QBio305: Population & Quantitative Genetics

Module Responsible:	**Version:**
Prof. Dr. Maria von Korff Schmising	30/04/2022

Module Organizer:	**Type:**
Prof. Dr. Maria von Korff Schmising	Compulsory

Lecturer:
Prof. Dr. Maria von Korff Schmising, Prof. Dr. Juliette de Meaux, Dr. Markus Stetter

Total Working Time	**Credit Points**	**Contact Time**	**Self Study**	**Duration**
180 h	6 CP	60 h	120 h	1 Semester

Course Components		**Group Size**	**Frequency**
Lecture:	3 SWS	P: 40	Every Winter Semester
Exercise:	1 SWS	P: 40	

Learning Competencies:
After completing the module, students can:
- describe types and sources of genetic variation and explain methods for the detection and characterisation of genetic diversity
- define and describe important population and quantitative genetic concepts such as: genetic drift, gene flow, natural selection, selective sweep, mating systems, heritability and quantitative traits
- infer population histories and signatures of selection from genetic and genomic data.
- Explain and estimate components of phenotypic variation from experimental data
- Understand and apply statistical methods for QTL detection and association mapping
- evaluate results from crossbreeding and breeding experiments and develop explanatory models.
- Describe the genetic and genomic changes implicated in crop domestication

Content:
- Origin of molecular diversity
  - Types of mutations (and how to detect them)
  - Models of mutations
- Detection and Quantification of genetic variation
  - Heterozygosity
  - DNA sequence variation (SFS, pi, theta)
- Genetic differentiation
  - Fst, PCA, STRUCTURE
- Neutral theory
- Recombination and linkage disequilibrium
- Selection
  - Types of selection (positive, balancing, purifying)
  - Detection of selection (sweeps, Fst outliers, Ka/ks)