# Course Syllabus

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

23 May 2025

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## 1 General information

- Course organiser: Prof. Karl Schmid, Institute of Plant Breeding, Seed Science and Population Genetics (350)
- Language of instruction: English
- 4 SWS
- 6 ECTS credits
- Workload of 180 hours: 54 contact hours and 126 hours for self-study and course work

## 2 Content

The course provides an introduction to plant genetic resources (PGR) for food and agriculture and is divided into three conceptual parts.

The **first part** deals with the analysis of genetic and phenotypic variation that is the basis for characterizing plant genetic resources. This includes methods of molecular population genetics and phylogenetics.

The **second part** addresses the domestication of crops.

The **third part** focuses on strategies for the conservation of PGR and its use in plant breeding and includes:

- Collection, evaluation and conservation of PGR
- Advantages and disadvantages of conservation strategies
- History, political importance and institutions of the worldwide system for the conservation of PGR
- Application of PGR in plant breeding programs

## 3 Teaching philosophy

The course is using the concept of an **flipped classroom**.

1. The **acquisition** of knowledge is done before class by self-study with online videos or assigned course literature.
2. During class sessions, there will be a **review** of knowledge by group discussions, problem solving exercises and computerlabs.
3. The third component is the **application** of knowledge and skills in the data analysis project that each student has to conduct.

## 4 Targeted audience

- Agrarbiologie - Agrarbiotechnologie (M.Sc. program)
- Agrarwissenschaften - Pflanzenproduktionssysteme (M.Sc. program)
- Crop Sciences - Crop Physiology and Nutrition (M.Sc. program)
- Crop Sciences - Crop Protection (M.Sc. program)
- Crop Sciences - Plant Breeding and Seed Science (M.Sc. program)

In all course programs, this elective module is scheduled for the second semester.

## 5 Prerequisites

- Background in basic population genetics and plant breeding. See for example this module: Population and Quantitative Genetics (3502-450). Use the same username and password as for this course.
- Basic familiarity in the R statistical package and the RStudio work environment.

## 6 Course goals

### 6.1 Knowledge:

- Students know the diversity and taxonomic distribution of major crop plants.
- They have a good understanding of aspect of molecular population genetics that is relevant for characterising plant genetic resources.

- They are familiar with the different strategies for the collection, conservation and evaluation of plant genetic resources.
- Students know about the major strategies to utilize genetic resources in plant breeding and are aware of the political implications of utilizing plant genetic resources.

### 6.2 Skills:

- Students are acquainted with the most common appraches for analysing the genetic diversity of genetic resources using current software packages.
- Students are able to analyse data themselves using the R statistical software and conduct a small study project.
- Students are able to write a report summarizing their analyses and present them to an audience.

## 7 Course website

Registration to the course is through ILIAS, but all course material are available on a separate password-protected website. The password for the website is provied in ILIAS.

## 8 Instructors

- Prof. Dr. Karl Schmid (mailto:karl.schmid@uni-hohenheim.de)
- Dr. Anurag Daware (mailto:anuragvasantrao.daware@uni-hohenheim.de)
- Clemens Hacke (mailto:clemens.hacke@uni-hohenheim.de)

## 9 Class hours and room

- Monday, 08:00 - 10:00
- Monday, 14:00 - 18:00
- Thursday, 08:00 - 10:00
- Classes begin c.t. (*cum tempore*), e.g. at 8:15 and 14:15
- Classes are only in the first half of the term (see schedule).
- Lecture rooms are S09 and PC room 3. See the course schedule for details.

The course is held in presence.

## 10 Course reading

Additional course reading (e.g., lecture notes) will be available before class on the course website.

### 10.1 Textbooks

There is no course textbook. However, the following books cover much of the material discussed in class:

- Jack Harlan: *Of Crops and Man*, 2nd edition (1992) American Society of Agronomy-Crop Science Society of America. PDF.
- Denis Murphy: *People, Plants and Genes*, (2006) Oxford University Press. Multiple copies available from the University Library.
- Hartl and Clark: *Principles of Population Genetics*, 4th edition (2008) Sinauer Associates. Multiple copies of the book are available from the university library. Note: Any other recent introductory book on population genetics is suitable as well.

In addition, original scientific papers and review articles will be used as course literature.

## 11 Computer labs

Some topics will be accompanied by computer labs to learn how to analyse data sets based on the concepts taught in class. Computer labs will be taught in presence in the computer room. You may use the computer in the computer room or bring your own laptop with the R statistical package and RStudio installed. Alternatively, you may use a web-based version of R, which requires registration and a browser.

During computer labs, students are expected to work on the problems, but will have the opportunity to ask questions during computer labs or discuss exercises online in the ILIAS forum.

## 12 Excursion

There will be an excursion over three days from 11 to 13 June. It will lead to the South of Baden-Württemberg and to Switzerland. The final program will be published in the third week of April.

## 13 Assessment

The assessment is based on a project report of a small data analysis project and a final written exam.

The final grade will be calculated as

- 50% Project report
- 50% Written exam

### 13.1 Project report

You will conduct a data analysis study using the methods taught in the course. The output is a written report using Quarto-flavored Markdown. More detailed instructions will be given on the course website.

### 13.2 Final exam

The final exam will be a written exam on selected topics of the module.

These topics are:

- Genetic variation: Genotyping and sequencing
- Biodiversity and crop diversity and systematics
- Domestication of plants and humans
- History and international legislation of PGR
- Core collections and conservation of plant genetic resources
- Allele Mining and genetic mapping
- PGR in plant breeding

Exam questions will be focused on the knowledge and an active understanding of the course material. You should know the key concepts of each of the above topics. Exam questions will be of the same type and scope than the review and discussion questions provided with each topic. Therefore, the best preparation for the exam is to work on the review and discussion questions as well as the questions discussed in class.

## 14 Contact hours

There are no fixed hours for a meeting with instructors. Please make an appointment for an online meeting or a presence meeting with any of the instructors by sending an email to anja.oehlmann@uni-hohenheim.de

For the discussion of questions or topics of general interest, please use the forum in ILIAS.