

**Name of course:**

Root Methods

**ECTS credits:** 5 ECTS.

**Course parameters:**

Language: English

Level of course: PhD course. Master students and Postdocs can also participate.

Time of year: **May 18-22, 2026**

No. of contact hours/hours in total: 125 hours in total whereof 50 are contact hours.

Capacity limits: 15 participants

**Objectives of the course:**

The objectives of the course are to:

- (i) train students in a wide range of root methods in field, lab and computation
- (ii) present advanced methods for studying roots and root-soil interactions with a special focus on field study
- (iii) introduce state-of-the-art approaches in root phenotyping, imaging, and root data analysis,
- (iv) encourage students to broaden their perspectives on how root research can be integrated across scales and disciplines, and
- (v) strengthen students' skills in designing, executing, and analyzing experiments related to root traits and functions.

**Learning outcomes and competences:**

At the end of the course, the student **should be able to**:

- describe the theoretical basis and practical application of key root research methods,
- identify suitable techniques for studying specific root traits and processes,
- critically evaluate and design experiments involving root phenotyping or root-soil interactions, and
- process, interpret, and discuss root data in the context of their own research projects.

**Compulsory program:**

To complete the course, students are expected to:

- actively participate in pre-course sessions (e.g. software installation), lectures, lab/field exercises, and post-course sessions (e.g. report writing)
- design and present an experiment or methodological plan applying root research techniques to their own project, and
- submit a written course assignment integrating relevant theory, methods, and data analysis approaches.

**Course contents:**

Roots are key to understanding how plants interact with soil, acquire resources, and adapt to changing environments. This course focuses on field root methods for studying roots across different spatial and temporal scales, linking structure, function, and ecosystem relevance. Students will gain insight into experimental design, measurement techniques, and data analysis workflows commonly used in root research.

The course is structured around three main themes:

- (1) Core principles and methods in root research
- (2) Hands-on experience in root methods in plant-soil systems
- (3) Data interpretation into scientific outcome using the results

Ad. (1): This theme introduces fundamental theories and methods for root measurement and analysis to measure three major traits categories, namely, root structure (root depth, density, morphology), root function (nutrient/water uptake, rhizodeposition) and root chemistry (root fibre, C,N contents).

Ad. (2): Students will actively perform selected root measurement methods through guided exercises and demonstrations. This will include destructive (soil coring, core-break, root washing), less-invasive (ingrowth-core, tracer-labelling, minirhizotron imaging), and non-destructive (microCT imaging) root methods. The emphasis is on **hands-on experience** and data collection relevant to real-world plant-soil systems.

Ad. (3): This theme focuses on analyzing and interpreting the composites of the root data as a whole (structure+function+chemistry) to generate meaningful scientific insights. Students will learn approaches for data processing, visualization, and integration with plant and soil parameters. The outcome will be a clear plan for translating results into scientific outputs such as manuscripts or project applications.

The final course assignment will include a written report describing the experiment or methodological plan developed during the course, the underlying theory, analytical approach, and interpretation of expected outcomes.

**Prerequisites:**

Participants should have a background in plant science, soil science, agronomy, environmental science, or related disciplines.

**Name of lecturers and lab teachers:**

Eusun Han, Jim Rasmussen, Lars Juhl Munkholm, Marco Lombardi, Yulin Zhang, Alexa Peterson, Yuma Ikeda, Michele Canciani, Christopher Steiness, Sehyeong Jo.

Additional invited experts will contribute according to course topics and student interests.

**Type of course/teaching methods:**

Hands-on sessions, lectures, group discussions, individual reading and writing,

**Literature:**

Reading materials will be selected jointly by lecturers and students to ensure relevance to participants' research.

**Course homepage:** None

**Course assessment:** The assessment will be based on the course assignment.

**Provider:** Department of Agroecology

**Special comments on this course:** There will be a course fee of 620 €.

**Time:** May 18-22, 2026.

**Place:** AU Viborg, Aarhus University, Denmark.

**Registration:**

Deadline for registration is April 17, 2026. Information regarding admission will be given before February 15<sup>th</sup> 2026.

For registration use the web-shop link: [PhD course Root Methods 2026 - Laravel](#)

If you have any questions, please contact Eusun Han, e-mail: [eusun.han@agro.au.dk](mailto:eusun.han@agro.au.dk)