GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2024-2025

Genomics, Proteomics and Metabolomics (D012555)

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

Credits 6.0 **Study time 180 h**

Course offerings in academic year 2024-2025

A (semester 1)	English	Gent

Lecturers in academic year 2024-2025

Gevaert, Kris	GE31	lecturer-in-charge
Vergult, Sarah	GE31	co-lecturer

Offered in the following programmes in 2024-2025	**crdts**	**offering**
Master of Science in Biomedical Sciences	6	A

Teaching languages

English

Keywords

Genome analytical technologies, transcriptome analysis, proteome analysis, quantitative proteomics, analysis of protein complexes, protein modifications, proteogenomics, metabolomics.

Position of the course

This course provides an overview on methods for analyzing genomes, transcriptomes, proteomes and metabolomes, the technical possibilities of these methods are discussed, as well as the results that can be obtained.

Contents

1. General introduction to the different layers of biological information
2. Next-generation sequencing (NGS) technologies: a. History of sequencing; b. NGS workflow; c. NGS library preparation; d. Data analysis
3. Genomic and transcriptomic applications: a. (Meta)genome & exome sequencing applications; b. Transcriptomic applications; c. Epigenomic applications
4. Mass spectrometry-driven proteomics: a. Mass spectrometry in proteomics; b. Identifying MS/MS-spectra; c. Boosting identifications
5. Quantitative proteomics: a. Introduction to quantitative proteomics; b. Metabolic labeling; c. Non-metabolic labeling/multiplexing; d. Label-free quantitative proteomics; e. Targeted proteomics
6. Analysis of protein complexes by affinity purification-mass spectrometry
7. Protein modifications: a. General introduction; b. Enrichment strategies; c. Protein phosphorylation; d. Protein ubiquitination; e. Protein processing
8. Proteogenomics: a. General introduction; b. Identification and quantifiation of proteoforms; c. N-terminal proteoforms
9. Emerging themes in proteomics: a. The Human Protein Atlas; b. Single-cell proteomics; c. Single peptide sequencing
10. Metabolomics: a. Introduction; b. The size of the metabolome; c. Metabolomics in biomedical research; d. Analytical methods; e. Sample preparation; f. Metabolite identification

Initial competences

Successfully followed the courses of Fundamental and Applied Biomedical Protein Research, Bio-informatics, Molecular Biology, Gene and Cell Technology and Human Molecular Genetics, all of which are from the Bachelor in Biomedical Sciences, or acquired the expected competences by other means

Final competences

1 To understand and assess the possibilities and possible pitfalls of current methods for OMICS analysis in the context of systems biology.
2 To critically assess relevant scientific papers and omics studies.

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

Study material

Type: Slides

Name: Hand-outs of Powerpoint presentations
Indicative price: € 10
Optional: no
Language : English
Number of Slides : 300
Available on Ufora : Yes
Online Available : No
Available in the Library : No
Available through Student Association : No
Additional information: Slides are always slightly updated at the start of the course.

References

"State-of-the-art" scientific papers.

Course content-related study coaching

Interactive support via e-mail.

Assessment moments

end-of-term assessment

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

Oral assessment, Written assessment open-book

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

Oral assessment, Written assessment open-book

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

The answers to the open book exam and the oral defense of these answers count for 80% of the exam score. The answers to the oral exam count for 20% of the exam score.

Calculation of the examination mark

Periodic evaluation: 100% of the total score.