GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2023-2024

Data Intelligence in Sustainable Drug Discovery (J000530)

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

Credits 6.0 **Study time 180 h**

Course offerings and teaching methods in academic year 2023-2024

A (semester 1)	English	Gent	lecture
			independent work
			seminar

Lecturers in academic year 2023-2024

Hertleer, Carla	FW02	staff member
De Preter, Katleen	GE31	lecturer-in-charge
Pattyn, Filip	TW07	co-lecturer
Van Nieuwerburgh, Filip	FW01	co-lecturer

Offered in the following programmes in 2023-2024	**crdts**	**offering**
International Master of Science in Sustainable Drug Discovery	6	A

Teaching languages

English

Keywords

Omics technologies, genetic analyses using bioinformatics, data visualization, data management, FAIR data, databases, differential expression/pathway/gene ontology analysis, R & SQL

Position of the course

This course will introduce omics technologies, and bioinformatic concepts and tools as applied in the context of drugging.

Contents

Pharmacogenomics

- Basics in genetics (human genome, epigenome, gene expression regulation, genetic variants)
- Omics techniques such as microarrays, and NGS/MPS
- Application of omics in GWAS, clinical diagnosis, neoantigen cancer treatment, etc.
- Practical sessions on BLAST, NGS read mapping, variant calling and genetic databases such as PharmGKB

Transcriptome data analysis

- Pipeline for analysis of transcriptome data in context of downstream pathway analysis of drugs
  - Data pre-processing, quality control, visualization/exploration
  - Differential expression analysis
  - Gene ontology and pathway analysis
- Public databases
- Single-cell versus bulk transcriptome data

Data management: sustainable storage and usage of data

- Data models and technologies, especially details on the pros and cons of these models/technologies in some existing use cases. Hereby, we will pay particular attention to relational data models. We will highlight fundamental operations on that model, which will lead us to the world of query languages. In addition, metadata annotation and data

standardization in drug discovery research will be handled.
- Usage of data in practical scenarios. This means we will see some best practices to make data available for internal and external sharing and re-use, which brings us to FAIR principles. This is of huge importance in a setting where re-validation and confirmation is becoming more and more important. Also, scenarios with public data initiatives will be handled.
- Some practical skills will be developed by bringing the theoretical principles to live by tackling some use cases. We will work with simple tools to setup a data pipeline and learn how to inspect datasets in a critical way.

Initial competences

Basics in statistics

Final competences

1 Implement simple algorithms in R for transcriptome analysis
2 Understand and perform a data-mining pipeline on genome and transcriptome data, including visualisation and differential expression analysis
3 Explain the different omics technologies and approaches
4 Extract useful drug discovery information from different datasets
5 Understand and apply data management using relational databases and FAIR data principles in the context of drug discovery

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

Seminar, Lecture, Independent work

Extra information on the teaching methods

Group work for microteaching: in groups of 4/5 students work on a published dataset and run the transcriptome pipeline (data pre-processing, data exploration, differential expression analysis, GSEA, ...). Via microteaching, they present their scripts/approaches and findings to the other students.
Data management and FAIR data topics will be handled during lectures often combined with demonstrations and with practical sessions.

Learning materials and price

Laptop/computer
Recent manuscripts

References

Course content-related study coaching

Assessment moments

end-of-term assessment

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

Written assessment with open-ended questions, Written assessment open-book, Written assessment, Assignment

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

Written assessment with open-ended questions, Written assessment open-book, Written assessment, Assignment

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Calculation of the examination mark

Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.