GHENT UNIVERSITY

# Course Specifications

Valid as from the academic year 2024-2025

## Precision Agriculture (I002739)

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

**Credits 5.0** **Study time 150 h**

**Course offerings in academic year 2024-2025**

A (semester 2) English Gent

**Lecturers in academic year 2024-2025**

Mouazen, Abdul LA20 lecturer-in-charge

| Offered in the following programmes in 2024-2025 | crdts | offering |
|---|---|---|
| International Master of Science in Soils and Global Change (main subject Soil Ecosystem Services and Global Change) | 5 | A |
| Master of Science in Bioscience Engineering: Agricultural Sciences | 5 | A |
| Exchange Programme in Bioscience Engineering: Agricultural Sciences (master's level) | 5 | A |

**Teaching languages**

English

**Keywords**

Sensing, Site specific management, variable rate technologies, robotics.

**Position of the course**

Precision agriculture aims at improving the management of spatial and temporal variability within agricultural fields, by applying the right amount of farm input (fertilisers, water for irrigation, pesticides, seeds, tillage etc.) into the right place in the right time by using of the right technologies and practices. In crop production the scale of management of variability is down to within field or subfield scale.
The final target of precision agriculture is successful management of within field variability to maximise yield at reduced input cost, and reduced environmental impacts and waste. The final farm output is increased profit and farming production efficiency, whereas a reduced risk for pollution can be achieved by applying less agrochemicals into the environment (e.g., into soil, water and air).
The implementation of precision agriculture requires the combination of several technologies into an integrated agricultural management system. These technologies often include global positioning systems, geographical information systems, remote sensing of crop, proximal soil and crop sensing, yield monitoring, geostatistical modelling and mapping, decision support tool (PA software), and variable rate technologies.
*Despite this course is of an multidisciplinary nature, it will focus on the technology of sensing, modelling and control, given by the lecturer in charge who will takes up a coordinating role in inviting 2 guest lecturers by specialists in the respective disciplines (e.g., environmental and socio-economics of PA, in the cloud data management and decision support). The guest lecturers are from the Faculty of Bioscience Engineering or External Institutions, The concrete contents will be adapted as a function of the foreknowledge of the students who select this optional course.*

**Contents**

The different parts of this course are detailed below:
- General philosophy of precision agriculture
- Proximal soil sensing I – reflectance
- Proximal soil sensing II gamma ray – electrochemical methods - XRF
- Proximal soil sensing III – multi-sensor data fusion

- Proximal crop sensing including yield sensors
- Variable rate technologies – VR pesticide, seeding, fertilisation, manure.
- Other precision agriculture technologies: e.g., controlled traffic farming, autosteering, robotics & hurdles and solutions for adoption of PA technologies.
- Guest lecture I
- Guest lecture II
- Agricultural machinery demonstration & CNH, AVR, or Bottelare HoGent.
- Visit to a commercial farm (e.g., Van De Borne farm), adopting PA.
- Student feedback with group lectures.

**Initial competences**

The students will need to have knowledge on Remote Sensing and GNSS, which they obtained while attending the Course I0O2651A - Monitoring systems in agriculture, during the Bachelor in Bioscience Engineering.

**Final competences**

1 1 Understand what precision agriculture is.
2 Insight in the multidisciplinary and multifunctionality nature of precision agriculture.
2

**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**

**Extra information on the teaching methods**

The theoretical lessons are lectures supported with illustrations. The practical exercises are composed out of demonstrations and excursions with two visits to: 1) a farm applying precision agriculture, and 2) agricultural machinery manufacturer. An interactive workshop will be organized after the two visits to discuss student opinion of precision agriculture and potential adoption.

**Study material**

None

**References**

***Castrignanò, A.; Buttafuoco, G.; Khosla, R.; Mouazen, A.M.; Moshou, D.; Naud, O.,*** *2019. Agricultural Internet of Things and Decision Support for Precision Smart Farming. ACADEMIC PRESS, Elsevier, pp. 459.*

***Martens, H., Naes, T.,*** *1989. Multivariate Calibration, 2nd ed. John Wiley & Sons, Ltd., Chichester, United Kingdom.*

***Mouazen, A.M., Ramon, H.,*** *2006. Development of on-line measurement system of bulk density based on on-line measured draught, depth and soil moisture content. Soil & Tillage Research 86 (2) 218–229.*

***Stenberg, B.; Viscarra Rossel, R.; Mouazen, A.M.; Wetterlind, J.,*** *2010. Visible and near infrared spectroscopy in soil science. Advances in Agronomy,* ***107****: 163-215.*

**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, Assignment

**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**

Participation, Assignment

**Possibilities of retake in case of permanent assessment**

examination during the second examination period is not possible

**Extra information on the examination methods**

The exam will consist of a combination of questions from the diverse disciplines which are covered in this course, with a focus on the interdisciplinary nature of Precision Agriculture and the practical experiences gathered during the farm and machinery visits.

**Calculation of the examination mark**

- End-of-term assessment: Periodic evaluation 70 % and non-periodic evaluation 30 % .
- Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.