Georg-August-Universität
Göttingen

Modulverzeichnis

zu der Prüfungs- und Studienordnung für den konsekutiven Master-Studiengang "Integrated Plant and Animal Breeding" (Amtliche Mitteilungen I Nr. 46/2018 S. 1084)

Module

Übersicht nach Modulgruppen

I. Master-Studiengang "Integrated Plant and Animal Breeding"

Es müssen Leistungen im Umfang von insgesamt wenigstens 120 C erfolgreich absolviert werden.

1. Block A - Pflichtmodule

Es müssen die vier folgenden Pflichtmodule im Umfang von insgesamt 27 C erfolgreich absolviert werden:

2. Block B - Wahlpflichtmodule A

Es müssen wenigstens vier der folgenden Wahlpflichtmodule im Umfang von insgesamt wenigstens 21 C erfolgreich absolviert werden:

3. Block C - Wahlpflichtmodule B

Es müssen wenigstens weitere fünf Module im Umfang von insgesamt wenigstens 30 C aus dem Lehrangebot eines Master-Studienganges der Fakultät für Agrarwissenschaften in Göttingen oder frei wählbare Module aus den am diesem Studiengang beteiligten Einrichtungen, einer entsprechenden anderen agrarwissenschaftlichen Fakultät oder aus verwandten Studiengängen erfolgreich abgeschlossen werden.

4. Block D - Schlüsselkompetenzen

Es müssen die zwei folgenden Module im Umfang von insgesamt 12 C erfolgreich absolviert werden:

5. Masterarbeit

Durch die erfolgreiche Anfertigung der Masterarbeit werden 24 C erworben.

6. Kolloquium zur Masterarbeit

Durch das erfolgreiche Absolvieren des Kolloquiums zur Masterarbeit werden 6 C erworben.

Georg-August-Universität Göttingen **Modul B.Bio.117: Genomanalyse** *English title: Genome analysis*	10 C 7 SWS

Lernziele/Kompetenzen:	**Arbeitsaufwand:**
The students will learn basic methods of genome analysis. After successful participation at this module, they have a basic knowledge in the field of genome sequencing, function and structure of genomes and algorithms for bioinformatical genome analysis. In the practical part of the module, the students will acquire a basic knowledge in the operating system LINUX and UNIX, respectively, and in the programming language PERL or in a comparable language. They are able to design and implement simple programs to independently insolve basic data processing tasks in a UNIX/LINUX environment.	Präsenzzeit: 140 Stunden Selbststudium: 160 Stunden

Lehrveranstaltungen:	
1. LINUX und PERL für Biologen (Praktikum) *Angebotshäufigkeit:* block course in lecture-free time in winter	3 SWS
2. Grundlagen der Bioinformatik (Vorlesung, Übung) *Angebotshäufigkeit:* jedes Sommersemester	4 SWS

Prüfung: Mündlich (ca. 30 Minuten) **Prüfungsvorleistungen:** Teilnahme am Praktikum mit abschließendem schriftlichem Test **Prüfungsanforderungen:** Basic methods of genome analysis, in particular genome assembly, sequence alignment and basic algorithms for phylogenetic tree reconstruction based on genome sequences.	10 C

Zugangsvoraussetzungen:	**Empfohlene Vorkenntnisse:**
BSc Biology: at least 40 C from the first study period	keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Burkhard Morgenstern
Angebotshäufigkeit: Praktikum jedes WiSe; Vorlesung jedes SoSe	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 3 - 6
Maximale Studierendenzahl: 10	

Bemerkungen:
For the lecture, we assume basic programming skills (e.g. from the practical part of the module), therefore the LINUX/PERL course should be completed before attending the lecture.

Georg-August-Universität Göttingen **Modul M.Agr.0020: Genome analysis and application of markers in plantbreeding** *English title: Genome analysis and application of markers in plantbreeding*	6 C 4 SWS

Lernziele/Kompetenzen: Studierende erlernen ihre Kenntnisse in klassischer Genetik auf Problemlösungen in züchterischen Situationen anzuwenden. Studierende erlernen selbständig sich Kenntnisse im Umgang mit großen Datensätzen anzueignen und sich in entsprechende Software einzuarbeiten.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Genome analysis and application of markers in plantbreeding (Vorlesung, Übung) *Inhalte*: Überblick über verschiedene Typen von molekularen Markern. Schätzung von genetischen Distanzen. Grundlagen der klassischen Genetik zur Kopplungsanalyse. Konstruktion von Kopplungskarten. Markergestützte Rückkreuzung. Kartierung von QTL: Theorie und praktische Übungen mit großen Datensätzen aus früheren Experimenten. Grundlagen der Bioinformatik: Vergleich von DNA Sequenzen.	4 SWS
Prüfung: Klausur (90 Minuten) **Prüfungsvorleistungen:** Abgabe der Lösung von Übungsaufgaben **Prüfungsanforderungen:** Grundlagenkenntnisse in klassischen und molekularen Methoden der Kartierung von Genen. Basiskenntnisse im Einsatz molekularer Marker in der Pflanzenzüchtung.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Heiko C. Becker
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 20	

Georg-August-Universität Göttingen **Module M.Agr.0093: Enviromental impact of genetically modified plant**	3 C 2 WLH

Learning outcome, core skills:	**Workload:**
Students should gain an understanding on interactions of genetically modified crops and the environment, learn the fundamentals of risk assessment and general surveillance concepts, should be able to evaluate studies on risks of GMOs to the environment	Attendance time: 22 h Self-study time: 68 h

Course: Environmental Impact of Genetically Modified Plants (Lecture, Seminar) *Contents*: Overview on genetically modified crop plants, mode of action of transgenic trraits, interactions with non target organisms, national legislation procedures, transgenic crops and sustainable agriculture, concepts of environmental risk assessments, resistance management of transgenic traits; biodiversity and genetically modified crops, global perspectives of transgenic crops	2 WLH
Examination: Written examination (45 minutes) **Examination prerequisites:** Presentation (approx. 15 min.) **Examination requirements:** Concepts of risk assessment of genetically modified crops, mode of action of genetically modified crops, interactions with the environment, case studies	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Stefan Vidal
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Georg-August-Universität Göttingen **Modul M.Agr.0114: Sicherheitsbewertung biotechnologischer Verfahren in der Pflanzenzüchtung** *English title: Biosafety evaluation of biotechnological approaches in plant breeding*	6 C 4 SWS

Lernziele/Kompetenzen: Vertieftes Verständnis von Sicherheitsbewertung und Sicherheitsmanagement biotechnologischer (einschließlich gentechnischer) Verfahren in der Pflanzenzüchtung; Erkennen komplexer Zusammenhänge zwischen Sicherheitsforschung, Sicherheitsbewertung und -management sowie zwischen gesetzlichen Regulierungen und wissenschaftlich-technischem Fortschritt auf nationaler und internationaler Ebene.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltungen: **1. Anwendung und Rechtsrahmen gentechnischer Verfahren** (Vorlesung, Exkursion) *Inhalte*: Sicherheitsbewertung, Beantragung und Durchführung gentechnischer Arbeiten in Labor und Gewächshaus: Rechtsrahmen, Kriterien, Voraussetzungen;Monitoring der Auswirkungen der Markteinführung gentechnisch veränderter Pflanzen: Zielsetzung, Rechtsrahmen, kritische Betrachtung (Zielstellung, Aufwand, Nutzen) ausgewählter Methoden;Gesetzliche Regelungen/Voraussetzungen für Freisetzungsversuche; Durchführung der Sicherheitsbewertung und Versuchsplanung, Beantragung, Versuchsdurchführung; Bedeutung und Notwendigkeit von Koexistenz, Situation in Deutschland/Europa, Confinement-Strategien. **2. Anwendung und Rechtsrahmen biotechnologischer Verfahren allgemein** (Vorlesung, Exkursion) *Inhalte*: Anwendung und juristische Bewertung biotechnologischer Verfahren in der Pflanzenzüchtung; Sicherheitsforschung, -bewertung und -management; Pflanzen als Produktionsplattform - Perspektiven und Sicherheitsbewertung. **3. Neue Züchtungsverfahren in der Anwendung** (Vorlesung, Exkursion) *Inhalte*: Gene targeting/editing, gene drive; vergleichende Auswirkung „klassischer“ und „neuer“ Züchtungsmethoden; Pflanzengenom- und Transkriptomanalyse, Datenbanken; next generation sequencing, Bioinformatik; Bewertung und Regulierung ausgewählter Züchtungsverfahren	
Prüfung: Klausur (90 Minuten) **Prüfungsanforderungen:** Anwendung und Rechtsrahmen gentechnischer Verfahren: Vertieftes Verständnis von gentechnischem Arbeiten in Labor und Freiland; Fallstudien; Monitoring und Koexistenz, Planung und Durchführung gentechnischer Versuche im Freiland; Anwendung und Rechtsrahmen biotechnologischer Verfahren allgemein: Vertieftes Verständnis von Sicherheitsbewertung und Sicherheitsmanagement biotechnologischer Verfahren in der Pflanzenzüchtung; Fallstudien GV Pflanzen für	6 C

Futter- und Nahrungsmittelanwendungen, GV Pflanzen als Produktionsplattform für industrielle & pharmazeutische Produkte sowie Energie Neue Züchtungsverfahren in der Anwendung: Vertieftes Verständnis und Sicherheitsbewertung neuer Züchtungsverfahren einschließlich Gentechnik und genome editing; Fallstudien vergleichende Sicherheitsbewertung und Bioinformatik	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Dr. Ralf Wilhelm
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 50	

Georg-August-Universität Göttingen **Module M.Agr.0126: Quantitative genetics and population genetics**	6 C 6 WLH

Learning outcome, core skills: Advanced knowledge of the basic model of quantitative genetics, genetic effects and parameters, breeding values and variances. Similarity between relatives, inbreeding, crossbreeding and heterosis. Dynamics of genetic variability in limited populations.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Quantitative genetics and population genetics (Lecture, Exercise) *Contents*: The genetic composition of a population in a single locus model, changes of gene and genotype frequencies, the polygenic model, components of phenotypic variance, relationship and inbreeding, heterosis and inbreeding depression, genetic drift, linkage disequilibrium, selection signatures. All contents are initially taught in theory and are consolidated in practical computer exercises (some with real data). Literature: Falconer & Mackay, Introduction to Quantitative Genetics (Prentice Hall), Lynch and Walsh, Genetics and Analysis of Quantitative Traits (Sinauer)	6 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Advanced knowledge of the quantitative-genetic and population genetic basics of breeding, ability to apply appropriate methods to real data sets. Final exam with practical examination on computer.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of plant and animal breeding
Language: English	**Person responsible for module:** Prof. Dr. Henner Simianer
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 1
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.Agr.0127: Breeding schemes and programs in plant and animal breeding**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Students will learn the basic elements and structures of breeding programs in plant and animal breeding. They understand the relationship between biological characteristics of the crop or livestock species and the specific design of the breeding program. The students know the four breeding categories and design possibilities of breeding programs for self-pollination, cross-pollination and vegetative and clonally propagated crops. They learn breeding programs for major crops and livestock species.	Attendance time: 56 h Self-study time: 124 h

Course: Breeding schemes and programs in plant and animal breeding (Lecture, Excursion) *Contents*: Design of breeding programs. Basic elements of breeding programs: Breeding objectives and breeding planning, performance testing, selection and mate selection, use of biotechnologies, transfer of breeding progress in the production level, monitoring of the breeding progress. Breeding program structures in the most important crop species: cereals, corn, rape, sugar beet, specialty crops. Breeding program structures in the main livestock species: dairy cattle, pigs, poultry, beef cattle, small ruminants. Breeding program structures in forest genetics.	4 WLH
Examination: Written exam (45 minutes, 50%) and Presentation (about 20 minutes) with written outline (max. 10 pages) (50%) **Examination requirements:** Profound knowledge of basic breeding program structures and elements of breeding programs and their concrete implementation to various crops and livestock. Elaboration of the breeding planning for a livestock or crop species.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Henner Simianer
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 1
Maximum number of students: 20	

Additional notes and regulations:
Mandatory excursions to practical plant breeding and animal breeding programs.

Georg-August-Universität Göttingen **Module M.Agr.0128: Statistical genetics, breeding informatics and experimental design**	6 C 4 WLH

Learning outcome, core skills: Novel biotechnological methods allow the production of very large data sets (gene sequences, genotypes, transcriptomes) at decreasing costs. Students learn about statistical and computational methods to use these records for breeding issues. Furthermore, the main experimental designs to plan, implement, and evaluate targeted and efficient experiments for data generation will be treated.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Statistical genetics, breeding informatics and experimental design (Lecture, Exercise) *Contents*: • Gene Expression Analysis • Genome-wide association analysis • QTL mapping • Statistical hypothesis testing • Regression methods • Analysis of variance • Multiple testing • Experimental designs (block designs, randomized designs, Latin squares) • Sample size estimation • Introduction to programming • Fundamentals of databases Literature: Andrea Foulkes: Applied Statistical Genetics with R; Francis O'Donnel: Statistical Experiment Design and Interpretation; An Introduction with Agricultural Examples	4 WLH
Examination: Written examination (60 minutes) **Examination requirements:** Profound knowledge of statistic and informatics methods to use them for breeding issues.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basics in statistics and genetics
Language: English	**Person responsible for module:** Prof. Dr. Armin O. Schmitt
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 2
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.Agr.0129: Poultry breeding and genetics**	6 C 4 WLH

Learning outcome, core skills: The module teaches substantiated and application-orientated understandings of the poultry breeding sector. The main organizational and technological elements of the current breeding programs as well as their optimization to future breeding challenges will be provided. Thereby, breeding strategies of relevant economic traits will be shown concentrating on the development of selection strategies to improve functional traits (adaption to climate, disease resistance, behavior, reproduction, product quality, metabolic dysfunction). Students will learn the application of quantitative and molecular genetic technologies for the applied research in poultry breeding.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Poultry breeding and genetics (Lecture, Excursion) *Contents*: • Structure, Organization and Economics of Poultry Breeding • Breeding Strategies for primary and functional traits in poultry and water fowl (genetics and breeding in reproduction, feed conversion, growth, product quality, immune system, disease resistance, behavior and well-being, environmental adaption and metabolic stability). This includes particularly: • Methods of phenotyping and performance testing • Estimation of breeding values (conventional and genomic) • Selection index and BLUP • Genome-wide association studies (GWAS) and QTL mapping • Omics • Software application	4 WLH
Examination: Written examination (90 minutes) **Examination prerequisites:** Attendance to the mandatory two-day excursion **Examination requirements:** Profound knowledge about applied poultry breeding.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of animal breeding
Language: English	**Person responsible for module:** Dr. Ahmad Reza Sharifi
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Additional notes and regulations:
Attendance to the mandatory two-day excursion.

Georg-August-Universität Göttingen **Module M.Agr.0130: Breeding informatics**	6 C 4 WLH

Learning outcome, core skills: Students deepen their knowledge of informatics methods to evaluate large datasets for breeding issues.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Breeding informatics (Lecture, Exercise) *Contents*: • Design and implementation of databases with mySQL • Basic data structures • Programming in R and Perl • Regular expressions • Design and implementation of pipelines for data analysis • Shell scripts on Linux (gawk, sed) • Relation of genotype - phenotype • Measures to detect selection signatures • Basic concepts of bioinformatics	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Profound knowledge of informatic methods to evaluate large datasets for breeding issues.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of molecular genetics, statistics, programing
Language: English	**Person responsible for module:** Prof. Dr. Armin O. Schmitt
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.Agr.0131: Biotechnology and molecular genetics in plant and animal breeding**	6 C 4 WLH

Learning outcome, core skills: Profound knowledge of biotechnologies to decipher phenotypes and traits for plant and animal breeding. Skills to use appropriate molecular genetic tools to elucidate the genetic basis of traits. Development of creativity and independent as well as globally thinking to solve complex breeding challenges; effective communication skills (both orally and written); self-learners.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Biotechnology and molecular genetics in plant and animal breeding (Lecture, Excursion) *Contents*: Basics of genetics (Mendelian inheritance; karyograms; DNA, RNA and protein; gene structure; epigenetics), Biotechnologies for animal breeding (Artificial Insemination; Spermsexing; embryo transfer and associated techniques such as in vitro fertilization, embryo sexing, stem cells, cloning), Biotechnologies for plant breeding (in vitro cloning, induction of haploids, direct and indirect genetic transformation, interspecific sexual and somatic hybridization), Molecular genetics (PCR; qPCR; Recombinant DNA Technology; DNA markers; miRNA; Sanger sequencing; expression analysis; Next Generation Sequencing; array techniques; cytogenetics; proteomics; genome editing techniques). Literature: Clark & Pazdernik: Biotechnology (Academic Cell Publishing); Pineda & Dooley: Veterinary Endocrinology and Reproduction (Blackwell Publishing); Squires: Applied Animal Endocrinology (CABI); Krebs, Kirkpatrick, Goldstein: Lewin's Gene XI (Jones and Bartlett Publishing); Brown: Gene cloning and DNA analysis (Blackwell Science); Journal: Trends in Plant Science (Elsevier Ltd.)	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** The examinee should show the potential to solve breeding challenges applying the best biotechnologies and most accurate molecular genetic tools.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basics in animal and plant breeding
Language: English	**Person responsible for module:** Prof. Dr. Jens Tetens
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 1
Maximum number of students: 20	

Additional notes and regulations:
The module includes a mandatory excursion to a DNA/Transcriptomics core facilitiy or a breeding

organisation.

Georg-August-Universität Göttingen **Module M.Agr.0132: Molecular and biotechnological methods in plant and animal breeding**	6 C 4 WLH

Learning outcome, core skills: In addition to the theoretical background (Module M.Agr.0131 (Biotechnology and molecular genetics in plant and animal breeding)), the students should improve their basic knowledge in biotechnologies and molecular genetics by learning hand-on skills in the lab. The students should be capable to perform experiments on their own and to present them in an adequate manner.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Molecular and biotechnological methods in plant and animal breeding (Block course, Practical course) *Contents*: Sample collection; DNA and RNA isolation; Sanger Sequencing including the usage of appropriate software programs; Separation and visualization of nucleic acids; qualitative and quantitative PCR; ELISA assays to determine hormone profiles or as a pregnancy/ non pregnancy testing system; microsatellites; SNP; AFLP; storage of DNA and RNA; semen evaluation; in vitro generation and genetic analyses of embryos; direct and indirect transformation; protoplasts, in vitro propagation, androgenesis and gynogenesis; gene cloning. Literature: e.g. Current Protocols in molecular biology; A practical guide to basic laboratory endocrinology: Introduction to Plant Biotechnology	4 WLH
Examination: Protocol (max. 40 pages, 80%) and presentation (about 10 minutes, 20%) **Examination requirements:** The examinees should provide detailed information in their protocols including the biological background of the methods. The examinee should show its independent ability to conduct experiments in the lab.	6 C

Admission requirements: M.Agr.0131	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Jens Tetens
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 2
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.Agr.0133: Genetic resources**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Students learn the value of genetic resources for crop and livestock. They know different methods to describe the genetic diversity and for prioritization of measures for conservation and can apply them to a practical example. They know how to collect, evaluate and conserve genetic resources. They know different technological approaches (in vivo, in vitro) for the conservation and management of genetic resources. The students know methods for the utilization of genetic resources for breeding programs. The students know the history, political meaning and the institutions of the global system for the conservation of plant and animal genetic resources.	Attendance time: 56 h Self-study time: 124 h

Course: Genetic resources (Lecture, Seminar) *Contents*: Definition of genetic resources. Primary, secondary and tertiary gene pool. Crossability and adaptation of genetic resources. Genetic distances. Multivariate methods for DNA markers and phenotypic traits. Cluster analysis, principal component analysis. Implementation of analytical methods with appropriate software. Utilization of genetic resources for breeding. Starting points for the expansion of breeding pools with genetic resources. Monitoring of diversity and performance in the expansion of breeding pools. Excursion to the gene bank in Gatersleben Literature: FAO (2015) The Second Report on the State of the World's Animal Genetic Resources for Food and Agriculture	4 WLH
Examination: Written exam (45 minutes, 50%) and presentation (about 20 minutes, 50%) **Examination requirements:** Overview of genetic resources and their use in a livestock or crop species. Profound knowledge of utilization and conservation of genetic resources.	6 C

Admission requirements:	**Recommended previous knowledge:**
none	Basics of plant and animal breeding
Language: English	**Person responsible for module:** N. N.
Course frequency: each winter semester; Start WS17/18	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.Agr.0134: Legal issues in plant and animal breeding**	3 C 2 WLH

Learning outcome, core skills: The students know the relevant laws, regulations and procedures for plant and animal breeding in the areas of patent law, plant variety rights, plant variety protection, animal breeding, animal protection. Students know the legal basis for genetically modified organisms in the EU and globally. The students gain a deeper understanding of the importance of legal issues in breeding.	**Workload:** Attendance time: 26 h Self-study time: 64 h

Course: Legal issues in plant and animal breeding (Lecture, Seminar) *Contents*: Legal issues in plant and animal breeding (Lecture and Seminar) Contents: International intellectual property rights, biological patents, agreements on genetic resources, GMO laws and regulations incl. The preparatory phase of European legislation for modern biological breeding tools for genome editing. In terms of plant breeding, the module covers the following topics: plant breeders 'rights, European and German breeders' rights and marketing rights for seeds including procedures for testing and acceptance of varieties and operating license obtained seed. Regarding the animal breeding, the module covers the following topics: German animal breeding law, European legal framework, animal breeding related aspects of animal welfare legislation, legal regulations on animal testing, legal regulations of international trade with breeding animals and breeding products. Literature: Plant Variety Protection Law, Animal Breeding Law, Patent Law, regulation on genetically modified food and feed	2 WLH
Examination: Written examination (45 minutes) **Examination requirements:** Profound knowledge of all aspects of the legal basis of plant and animal breeding. Preparation of a case study on legal issues.	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Henner Simianer
Course frequency: each winter semester; ab WS19/20	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.Agr.0135: Seed marketing**	6 C 4 WLH

Learning outcome, core skills: Students can apply the tools of marketing to the specifics of the researchintensive seed market. They will be able to apply modern research methods in order to collect information on agricultural procurement processes and public settings. On this basis they can develop targeted strategies for national and international markets. They know customized concepts and methods of distribution.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Seed marketing (Seminar) *Contents*: The marketing of seed is a hitherto largely unexplored field of research. In the research-oriented master's degree program, the students will learn the basics of the business-to-business marketing (positioning, market segmentation, competitive strategies, international marketing, marketing tools, sales management) and its application to the purchasing behavior of farmers. Since the seed market is a socially critical debated topic, fundamentals of public relations and the corporate social responsibility are taught. In a project report in the second part of the seminar, students will elaborate their own studies on current aspects of the seed marketing and present it in a presentation.	4 WLH
Examination: Written exam (60 minutes, 50%) and presentation (about 30 minutes, 50%) **Examination requirements:** Students show in the exam that they know the basics of seed marketing. In a scientific presentation they can demonstrate that they can apply this knowledge to current problems of the subject and are able to transfer their knowledge.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of marketing and market research (incl. statistics)
Language: English	**Person responsible for module:** Prof. Dr. Achim Spiller
Course frequency: Every 2 years. Start SoSe 2017	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 2 - 4
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module M.Agr.0136: Journal Club: Key papers in animal and plant breeding**	6 C 4 WLH

Learning outcome, core skills: Students gain competences in the opening and discussion of a scientific topic by using the literature in the field of plant and animal breeding. They also obtain skills in oral and written presentation of their investigation.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Journal Club: Key papers in animal and plant breeding (Lecture, Seminar) *Contents*: Teaching of methods for collecting and using of scientific contents and papers for a specific topic. Ability to discuss scientific texts in a deepened substantive way on the basis of a comprehensive literature review.	4 WLH
Examination: Presentation (about 20 minutes) with written outline (max. 10 pages) **Examination prerequisites:** Regular participation in 10 seminars **Examination requirements:** Preparation of a literature based seminar presentation including discussion and a short draft, Preparation of a co-moderation and discussion leading, attendance to seminars.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Jens Tetens
Course frequency: each semester	**Duration:** 2 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.Agr.0137: Internship**	9 C 6 WLH

Learning outcome, core skills: Specialized knowledge of the respective field, social competences (working organization, teamwork, interdisciplinary working, flexibility), applied methodical competences.	**Workload:** Attendance time: 240 h Self-study time: 30 h

Course: Internship (Internship) *Contents*: Practical working in different areas of plant and animal breeding (industry, departmental research, consulting). Insights to working methods, areas of responsibility and the everyday professional life in plant and animal breeding. Acquisition of practical and applied knowledge and skills. Duration of Internship: 6 weeks	6 WLH
Examination: Homework (max. 20 pages, 50%) and presentation (about 20 minutes, 50%) **Examination requirements:** Practical working in different areas of plant and animal breeding, internship report and presentation.	9 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Henner Simianer
Course frequency: each semester; Start WS17/18	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.Agr.0138: Selection theory, design and optimisation of breeding programs**	6 C 4 WLH

Learning outcome, core skills: Students are familiar with the theoretical basics of the selection theory even for complex cases (direct and correlated breeding progress, single- and multiple trait selection, multiple-path selection, gene flow method, optimum genetic contribution theory). Students are able to estimate the expected breeding progress for specific cases. They know the basic designs of breeding programs in plant and animal breeding and are able to model, calculate and optimize practical breeding programs by using suitable software programs.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Selection theory, design and optimisation of breeding programs (Lecture, Exercise) *Contents*: Introduction to the selection theory, direct and correlated breeding progress , single- and multiple trait selection , multi - path models , multiplepath selection, gene flow method, optimum genetic contribution theory; Explanation of typical breeding program structures in plant and animal breeding, principles of experimental design and optimal allocation of resources, introduction to breeding planning software (ZPLAN+, Genecont etc.), impact of selection on allele frequencies (Wright-model) and genetic variance (Bulmer effect), optimization of breeding programs under constraints (eg. conservation of genetic diversity). Literature: Walsh&Lynch: Evolution and Selection of Quantitative Traits	4 WLH
Examination: Written exam (45 minuntes, 50%) and presentation (about 20 minutes, 50%) **Examination requirements:** Profound knowledge of all aspects of the selection theory, application of methods for estimating the breeding progress, assessing the impact of different selection strategies to progress in breeding, inbreeding development and preservation of genetic variance. Modeling and optimization of a given breeding program with appropriate software.	6 C

Admission requirements: none	**Recommended previous knowledge:** Good knowledge of quantitative genetics and statistics
Language: English	**Person responsible for module:** N. N.
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 2
Maximum number of students: 20	

Georg-August-Universität Göttingen **Modul M.Cp.0004: Plant Diseases and Pests in Temperate Climate Zones** *English title: Plant diseases and pests in temperate climate zones*	6 C 4 SWS

Lernziele/Kompetenzen: Students will be able to recognize and identify the main pests and diseases, understand the origin, distribution and dynamics of diseases and pests in the field as a basis for the development of control methods.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Plant Diseases and Pests in Temperate Climate Zones (Vorlesung, Exkursion, Übung) *Inhalte*: The main diseases and pests (fungi, viruses, bacteria, nematodes, mites, and insects) of crops (arable crops, vegetables, fruit crops) in temperate climate zones will be presented. The symptoms, diagnosis, biology and life cycles, economic importance, possible control methods will be studied in lectures, practicals and field trips. The economic damage, prognosis, possible control methods using economic thresholds will be presented.	4 SWS
Prüfung: Klausur (45 Minuten) **Prüfungsvorleistungen:** Teilnahme an Exkursionen und Übungen im Feld **Prüfungsanforderungen:** Identification and diagnosis of plant pests and diseases of crops of the temperate climate zones, knowledge of the life cycle, distribution, and population dynamics.	6 C

Zugangsvoraussetzungen: Only for students in the study programmes “Crop Protection”, EMJMD PlantHealth and “Sustainable international Agriculture”.	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Dr. Birger Koopmann
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** Master: 2
Maximale Studierendenzahl: 30	

Georg-August-Universität Göttingen **Module M.Cp.0016: Practical statistics and experimental design in agriculture**	6 C 4 WLH

Learning outcome, core skills: The aim of the course is to familiarize students with the basic concepts of statistics and their application in agricultural science. The second goal is to learn the use of software packages like SAS.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Practical Statistics and Experimental Design in Agriculture (Lecture, Exercise) *Contents*: In the beginning of the course, students are introduced to the basic concepts of statistics like frequency distributions, the normal distribution and hypothesis testing. They are also introduced to software packages like SAS, that are used for the practical exercises. Regression and correlation analysis are then introduced. Different experimental designs like randomized block, latin square, and split plot are described and analyzed by one-way analysis of variance or as factorial experiments. Generalized Linear Models will be used and multivariate data will by analyzed by cluster and principal component methods. A large amount of examples and exercises constitute an important aspect of the course, enabling the students to understand and assimilate the theoretical content. Practical analyses of example data sets also provide the students with the required experience and skills for future statistical tasks in the context of Mastertheses.	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Knowledge of the basic concepts of statistics and their application in agricultural science and in the use of software packages like SAS.	6 C

Admission requirements: none	**Recommended previous knowledge:** Mathematics, statistics
Language: English	**Person responsible for module:** Prof. Dr. Heiko C. Becker
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 2
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module M.Forst.1524: Biotechnology and forest genetics**	6 C 4 WLH

Learning outcome, core skills: Biotechnology is a fast developing field with many aspects and options in efficient and environmentally friendly bioresource production and utilization of bioresources including plant biomass. Sustainable management of tropical forests requires an understanding of the spatial and temporal dynamics of genetic information both in natural and man-made tropical forest ecosystems. The teaching module gives introductory lectures into biotechnology and into forest genetics.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Biotechnology (Lecture) *Contents*: Students will be introduced into subjects of microbiology, biochemistry and molecular biology being basics for biotechnology. With the gained knowledge, modern biotechnological applications in the forest and the wood industry sectors and the progress of biotechnological biomass conversion will be discussed, as well as other environmental problems that might be solved by biotechnological approaches on industrial scales and, particularly in tropical countries, also by small family business.	2 WLH
Examination: Oral examination (approx. 15 minutes)	3 C

Course: Tropical forest genetics (Lecture) *Contents*: Basic principles of population genetics are introduced, factors shaping genetic diversity of tropical forest species are discussed with emphasis on the reproduction system of tropical forest plants, and genetic diversity patterns of tropical forest trees are described. Main applications of forest genetics are mentioned: provenance research and tree breeding, genetic implications of forest management, forest reproductive material, and conservation of forest genetic resources.	2 WLH
Examination: Oral examination (approx. 15 minutes)	3 C

Examination requirements: Kenntnis der beschriebenen Lehrinhalte, Erreichung der festgelegten Lernziele und Nachweis der angestrebten Kompetenzen.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ursula Kües
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

cf. examination regulations	
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A02M: Epidemiology of international and tropical animal infectious diseases**	6 C 4 WLH

Learning outcome, core skills: Based on a scientific and practical up-to-date level, students know to evaluate and develop modern and effective livestock hygiene and husbandry concepts and to integrate them into complex quality management programs. Graduates are trained to be competent in implementing and communicating their knowledge in a multidisciplinary occupational setting that establishes epizootic control programs.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Epidemiology of international and tropical animal infectious diseases (Lecture, Exercise) *Contents*: Infectious diseases play an enormous role in international animal health control. National health and veterinary authorities, as well as international organizations (WHO, FAO) are very much involved in the surveillance of epidemics and establishment of health and hygiene monitoring programs. These efforts will increase in future, because of a further globalization of international markets, and will require well-educated experts collaborating worldwide in this multidisciplinary field. This module will give a generalized view of current epidemics together with a specialized understanding of infectious diseases and hygienic programs in subtropical and tropical countries. Characteristics of the biology of relevant infectious agents like parasites, fungi and bacteria together with their toxins, viruses, and prions will be presented in detail. Some of these germs included in this unit cause severe zoonotic diseases with a lethal danger for humans. Immunological host-defence mechanisms of wild and domestic farm animals against pathogens will be discussed together with modern strategies of active and passive immunizations. Diagnostic methods presently available and new biotechnological approaches in future assay and vaccine development will be demonstrated. The adaptation of practical health and standardized quality management processes to various animal production systems (ruminants, pigs, poultry) and the corresponding management measurements will be explained. The view will deeply focus on environmental impacts (water, soil, air hygiene), epizootiology and modern tools in epizootiological research. It will include biology and eradication of vectors (insects, ticks) transmitting pathogens of animal and zoonotic diseases, as well as biological and chemical methods for vector control. In the laboratory course, this module will also communicate well-established techniques of microbiological and parasitological diagnostics. Students will be practically trained in classical methods and in modern biochemical, immunological, biotechnological and molecular biological techniques for the detection of infectious agents, toxins and noxious substances. Tissue culture procedures for vaccine or antibody development are also used. Modification of livestock-environment interactions through human management are discussed.	4 WLH
Examination: Oral examination (approx. 90 minutes)	6 C

Examination requirements: Knowledge of current veterinary epidemic and infectious diseases inclusive emerging diseases. Background of hygiene and eradication programs. Profound knowledge in important infectious agents (parasites, fungi, bacteria, viruses) as well as toxins and prions. Skills in immunologic defense mechanisms of wildlife, zoo and domesticated animals in connection with modern active and passive vaccination strategies and biotechnological vaccine development. Knowledge in modern diagnostic tools as well as in biology and control of biological vectors (ticks, midges).	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of soil, plant and animal sciences
Language: English	**Person responsible for module:** Prof. Dr. Dr. Claus-Peter Czerny
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Additional notes and regulations:

Literature:

Lecture based materials.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A14: Organic livestock farming under temperate conditions**	6 C 4 WLH

Learning outcome, core skills: *Advances in animal nutrition and animal health:* Students get to know scientific tools for quantifying, assessing and evaluating problems within organic livestock production. *Animal welfare :* Students have a basic understanding of animal welfare, familiarize with different organic husbandry systems, practical problems and scientific concepts including how to assess animal welfare both at farm and system level. *Sustainable forage production systems:* Students are able to assess the relationships between sward management and structural (yield, botanical composition) and functional (nutrient efficiency) sward characteristics.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Courses:	
1. Animal Welfare (Lecture) *Contents*: • Principles of animal welfare in relation to organic farming; scientific methods of welfare assessment	1,33 WLH
2. Advances in animal nutrition and animal health (Lecture) *Contents*: • Organic livestock production in Europe • Possibilities and limitations within organic farming to ensure a high level of animal health • Strategies within animal nutrition to increase the efficiency in the use of limited esources • System-oriented versus technical approaches	1,33 WLH
3. Sustainable forage production systems (Lecture) *Contents*: • Design and management of a sustainable forage production • Management of forage quality and biodiversity on grassland • Minimizing nutrient losses towards water and atmosphere	1,33 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Knowledge of basic terms relevant to organic livestock systems; insights into aspects of feeding, healthcare, welfare, forage production and forage quality assessment; linkages and interdependencies between the discussed fields.	6 C

One written exam with all three parts**.**	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of animal sciences
Language: English	**Person responsible for module:** Prof. Dr. Albert Sundrum
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 35	

Additional notes and regulations:

Literature:

Advances in animal nutrition and animal health:

- Vaarst, M., Roderick, S., Lund, V., Lockeretz, W. (eds.) 2004: Animal health and welfare in organic agriculture. CABI Publishing

Animal welfare:

- Appleby, M.C., Hughes, B.O. (eds) 1997: Animal welfare. CAB International, Wallingford;
- Vaarst, M. et al. (eds.) 2004: Animal health and welfare in organic Agriculture. CAB International, Wallingford

Sustainable forage production systems:

- Hopkins, A. 2000: Grass, its production and utilization. Blackwell Science, Oxford, UK;
- Cherney J.H. 1998: Grass for dairy cattl.e CABI Publishing, Exon, UK;
- Frame, J. 1992: Improved Grassland Management. Farming Press Books, Ipswich, UK.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E11: Socioeconomics of rural development and food security**	6 C 4 WLH

Learning outcome, core skills: Students learn concepts of development and problem-oriented thinking in a development policy context. The identification of interdisciplinary linkages is trained. Building on case-study analyses, course participants can pinpoint appropriate economic and social policies and assess their impacts. These qualifications can also be transferred to unfamiliar situations.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Socioeconomics of rural development and food security (Lecture) *Contents*: This module provides students with an overview of socioeconomic aspects of hunger and poverty in developing countries. Apart from more conceptual issues and development theories, policy strategies for rural development and poverty alleviation are discussed and analyzed. Special emphasis is put on problems in the small farm sector. Numerous empirical examples are used to illustrate the main topics.	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Concepts and measurement of hunger and poverty; development theory; classification and evaluation of rural development policies	6 C

Admission requirements: none	**Recommended previous knowledge:** Prior knowledge of microeconomics at the BSc level is useful
Language: English	**Person responsible for module:** Prof. Dr. Matin Qaim
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 120	

Additional notes and regulations:

Literature:

Text books, research articles and lecture notes.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E13M: Microeconomic theory and quantitative methods of agricultural production**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Microeconomic Theory of Agricultural Production Students are familiar with microeconomic approaches and can apply them to analyze issues related to agriculture and rural development. Quantitative Methods in Agricultural Business Economics Students are familiar with quantitative methods used for the analysis and planning of farms and enterprises in the agricultural sector.	Attendance time: 56 h Self-study time: 124 h

Courses:	
1. Microeconomic theory of agricultural production (Lecture) *Contents*: Consumer theory, producer theory, markets, monopoly situations, risk and uncertainty, economics of technical change, farm household models, sharecropping contracts.	2 WLH
2. Quantitative methods in agricultural business economics (Lecture) *Contents*: Budgeting, accounting, annual balance sheets, linear programming, finance, investment analysis	2 WLH
Examination: Written examination (120 minutes) **Examination requirements:** Consumer theory; producer theory; risk; technological progress; farm household models; budgeting and accounting; linear programming; finance; investment analysis	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Matin Qaim
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 40	

Additional notes and regulations:

Literature:

Text books, research articles and lecture notes.

After successful conclusion of M.Agr.0060 students can not complete M.SIA.E13M

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I14M: GIS and remote sensing in agriculture**	6 C 4 WLH

Learning outcome, core skills: GIS: A broad overview of basic GIS functions and related background knowledge should enable students to explore GIS-Software for relevant commands and prepare functional strategies for spatial data management and analysis. Lecture and exercise examples have predominantly agricultural reference. Remote Sensing The lecture will introduce physical principles (reflectance, transmittance, and absorption), sensor techniques (passive and active sensors, satellites, field spectrometer) and methods of analysis (calibration, validation) in remote sensing applications. This technical framework is presented using agricultural examples, as e.g. the generation of maps for crop yield and protein, assessment of species composition in mixed vegetation (e.g. grassland), like legume content for a calculation of residual nitrogen and crop rotation effects.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Courses:	
1. GIS (Lecture) *Contents*: The course gives an introduction to Geographical Information Systems (GIS). Starting from geodetical background information, a wide range of different GIS- methods and -functions are presented using agricultural examples (e.g. data import, georeferencing, aggregation, (re)classification, interpolation, overlays and image analysis). The students have the opportunity to carry out exercises on the computer themselves for some important GIS-procedures. A special focus is given on data capturing using maps and field data survey with GPS as well as the spatial analysis of site conditions. Finally a particular view on GIS in organic farm management and Precision Farming is given.	2 WLH
2. Remote sensing in agriculture (Lecture) *Contents*: The lecture will introduce physical principles (reflectance, transmittance, and absorption), sensor techniques (passive and active sensors, satellites, field spectrometer) and methods of analysis (calibration, validation) in remote sensing applications. This technical framework is presented using agricultural examples, as e.g. the generation of maps for crop yield and protein, assessment of species composition in mixed vegetation (e.g. grassland), like legume content for a calculation of residual nitrogen and crop rotation effects.	2 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:**	6 C

Knowledge about basic GIS functions and the preparations of functional strategies for spatial data management. Knowledge of physical principles, methods of analysis and sensor techniques.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Thomas Möckel
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:

Literature:

Principles of Geographical Information Systems
by Peter A. Burrough and Rachael A. McDonnell (2015)

Introduction to Remote Sensing
by James B. Campbell **a**ndRandolph H. Wynne (2011)

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P13: Agrobiodiversity and plant genetic resources in the tropics**	6 C 4 WLH

Learning outcome, core skills: Students are able to understand the role of agrobiodiversity in tropical agro-ecosystems, to present approaches of functional biodiversity analysis and to discuss the needs and strategies of on-farm (in situ) and off-farm conservation of plant genetic resources.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Agrobiodiversity and plant genetic resources in the tropics (Lecture, Seminar) *Contents*: Case-study based analysis of the role of biodiversity for selected crops in different agro-ecosystems from the arid to the humid climate zones; importance of biodiversity for the stability / sustainability of smallholder (subsistence) versus commodity-oriented commercial agriculture in the Tropics, assessment and utilization of diversity, principles and practices in conservation of genetic resources, role of homegardens and indigenous wild fruit trees for in situ conservation of biodiversity, causes and consequences of genetic erosion, approaches of germplasm collection.	4 WLH
Examination: Oral exam (about 15 minutes, 60%) and presentation (about 20 minutes, 40%) **Examination requirements:** Students should be able to understand the role of agrobiodiversity in tropical agroecosystems, to present basic approaches to functionally analyse biodiversity and to discuss the need of and strategies for *in* and *ex situ* conservation of genetic resources.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge in plant and soil sciences
Language: English	**Person responsible for module:** Prof. Dr. Gunter Backes
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Literature:

Altieri, M. 1987: Agroecology: the scientific basis of alternative agriculture. Westview Press, Boulder, Colorado, USA; Eyzaguirre, P.B., Linares, O.F. 2004: Home gardens and agrobiodiversity. Smithsonia

Books, Washington, USA; Wood, D., Lenne, J.M. 1999: Agrobiodiversity: Characterization, utilization and management. CABI Publishing, Wallingford, UK.