examen in de tweede examenperiode is mogelijk

#### **Toelichtingen bij de evaluatievormen**

The final examination consists of a written examination (open book). Most of the questions aim to assess the insight of the student in omics data-analysis and how this results in conclusions. The assignment relates to a real life problem and students may work together in groups. The result of the assignment will be reported by means of a written report and a presentation, upon which both results and used methods will be further discussed ("oral examination"). Depending on the group size, peer-evaluation may be used. This may lead to a score modification of at most two points for the assignment, unless a student did clearly insufficiently contribute (should be reported by fellow group members during semester), in which case a more severe penalty is possible.

#### **Eindscoreberekening**

The total mark is a weighted average of:

- Assignment (12/20)
- Open book examination (8/20)