# Schedule

**Plant Genetic Resources (3502-470)**

26 May 2025

## Table of contents



**Note: The schedule is subject to changes!**

| Date | Day | Time | Topic | Room | Lecturer |
|---|---|---|---|---|---|
| 03-04-2025 | Thu | 08-10 | Introduction | S09 | Schmid |
| 07-04-2025 | Mon | 08-10 | Genetic diversity | S09 | Schmid |
| 07-04-2025 | Mon | | *No class* | | |
| 10-04-2025 | Thu | 08-10 | Genomic variation: Genotyping and sequencing | S09 | Daware |
| 14-04-2025 | Mon | 08-10 | Phylogenetic analysis | S09 | Daware |

| Date | Day | Time | Topic | Room | Lecturer |
|---|---|---|---|---|---|
| 14-04-2025 | Mon | 14-18 | Computer lab: Data preparation, Genetic diversity, Phylogenetics | PC3 | Daware |
| 17-04-2025 | Thu | 08-10 | Biodiversity & Crop diversity and systematics | S09 | Schmid |
| 21-04-2025 | Mon | | *Easter Monday - No class* | | |
| 24-04-2025 | Thu | 08-10 | Crop domestication | S09 | Daware |
| 28-04-2025 | Mon | 08-10 | Population structure & Gene flow | S09 | Daware |
| 28-04-2025 | Mon | 14-18 | Computer lab | PC3 | Daware |
| 01-05-2025 | Thu | | *Public holiday - No class* | | |
| 05-05-2025 | Mon | 08-10 | Coalescent Theory | S09 | Schmid |
| 05-05-2025 | Mon | 14-18 | Tests of selection / Computer lab | PC3 | Schmid |
| 08-05-2025 | Thu | 08-10 | Genetics of crop evolution | S09 | Daware |
| 12-05-2025 | Mon | 08-10 | History of PGR, Legislation for PGR | S09 | Schmid |
| 12-05-2025 | Mon | 14-18 | Demographic analysis / Computer lab | PC3 | Schmid |
| 15-05-2025 | Thu | 08-10 | Conservation of plant genetic resources | S09 | Daware |
| 19-05-2025 | Mon | 08-10 | Core collections | PC3 | Daware |
| 19-05-2025 | Mon | 14-18 | Allele mining in PGR / Computer lab | S09 | Schmid |
| 22-05-2025 | Thu | 08-10 | Genetic mapping of useful alleles | S09 | Daware |
| 26-05-2025 | Mon | 08-10 | Analysis of phenotypic diversity | S09 | Schmid |

| Date | Day | Time | Topic | Room | Lecturer |
|---|---|---|---|---|---|
| 26-05-2025 | Mon | 14-18 | Genetic resources in plant breeding / Computer lab | PC3 | Schmid |
| 29-05-2025 | Thu | | *Ascension day - No class* | | |
| 02-06-2025 | Mon | 08-10 | Genetic resources in plant breeding - II / Data analysis project | S09 | Schmid |
| 11-06-2025 | Wed | | Excursion during Pentecost break: 11-13 June | | |
| 11-07-2025 | Fri | 23:55 | Deadline submission of data analysis report | | |
| 17-07-2025 | Thu | 08-10 | Written exam (Exam period 1) | S09 | |
| 22-09-2025 | Mon | 14-16 | Written exam (Exam period 2) | S09 | |

Course organisation

- Syllabus: HTML
- Computer labs:
  - The computer labs will take place in PC Room 3 where we have access to windows PCs. You can either work with them or bring your own laptop.
  - We will use R and Rstudio for the computer exercises. If you want to install R and Rstudio on your own computer: R download and R studio
  - We will work with the same data set for many of the computer exercises. To avoid having to prepare the data each time, we will do it only once using these instructions and save the prepared data. You will need the following data files: genetic data, list with teosinte samples, list with landraces, and list with improved varieties. If you encounter any problems you can also download the prepared data here.
- Data analysis project: **To be added**

Topics

## 1 Introduction and motivation

- Slides | Lecture notes
- Video: Introduction (30 min)

## 2 Genetic diversity

- Slides | Lecture notes
- Videos: 1-Types of genetic diversity (22 min) 2-Diversity in PGR (14 min) 3-Measuring diversity (18 min) 4-DNA sequence diversity (18 min) 5-Complex diversity (10 min)
- In class exercise
- Computer lab:
  - Data preparation: HTML | Markdown
  - Analysis of genetic diversity: HTML | Markdown

## 3 Genomic variation: Genotyping and sequencing

- Slides | Lecture notes
- Videos: 1-Genetic variation and genotyping (21 min) 2-Sequencing (19 min) 3-Bioinformatics (15 min)
- In class exercise
- Computer lab: No computerlab for this topic

Additional reading materials:

- *A field guide to whole-genome sequencing, assembly and annotation* by R Eckblom and JBW Wolf (2014)

## 4 Phylogenetic analysis

- Slides | Lecture notes
- Video: 1-Key concepts (14 min) 2-Phylogenetic trees (14 min) 3-Methods tree construction (8 min) 4-UPGMA clustering (10 min) 5-Further methods and PGR examples (20 min)
- In class exercise
- Computer lab: HTML | Markdown

## 5 Biodiversity

- Slides | Lecture notes
- Video: 1-Introduction (19 min) 2-Economic value (5 min) 3-Agrobiodiversity (13 min) 4-Changes in biodiversity (10 min)
- In class exercises

## 6 Crop diversity and systematics

- Slides | Lecture notes
- Video: 1-Plant phylogeny (15 min) 2-Plant architecture (20 min) 3-Crop phylogeny (17 min)
- In class exercise

## 7 Crop domestication

- Slides | Lecture notes
- Videos: 1-History (21 min) 2-Centres (23 min) 3-Old-World (17 min)
- In class discussion

## 8 Population structure

- Slides | Lecture notes | 3-D PCA of Amaranth domestication: HTML (loading may take a while)
- Videos: 1-Introduction and phylogeny (10 min) 2-PCA (14 min) 3-Modelbased inference (20 min)
- In class exercise:
- Computer lab: HTML | Markdown

## 9 Gene flow and reticulate evolution

- Slides | Lecture notes
- Videos: 1-Introduction (19 min) 2-Reticulate evolution (9 min) 3-Examples (28 min)
- In class discussion

## 10 Coalescent theory

- Slides | Lecture notes
- Videos: 1-Theory and genealogies (24 min) 2-Mutations (22 min) 3-Demography and applications (26 min)
- Computer lab: HTML | Markdown

## 11 Tests of selection

- Slides | Lecture notes
- Videos: 1-Introduction (20 min) 2-Concepts (13 min) 3-Selection tests (25 min)
- Computer lab: HTML | Markdown

## 12 Genetics of crop evolution

- Slides | Lecture notes
- Videos: 1-Domestication syndrome (15 min) 2-Genetics of maize domestication (15 min) 3-Molecular genetics of teosinte branched 1 (24 min)
- In class discussion (only questions 1 to 4).

## 13 Demographic analysis of crop evolution

- Slides | Lecture notes
- Videos: 1-Introduction (19 min) 2-Selection at tb1 (20 min) 3-Genome-wide selection detection (11 min)
- In class discussion (only questions 5 to 8).

## 14 History of plant genetic resources

- Slides | Lecture notes
- Videos: 1-Introduction (10 min) 2-World-changing plants (14 min) 3-Collection expeditions (29 min) 4-German genebank history (5 min) 5-International developments (20 min)

## 15 International legislation for plant genetic resources

- Slides | Lecture notes
- Videos: 1-Introduction (20 min) 2-International Treaty (9 min) 3-SMTA (14 min) 4-Nagoya-Protocol (13 min)
- Additional videos: ABS - Simply explained (5 min) What is ABS? (2.5 min) ABS monitoring (6 min)
- In class exercise: PDF

## 16 Conservation of plant genetic resources

- Slides | Lecture notes
- Videos: 1-Introduction (26 min) 2-Ex situ conservation (17 min) 3-In situ conservation (31 min)
- In class discussion

## 17 Core collections

- Slides | Lecture notes
- Videos: 1-Background (7 min) 2-Construction of core collections (24 min) 3-Examples (5 min)
- Computer lab: PDF, data

## 18 Allele mining in PGR

- Slides | Lecture notes
- Videos: 1-Introduction (19 min) 2-FIGS (16 min) 3-Popgen-based allele mining (6 min)
- In class discussion (part 1)

## 19 Genetic mapping of useful alleles

- Slides | Lecture notes
- Videos: 1-Introduction (16 min) 2-Basic principles (16 min) 3-Methods and caveats (18 min) 4-Genetic mapping in PGR (9 min)
- In class discussion (part 2)

## 20 Analysis of phenotypic diversity

- Lecture notes
- Videos: 1-Background (11 min) 2-Mapping populations (22 min) 3-Phenotyping technologies (24 min)
- Computer lab: Rmd, dataset

## 21 Genetic resources in plant breeding

- Slides | Lecture notes
- Video: 1-Introduction (12 min) 2-Prebreeding (25 min) 3-Breeding methods (17 min) 4-Genomic selection (45 min) 5-Introgression libraries (9 min) 6-Genetic engineering (8 min) *Note: No video on genome editing, check out the lecture notes*
- In class discussion

Course literature

- Jack Harlan: Crops and Man (1992) PDF