Name of course: Assembly and functioning of crop microbiomes

ECTS credits: 5

Course parameters:

Language: English

Level of course: PhD course

Time of year: Q4 2026

No. of contact hours/hours in total incl. preparation, assignment(s) or the like: 125

Capacity limits: 20

Objectives of the course: Over the past decades, rapid advances in methods for analysing microbial communities based on high through-put sequencing technologies have revolutionized the way we observe, quantify, and understand plant-microbe interactions. This intensive 5-days PhD course provides an in-depth overview of modern sequencing technologies and their applications in understanding microbial–crop interactions. Students will explore how advanced genomic and metagenomic approaches can be used to characterize plant-associated microbiomes, identify functional traits of beneficial and pathogenic microbes, and elucidate the molecular mechanisms underpinning plant–microbe relationships.

Through a combination of lectures, wet-lab exercises, hands-on bioinformatics sessions, and case study discussions, participants will gain both theoretical knowledge and practical skills. The course will begin with an introduction to crop-microbiome interactions and to the various sequencing approaches and data types relevant to microbiome and crop–microbe research. It will then cover experimental design considerations, sampling strategies, sample preparation, and data analysis pipelines for amplicon datasets.

Special emphasis will be placed on integrating sequencing data with ecological and physiological information to interpret microbial community functions in the context of crop health, productivity, and resilience. Students will also explore stable isotope probing, long-read metagenomics, and multi-omics integration.

Learning outcomes and competencies:

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

- Design experiments employing sequencing-based methods to investigate microbial–crop interactions.
- Process and analyze microbial community sequencing data using bioinformatics tools.

- Interpret sequencing results in relation to plant biology and environmental variables.
- Critically assess recent literature and technological advances in microbial genomics and plant–microbe research.

Compulsory program:

Lectures, exercises, student presentations and field and laboratory measurements. Active participation in both lectures, practical work and student presentations is expected.

Course contents:

The course provides formal lectures and exercises covering:

- Overview of plant–microbe interactions and the role of microbiomes in crop productivity and health
- Introduction to sequencing platforms
- Experimental design and best practices for sample collection and DNA/RNA extraction
- Amplicon sequencing (16S/ITS) workflows for community profiling
- Shotgun metagenomics for functional and taxonomic analysis
- Bioinformatics pipelines for sequence data processing and interpretation
- Integrating multi-omics data with plant physiological and environmental information
- Case studies on beneficial microbes, plant pathogens, and rhizosphere ecology
- Phage sequencing, stable isotope probing)

Prerequisites: PhD students with a background in microbiology, plant sciences, genomics, or bioinformatics.

Name of lecturer[s]: Mette Vestergård, Mogens Nicolaisen, Chris Barnes, Henry Janse C. van Rensburg, Enoch Narh Kudjordjie, Lisa Martinez, Remi Moerenhout, Karl Ludwig Körber, Tarquin Netherway, Ella Tali Sieradzki, Menghui Dong, Nathan Roussel and others

Type of course/teaching methods:

The course will last for five days. Each day begins with a lecture session. The second half of the day will mainly involve hands-on lab or data analysis activities, and student presentations/discussions of their own projects.

Literature: Obligatory reading before the start of the course. The material will be distributed to

participants after signing up.

Preparation: Each student must prepare and submit a short synopsis of their individual presentation of their own project before the course starts. Students should present their own project at the course.

Course assessment: Individual student evaluation (pass/not pass) will be based on contribution to class discussions, group work, and presentations.

Provider: Department of Agroecology

Special comments on this course: The course fee is 1200 Euros (incl. accommodation and meals) or 600 Euros without accommodation (but incl. meals). Participants are responsible for arranging their own transportation to the campus.

Time: October 26-30, 2026

Place: Aarhus University Flakkebjerg, Forsøgsvej 1, Slagelse, Denmark

Registration: The deadline for registration is 1st of September 2026. Admission information will be sent out no later than 10th of September. Please note the capacity limit (20 participants).

For registration: Assembly and functioning of crop microbiomes - Eventværk

If you have any questions regarding registration, please contact Charlotte Hamann Knudsen, e-mail: charlotte.knudsen@agro.au.dk; or regarding the course content Mogens Nicolaisen, e-mail: mn@agro.au.dk