Course Specifications
Valid as from the academic year 2017-2018

Genome Analysis (I001955)

Course offerings and teaching methods in academic year 2018-2019
A (semester 2) English lecture 30.0 h
seminar: practical PC room classes 30.0 h

Lecturers in academic year 2018-2019
Thas, Olivier LA26 lecturer-in-charge
De Meyer, Tim LA26 co-lecturer

Offered in the following programmes in 2018-2019
Master of Science in Bioscience Engineering: Cell and Gene Biotechnology
Exchange Programme in Bioscience Engineering: Cell and Gene Biotechnology (master's level)

Teaching languages
English

Keywords
Genome analysis, high-throughput data-analysis, rt-qPCR, dPCR, microarrays, ChIP-seq, RNA-seq

Position of the course
Recent biotechnology methods typically generate enormous amounts of data. During this course, students will become familiar with these types of data, and will learn how to analyze them in a state of the art manner.

Contents
The following genome data analysis methods will be covered and illustrated on microarrays, RNA-Seq, qPCR, and dPCR:
Data preprocessing
- Data normalization, background correction, summarisation
- Data-type specific examples

Data-exploration
- PCA and SVD
- Cluster analysis
- Data-type specific examples

High-throughput statistical data-analysis
- Family-wise error rate / false discovery rate
- Large-scale statistical hypothesis testing (e.g. differential gene expression)
- Classification, sensitivity, specificity, ROC curves
- High dimensional prediction models
- Data-type specific examples

Initial competences
Genetics and molecular biology, a solid basis knowledge of statistics (hypothesis testing, regression, ANOVA)

Final competences
1 The student is able to explore large genomic data sets and he/she can formulate answers to some typical substantive research questions through the application of
data-analysis methods, using the statistical software R and Bioconductor.

2 The student has knowledge of some important methods for the preprocessing and analysis of genomic and high-dimensional data.

3 The student can correctly report the results of analyses of genomic and high-dimensional data.

4 The student can take responsibility and initiative in a group effort.

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, seminar: practical PC room classes

Learning materials and price

Cursusnota’s (inclusief de slides) en wetenschappelijke papers

References

Course content-related study coaching

In the practical sessions in the PC classes the students are coached by an assistant. Students can make an appointment to ask questions to the lecturers. Questions and answers can be exchanged in Minerva.

Evaluation methods

end-of-term evaluation and continuous assessment

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

Open book examination

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

Open book examination

Examination methods in case of permanent evaluation

Oral examination, assignment, peer assessment

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

The final examination consists of a written examination (open book, with open questions). Most of the questions aim to assess the insight of the student in the data-analysis and how they result in the conclusions.

The project work relates to a real life problem. Students may work together in groups of 3 to 4 persons. The result of the project work 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”). For a better evaluation of the individual contribution of the student, peer-evaluation is used.

Calculation of the examination mark

The total mark is a weighted average of:
- Project work (12/20)
- Final exam (8/20)