

<b>Module Name</b>	<b>Module Code</b>
Methods for Breeding Field Crops	AEF-agr046
<b>Module Coordinator</b>	
Prof. Dr. Christian Jung	
<b>Organizer</b>	
Institute of Crop Science and Plant Breeding - Plant Breeding	
<b>Faculty</b>	
Faculty of Agricultural and Nutritional Sciences	
<b>Examination Office</b>	
Faculty of Agricultural and Nutritional Sciences - Examination Office	

<b>ECTS Credits</b>	6
<b>Evaluation</b>	Graded
<b>Duration</b>	one semester
<b>Frequency</b>	Only takes place during winter semesters
<b>Workload per ECTS Credit</b>	30 hours
<b>Total Workload</b>	180 hours
<b>Contact Time</b>	60 hours
<b>Independent Study</b>	120 hours
<b>Teaching Language</b>	English

<b>Entry Requirements as Stated in the Examination Regulations</b>			
none			
<b>Recommended Requirements</b>			
Advanced understanding of genetics, evolution, botany and breeding of major crop species.			
<b>Module Courses</b>			
<b>Course Type</b>	<b>Course Name</b>	<b>Compulsory/Optional</b>	<b>SWS</b>
Lecture	Methods for Breeding Field Crops	Compulsory	4
<b>Prerequisites for Admission to the Examination(s)</b>			
AgriGenomics students must have successfully passed examinations of module AEF-agrig004 Introduction to Crop and Animal Breeding.			

<b>Examination(s)</b>				
<b>Examination Name</b>	<b>Type of Examination</b>	<b>Evaluation</b>	<b>Compulsory / Optional</b>	<b>Weighting</b>
Oral Examination: Methods for Breeding Field Crops	Oral Examination	Graded	Compulsory	100
<b>Further Information on the Examination(s)</b>				
1.+2. period in winter semester 1. period in summer semester  examiner: Dr. Karunarathna, if not present: Prof. Dr. Jung QIS: 91101 with number of Examination 91130				

<b>Course Content</b>
<p>The module deals with the most important crops under central European conditions. General and specific aspects of breeding methodology like Cultivar Release and Seed Production, quantitative genetics and selection will be explained.</p> <p><b>General structure:</b>            Cultivar Release and Seed Production            Fundamentals of Quantitative Genetic Variation            Selection            Line varieties           <ul style="list-style-type: none"> <li>• Wheat</li> <li>• Triticale</li> <li>• Barley</li> </ul>           Synthetics and open pollinating varieties           <ul style="list-style-type: none"> <li>• Perennial Ryegrass</li> </ul>           Hybrid Breeding           <ul style="list-style-type: none"> <li>• Maize</li> <li>• Rye</li> <li>• Rapseseed</li> <li>• Sugar beet</li> </ul>           Clone varieties           <ul style="list-style-type: none"> <li>• Potato</li> </ul> <b>Structure for Each Crop:</b> <ul style="list-style-type: none"> <li>• Importance and distribution</li> <li>• Systematics and domestication</li> <li>• Genome structure</li> <li>• Flowering time and reproduction</li> <li>• Breeding goals</li> <li>• Generating genetic variation               <ul style="list-style-type: none"> <li>- crossing, transformation, mutation, protoplast fusion</li> </ul> </li> <li>• Clonal propagation, doubled haploid production</li> <li>• Structure of varieties</li> </ul>           Breeding methods         </p>

**Learning Outcome**

The students learn how crop plants evolved from their wild ancestors. They will understand the importance of Mendelian and quantitative genetics for crop plant breeding. They will learn different methods of selection, from phenotypic selection in greenhouse and field to genomic selection. They learn basic breeding methodology and specific breeding programs for the respective crops. The features of different kinds of cultivars will be understood. Emphasis will be given to biotechnological techniques like molecular markers and genetically modified plants. The students will also learn how genome based techniques are employed in modern breeding schemes.

**Reading List**

- Acquaah G (2007) Principles of Plant Genetics and Breeding. Blackwell Publishing
- Bernardo R (2010) Breeding for Quantitative Traits in Plants. Second edn. Stemma Press, Woodbury, Minnesota
- Biancardi E, Campbell LG, Skaracis GN, De Biaggi M (2005) Genetics and Breeding of Sugar Beet. Science Publishers Inc., Enfieldt, NH, USA
- Brown J, Caligari P (2008) An Introduction to Plant Breeding. Blackwell Publishing
- Carena MJ (2009) Handbook of Plant Breeding: Cereals. Springer Science
- Coors JG, Pandey S (1999) The Genetics and Exploitation of Heterosis in Crops. American Society of Agronomy, Madison, Wisconsin USA
- Falconer DS, Mackay TFC (1996) Introduction to Quantitative Genetics. Addison Wesley Longman, Harlow, Essex, UK
- Hancock JF (2012) Plant Evolution and the Origin of Crop Species. CABI, Oxfordshire
- Hill J, Becker HC, Tigerstedt PMA (1998) Quantitative and ecological aspects of plant breeding. Chapman & Hall, London
- Ingrouille M, Eddie W (2006) Plants: Diversity and Evolution. Cambridge University press, Cambridge
- Jackson M, Ford-Lloyd B, Parry M (2014) Plant Genetic Resources and Climate Change. CABI, Oxfordshire
- Jung C (2007) Ausgewählte Themen der Pflanzenzüchtung, Kiel
- Kang MS (2002) Quantitative Genetics, Genomics and Plant Breeding. CABI Publishing, Wallingford, Oxon, UK
- Kang MS, Priyadarshan PM (2007) Breeding Major Food Staples. Blackwell Publishing Ltd.
- Kole C (2006) Cereals and Millets. Springer, Berlin
- Lamkey K, Lee M (2006) Plant Breeding: The Arnel R. Hallauer International Symposium. Blackwell Publishing Professional, Ames, Iowa
- Lieberei R, Reisdorff C (2007) Nutzpflanzenkunde. Georg Thieme Verlag, Stuttgart
- Liu BH (1998) Statistical Genomics. CRC Press, Boca Raton New York
- Schlegel RHJ (2003) Encyclopedic Dictionary of Plant Breeding and Related Subjects. Food Products Press and The Haworth Reference Press, Binghamton
- Tuberosa R, Graner A, Frison E (2014a) Genomics of Plant Genetic Resources, Vol. 2. Crop Productivity, Food Security and Nutritional Quality. Springer, Heidelberg
- Tuberosa R, Graner A, Frison E (2014b) Genomics of Plant Genetic Resources, Volume 1. Managing, Sequencing and Mining Genetic Resources. Springer, New York
- Varshney RK, Koebner RMD (2007) Model Plants and Crop Improvement. Taylor & Francis Group, New York
- Walsh B (2001) Quantitative Genetics. Nature Publishing Group, pp
- Xu Y (2010) Molecular Plant Breeding. CABI, Oxfordshire, UK

Use	Compulsory / Optional	Semester
Master, 1-Subject, Agricultural Sciences, Specialisation Agricultural Economics, (Version 2017)	Optional	1.-3. Semester
Master, 1-Subject, Agricultural Sciences, Specialisation Agricultural Economics, (Version 2013)	Optional	1.-3. Semester
Master, 1-Subject, Agricultural Sciences, Special. Agricultural Economics and Agribusiness # Specific Field of Study: Agricultural Economics, (Version 2008)	Optional	1.-3. Semester
Master, 1-Subject, Agricultural Sciences, Special. Agricultural Economics and Agribusiness # Specific Field of Study: Agribusiness, (Version 2008)	Optional	1.-3. Semester
Master, 1-Subject, Agricultural Sciences, Specialisation Agribusiness, (Version 2017)	Optional	1.-3. Semester
Master, 1-Subject, Agricultural Sciences, Specialisation Agribusiness, (Version 2013)	Optional	1.-3. Semester
Master, 1-Subject, Agricultural Sciences, Specialisation Crop Sciences, (Version 2017)	Compulsory	1.-3. Semester
Master, 1-Subject, Agricultural Sciences, Specialisation Crop Sciences, (Version 2013)	Compulsory	1.-3. Semester
Master, 1-Subject, Agricultural Sciences, Specialisation Crop Sciences, (Version 2008)	Optional	1.-3. Semester
Master, 1-Subject, Agricultural Sciences, Specialisation Animal Sciences, (Version 2017)	Optional	1.-3. Semester
Master, 1-Subject, Agricultural Sciences, Specialisation Animal Sciences, (Version 2013)	Optional	1.-3. Semester
Master, 1-Subject, Agricultural Sciences, Specialisation Animal Sciences, (Version 2008)	Optional	1.-3. Semester
Master, 1-Subject, Agricultural Sciences, Specialisation Environmental Sciences, (Version 2017)	Optional	1.-3. Semester
Master, 1-Subject, Agricultural Sciences, Specialisation Environmental Sciences, (Version 2013)	Optional	1.-3. Semester
Master, 1-Subject, Agricultural Sciences, Specialisation Environmental Sciences, (Version 2008)	Compulsory	1.-3. Semester
Master, 1-Subject, AgriGenomics, (Version 2017)	Optional	1.-3. Semester
Master, 1-Subject, AgriGenomics, (Version 2010)	Optional	1.-3. Semester
Master, 1-Subject, Biology, (Version 2015)	Optional	1.-3. Semester
Master, 1-Subject, Biology, (Version 2011)	Compulsory	1.-3. Semester
Master, 1-Subject, Biology, (Version 2007)	Compulsory	1.-3. Semester
Master, 1-Subject, Dairy Science, (Version 2017)	Compulsory	1.-3. Semester
Master, 1-Subject, Nutritional and Food Science, (Version 2013)	Optional	1.-3. Semester
Master, 1-Subject, Nutritional and Consumer Economics, (Version 2017)	Optional	1.-3. Semester
Master, 1-Subject, Nutritional and Consumer Economics, (Version 2013)	Optional	1.-3. Semester
Master, 1-Subject, Nutritional Sciences and Household Economics, Specialisation Nutritional and Consumer Economics, (Version 2013)	Optional	1.-3. Semester

