GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Plant Phenotyping Technologies (I002629)

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

Credits 3.0 **Study time 90 h**

Course offerings in academic year 2025-2026

A (semester 2)	English	Gent

Lecturers in academic year 2025-2026

Audenaert, Kris	LA21	lecturer-in-charge
De Zutter, Noémie	LA21	co-lecturer
Maes, Wouter	LA21	co-lecturer
Steppe, Kathy	LA21	co-lecturer
Verwaeren, Jan	LA26	co-lecturer

Offered in the following programmes in 2025-2026	crdts	offering
Master of Science in Bioscience Engineering: Cell and Gene Biotechnology	3	A
Exchange Programme in Bioscience Engineering: Agricultural Sciences (master's level)	3	A
Exchange Programme in Bioscience Engineering: Cell and Gene Biotechnology (master's level)	3	A

Teaching languages

English

Keywords

Sensor-based phenotyping, image-based phenotyping, modelling, data mining, crop traits

Position of the course

By means of hands-on experience, state-of-the-art systems and methods for the phenotyping of plants will be demonstrated and explained. The methods include analysis at the molecular level (marker expression), the tissue, organ and plant level (shape, size, vegetation indices) up to crop level (drone technology). The course will explain how data are being processed and used for modelling and data mining.

Contents

- The position of phenomics in the omics era
- Genotype-Phenotype-Environment map
- Link between phenotype and plant physiology/biochemistry
- Image-based phenotyping:
  - Reflectance-based multispectral imaging analysis (reflectance indices: chlorophyll content, NDVI, mARI)
  - Fluorescence based imaging analysis for plant traits (chlorophyll fluorescence, fluorescent tags)
  - Thermal imaging
- Sensor-based phenotyping:
  - Plant sensors, including sap flow sensors, leaf clips, LVDT-sensors
  - Gas-exchange systems
- Hands-on analysis and modeling of phenomics data
  - Image processing pipelines for individual plant monitoring (root and shoot)
  - 3D plant modeling, functional-structural plant modelling (FSPM)
  - Mining (large) phenomics datasets
- Examples from research
  - Measurement of abiotic stress (e.g. nutrient deficiencies, temperature,

drought)
- Measurement of infection levels from fungal, bacterial, viral or insecticidal origin.

Initial competences

Basic knowledge of plant morphology, plant physiology, molecular biology
Basic knowledge of the programming language python

Final competences

1 Execute appropriate phenotyping technology
2 Perform post data processing, database construction, automated image analysis
3 Interpret phenotypic data to assess the physiological health status of a plant
4 Implement phenotyping platform to address a research question or a plant breeding goal
5 Summarize the conclusions of a collection of plant phenotype datasets in a report

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

Excursion, Lecture

Extra information on the teaching methods

The Fieldwork will cover an excursion during which we will visit different state-of-the art plant phenotyping platforms.
Each lesson will consist of a small theoretical part during which the basis of a technique is explained, followed by a demonstration or exercises on the computer.

Study material

Type: Slides

Name: slides theoretical course
Indicative price: Free or paid by faculty
Optional: no
Language : English
Number of Slides : 400
Oldest Usable Edition : 2024
Available on Ufora : Yes
Online Available : Yes
Available in the Library : No
Available through Student Association : No

References

Course content-related study coaching

Assessment moments

end-of-term and continuous assessment

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

Written assessment with open-ended questions

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

Written assessment with open-ended questions

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Calculation of the examination mark