

## Plant Phenotyping Technologies (I002629)

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

**Studiepunten 3.0** **Studietijd 90 u**

**Aanbodsessies in academiejaar 2023-2024**

A (semester 2) Engels Gent

**Lesgevers in academiejaar 2023-2024**

Audenaert, Kris	LA21	Verantwoordelijk lesgever
Desmedt, Willem	LA25	Medelesgever
Maes, Wouter	LA21	Medelesgever
Steppe, Kathy	LA21	Medelesgever
Verwaeren, Jan	LA26	Medelesgever

**Aangeboden in onderstaande opleidingen in 2023-2024**

	stptn	aanbodsessie
<a href="#">Master of Science in Bioscience Engineering: Cell and Gene Biotechnology</a>	3	A
<a href="#">Uitwisselingsprogramma bio-ingenieurswetenschappen: cel- en genbiotechnologie (niveau master-na-bachelor)</a>	3	A
<a href="#">Uitwisselingsprogramma bio-ingenieurswetenschappen: landbouwkunde (niveau master-na-bachelor)</a>	3	A

**Onderwijstalen**

Engels

**Trefwoorden**

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

**Situering**

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.

**Inhoud**

- 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.

### **Begincompetenties**

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

### **Eindcompetenties**

- 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

### **Creditcontractvoorwaarde**

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

### **Examencontractvoorwaarde**

Dit opleidingsonderdeel kan niet via examencontract gevolgd worden

### **Didactische werkvormen**

Werkcollege, Excursie, Hoorcollege, Peer teaching

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

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.

### **Leermateriaal**

During this course an excursion will be made to different state-of-the-art phenotyping facilities. The travelling fee will cover transportation and eventual overnight stay in a hotel. The exact price may differ from year to year and will be communicated through Ufora.

Demonstration practical courses will be organized in case the excursion cannot be scheduled due to the Covid pandemic.

### **Referenties**

### **Vakinhoudelijke studiebegeleiding**

### **Evaluatiemomenten**

periodegebonden en niet-periodegebonden evaluatie

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

Schriftelijke evaluatie met open vragen

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

Schriftelijke evaluatie met open vragen

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

Participatie, Werkstuk

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

Niet van toepassing

### **Eindscoreberekening**