JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

Faculty 09

Summer Semester 2026

As of 12.03.2026

Module Directory

Faculty 09 - Agricultural Sciences, Nutritional Sciences and Environmental Management

"Insect Biotechnology and Bioresources" Master Degree Course Modules

Please consult the timetable or current university calendar for information regarding dates and room numbers of the modules taught in the course:

http://www.uni-giessen.de/cms/fbz/fb09/studium/msc/stpl

Core Modules

MK-002-EN	MK-002-EN Applied Statistics Applied Statistics	6 CP
Core Module / Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Agronomy and Plant Breeding II Offered for the first time: WS 2015/16 Intake capacity: not limited	1. Sem.;

Frequency and Duration: WS, 1 semester

Module Coordinator: Chair of Biometry and Population Genetics

Applies to the Study Programmes: Agrobiotechnology, Master (1.); Insect Biotechnology and Bioresources, Master (1.); Agrobioinformatics, Master (1.);

Prerequisites for Participation: None

Learning Outcomes:
The Students
- have knowledge of statistical methods;
- have knowledge of experimental designs;
- are able to analyse experiments and studies.

Module Content:
- Analysis of variance
- Comparison of treatments
- Mixed linear models
- Experimental designs
- Data analysis using statistical software

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	30	60
Seminar		
Practical training	30	60
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Assignments (4) or written examination
- Components of final grade: Assignments (100 %) or written examination (100 %)
- Form of module retake examination: Written examination

Language: English

MK-087-EN	MK-087-EN Natural Product Chemistry	6 CP
	Natural Product Chemistry	
Core Module / Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Insect Biotechnology	1. Sem.;
	Offered for the first time: WS 2017/18	
	Intake capacity: 30	

Frequency and Duration: WS, 1 Semester

Module Coordinator: Chair of Natural Substance Research with a Focus on Insect Biotechnology

Applies to the Study Programmes: Insect Biotechnology and Bioresources, Master (1.);

Prerequisites for Participation: None (recommended: knowledge in organic chemistry)

Learning Outcomes:
The students
- have comprehensive insight into the chemistry of organic natural products;
- know the most important classes of natural products, including their biosynthesis, important structural and chemical features as well as bioactivities.

Module Content:
- Bioresources (=origin), biosynthesis, ecophysiological role, and practical importance of natural products, thereby emphasizing insect-derived and 'anti-insect' compounds
- classes of natural products (carbohydrates, lipids, polyketides, phenylpropanoids, terpenes, peptides (non-ribosomally and ribosomally synthesized), and alkaloids) as well as their biosynthesis and important features (structure-activity relationships, toxicity)
- Methods section: Introduction to production/fermentation, isolation, purification of natural products (several (column) chromatographic techniques, especially HPLC), and structure elucidation

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	30	60
Seminar	30	60
Practical training		
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Written examination and presentation (10-15 min.)
- Components of final grade: Written examination (60 %), presentation (40 %)
- Form of module retake examination: Written examination or oral examination

Language: English

MK-088-EN	MK-088-EN Entomology I Entomology I	6 CP
Core Module / Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Insect Biotechnology Offered for the first time: WS 2017/18 Intake capacity: 30	1. Sem.;

Frequency and Duration: WS, 1 Semester

Module Coordinator: Chair of Applied Entomology

Applies to the Study Programmes: Insect Biotechnology and Bioresources, Master (1.);

Prerequisites for Participation: None

Learning Outcomes:
The students
- gain fundamental knowledge of insects as a central bioresource;
- study insect anatomy and systematics;
- know the basics of insect identification and will learn ist practical application;
- learn techniques of preservation of insect specimens;
- understand the basics of evolutionary biology & ecology of insects.

Module Content:
- studies on internal (including dissections) and external insect morphology
- microscopy of organ systems
- use of insect identification keys with real specimens
- evolutionary strategies of insects
- insect ecology

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	40	80
Seminar		
Practical training		
Exercises	20	40
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Written examination
- Components of final grade: Written examination (100 %)
- Form of module retake examination: Written examination

Language: English

MK-089-EN	**MK-089-EN Insect Biotechnology and Integrated Pest Management**	6 CP
	Insect Biotechnology and Integrated Pest Management	
Core Module / Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Insect Biotechnology	1. Sem.;
	Offered for the first time: WS 2017/18	
	Intake capacity: 40	

Frequency and Duration: WS, 1 Semester

Module Coordinator: Chair of Insect Biotechnology in Plant Protection

Applies to the Study Programmes: Insect Biotechnology and Bioresources, Master (1.);

Prerequisites for Participation: None

Learning Outcomes:
The students
- have important knowledge in various methods of biological pest control (including classical biological control, inundative releases, etc.);
- have competencies in biology and ecology as well as the use of physical and microbiological control procedures;
- know the basic principles of important biotechnological plant protection strategies;
- can assess how and to what extent individual techniques can be used within the framework of IPM strategies;
- can independently compile, summarize, and present literature on a given topic in a lecture

Module Content:
- The legal basis of integrated and biological plant protection
- Biology and ecology of agricultural pests and entomopathogens and their application possibilities in crop protection (production and application technology)
- Case studies on methods of classical biological pest control, inundative releases of antagonists (in the field and greenhouse), sterile insect technology and strategies for the promotion of natural enemies in agricultural ecosystems
- Use of pheromones (monitoring, mass capture, confusion, lure and kill) and other biotechnological plant protection methods in agriculture

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	44	88
Seminar	8	16
Practical training		
Exercises		
Excursion	8	16
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Written examination and presentation (10-20 min. + discussion 5-10 min.)
- Components of final grade: Written examination (50%), presentation (50%)
- Form of module retake examination: Written examination or oral examination

Language: English

MK-090-EN	MK-090-EN Bioresources for Natural Product Discovery **Bioresources for Natural Product Discovery**	6 CP
Core Module / Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Insect Biotechnology Offered for the first time: SS 2018 Intake capacity: 30	2. Sem.;

Frequency and Duration: SS, 1 Semester

Module Coordinator: Chair of Natural Substance Research with a Focus on Insect Biotechnology

Applies to the Study Programmes: Insect Biotechnology and Bioresources, Master (2.);

Prerequisites for Participation: None

Learning Outcomes:
The students

- gain insights into suitable bioresources for natural product discovery approaches and how discovery pipelines are set-up (biological activity-based platforms versus modern genomics / bioinformatics-driven pipelines);
- get knowledge in currently used and emerging natural product-producing microorganisms and their application in pharmaceutical, agricultural and food industry;
- acquire knowledge in the industrial value chain from spanning early discovery programs up to lead candidate identification and lead development;
- get experience in the application of bioinformatic tools for biosynthetic gene cluster identification;
- get insights into recent literature and acquire skills in selecting and presenting publications as well as other data in seminars.

Module Content:

- Systematics, biology, and ecology of microorganisms producing natural products
- Examples of plant-derived natural products
- Examples of natural products biosynthesis in microorganisms (physiology, gene regulation)
- From bioresource to product: Strategies to select and exploit bioresources for natural product discovery
- Principles and application of biological detection systems and their application in academic and industrial screening systems
- Target identification and target-based screening systems
- Analytical platforms in natural product identification
- Connection of gene clusters and metabolites: modern approaches for drug discovery
- Lead identification and strategies for lead development
- Seminar on recent approaches in drug discovery
- Demonstration / hands on training to gain insights into bioinformatics tools in drug discovery (using the antiSMASH platform as an example to exploit genome sequence information)

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	42	84
Seminar	9	18
Practical training		
Exercises	9	18
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:

- Form(s) of assessment: Written examination, presentation (10-15 min.) and project work (group work: preparation of a video tutorial, 4-10 min)
- Components of final grade: Written exam (50 %), presentation (40 %), project work (10 %)
- Form of module retake examination: Written examination or oral examination

Language: English

MK-091-EN	**MK-091-EN Entomology II** **Entomology II**	**6 CP**
Core Module / Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Insect Biotechnology Offered for the first time: SS 2018 Intake capacity: 30	2. Sem.;

Frequency and Duration: SS, 1 Semester

Module Coordinator: Chair of Applied Entomology

Applies to the Study Programmes: Insect Biotechnology and Bioresources, Master (2.);

Prerequisites for Participation: None

Learning Outcomes:
The students
- gain in-depth knowledge on insect anatomy;
- broaden their knowledge on insect systematics;
- increase their skills in insect identification;
- understand concepts of insect physiology;
- understand insect adaptations to environmental pressures;
- extend their knowledge about insect ecological strategies.

Module Content:
- microscopic studies on histological sections of insect tissues
- identification of specimens on family and species level
- specific taxonomic techniques
- insect physiology (including development)
- examples and concepts how insects adapt to their environment
- insect feeding strategies (including field observations)

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	28	56
Seminar		
Practical training		
Exercises	24	48
Excursion	8	16
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Written examination
- Components of final grade: Written examination (100 %)
- Form of module retake examination: Written examination

Language: English

MK-092-EN	MK-092-EN Food Technology	6 CP
	Food Technology	
Core Module / Optional Module	Biology and Chemistry / Institute of Food Chemistry and Food Biotechnology	2. Sem.;
	Offered for the first time: SS 2019	
	Intake capacity: 30	

Frequency and Duration: SS, 1 Semester

Module Coordinator: Working group for biochemical and molecular biological food analytics and biotechnology

Applies to the Study Programmes: Insect Biotechnology and Bioresources, Master (2.);

Prerequisites for Participation: None

Learning Outcomes:
The students
- master basic engineering and bioprocess principles relevant to the food industry
- know special separation techniques
- understand the basic principles of the processing of animal and plant food
- can perform basic food biotechnological processes
- are able to analyze and assess parameters relevant in processes of food biotechnology

Module Content:
- Cereal technology
- Production of sugar and confectionery
- Techniques to produce fats and oils
- Production processes of food additives
- Food Biotechnology
- Basics in insect rearing and downstream processing
- Fermented asiaon food

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	30	50
Seminar	10	20
Practical training	30	40
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Written examination
- Components of final grade: Written examination (100 %)
- Form of module retake examination: Written examination or oral examination

Language: English

<table>
<tr><td rowspan="2">MK-116-EN</td><td>MK-116-EN Principles of Scientific Practice</td><td rowspan="2">6 CP</td></tr>
<tr><td>Principles of Scientific Practice</td></tr>
<tr><td rowspan="3">Core Module /
Optional Module</td><td>Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Agronomy and Plant Breeding I</td><td rowspan="3">1. Sem.;
2. Sem.;</td></tr>
<tr><td>Offered for the first time: SS 2021</td></tr>
<tr><td>Intake capacity: not limited</td></tr>
<tr><td colspan="3">Frequency and Duration: WS and SS, 1 Semester</td></tr>
<tr><td colspan="3">Module Coordinator: Chair of Agrobioinformatics</td></tr>
<tr><td colspan="3">Applies to the Study Programmes: Agrobiotechnology, Master (1.); Insect Biotechnology and Bioresources, Master (2.); Agrobioinformatics, Master (1.);</td></tr>
<tr><td colspan="3">Prerequisites for Participation: None</td></tr>
<tr><td colspan="3">Learning Outcomes:
The students
• understand principles of scientific methods, scientific recording and scientific reporting;
• are able to formulate testable research hypotheses and design experiments to answer scientific questions;
• understand requirements and reporting standards for statistical analysis;
• understand how to generate and communicate scientific knowledge;
• are familiar with guidelines for good scientific practise;
• are able to locate reliable, quality-assured information representing the accepted status quo in regard to a specific scientific question;
• are able to correctly use and cite scientific sources in written work and presentations.</td></tr>
<tr><td colspan="3">Module Content:
• Scientific methods
• Scientific hypotheses
• Experimental design
• Generation, recording and communication of scientific knowledge
• Good scientific practice
• Types and sources of scientific information</td></tr>
</table>

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	30	60
Seminar	10	20
Practical training		
Exercises	20	40
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:

- Form(s) of assessment: Assignment (9 tasks), oral presentation (15 - 20 min.) and written assignment (2500 - 3000 words) or written examination or oral examination
- Components of final grade: Assignment (25 %), oral presentation (25 %) and written assignment (50 %) or written examination (100 %) or oral examination (100 %)
- Form of module retake examination: Revision of the written assignment or written examination or oral examination

Language: English

Profile Modules

MK-015-EN	MK-015-EN Plant Protection and Bioengineering	6 CP
	Plant Protection and Bioengineering	
Core Module / Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Phytopathology	1./2. Sem.;
	Offered for the first time: WS 2015/16	
	Intake capacity: not limited	

Frequency and Duration: WS, 1 Semester

Module Coordinator: Chair of Phytopathology

Applies to the Study Programmes: Agrobiotechnology, Master (1./2.);

Prerequisites for Participation: None (recommended: Basic knowledge in plant pathology and molecular biology)

Learning Outcomes:
The Students
- are able to understand and evaluate industrial strategies for disease control;
- have experience with basic biotechnological processes, such as tissue culture, high-throughput screening and pesticide applications;
- have a conception of the implementation impacts of plant biotechnology;
- have a command of the most important transformation techniques in the production of genetically modified plants;
- have a theoretical background of the biological mechanismus modern plant protection is based on.

Module Content:
- transgenic plants
- agronomically significant genes
- biotechnological disease control techniques
- tissue techniques and tissue cultures
- high-throughput screening methods
- industrial strategies in plant protection

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	40	70
Seminar	30	40
Practical training		
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Written examination and presentation (10-20 min.)
- Components of final grade: Written examination (75 %) and presentation (25 %)
- Form of module retake examination: Oral examination or written examination

Language: English

MK-016-EN	**MK-016-EN Biotechnology and Genomics** **Biotechnology and Genomics**	**6 CP**
Core Module / Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Agronomy and Plant Breeding I Offered for the first time: SS 2016 Intake capacity: not limited	2. Sem.;

Frequency and Duration: SS, 1 Semester

Module Coordinator: Chair of Plant Breeding

Applies to the Study Programmes: Agrobiotechnology, Master (2.);

Prerequisites for Participation: None (recommended: Knowledge of molecular genetics)

Learning Outcomes:
The students
- have deep theoretical knowledge about genome analysis methods methods, with an emphasis on plant genome mapping and gene expression techniques;
- gain insight into the practical applications of biotechnological and molecular genetic methods in plant breeding;
- have the necessary theoretical background to apply experimental molecular genetics, biotechnological and gene technological methods in plant breeding.

Module Content:
- Molecular and cellular plant genetics
- Methods and techniques of experimental biotechnology and genome analysis
- Molecular plant breeding: Structure and function of plant genomes, molecular markers, genome mapping, QTL analysis, gene cloning techniques, gene expression methodology
- Methods of gene technology in plant breeding: Gene isolation, gene transfer (transformation techniques), detection methods

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	50	70
Seminar		
Practical training		
Exercises		
Excursion	20	20
Total:	160	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Written examination and seminar paper (4 pages)
- Components of final grade: Written examination (80%), seminar paper (20%)
- Form of module retake examination: Written examination

Language: English

MK-068-EN	MK-068-EN Empirical Research Methods	6 CP
	Empirical Research Methods	
Core Module / Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Agricultural Policy and Market Research	1. Sem.;
	Offered for the first time: WS 2015/16	
	Intake capacity: not limited	

Frequency and Duration: WS, 1 Semester

Module Coordinator: Chair of Agricultural, Food and Environmental Policy

Applies to the Study Programmes: Transition Management, Master (1.);

Prerequisites for Participation: None

Learning Outcomes:
The students
- have acquired knowledge of general principles of various qualitative and quantitative research methods as well as evaluation research
- are able to understand the application of various methods with regard to research objectives

Module Content:
- Principles of applied statistics
- Correlation and causality
- Basic approach of econometrics
- Basic introduction to simple and multiple regression analysis
- Collecting and analysing panel data
- Designing of surveys, interviews, questionnaires
- Qualitative data collection techniques
- Qualitative data analysis
- Mixed methods

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	30	60
Seminar	30	60
Practical training		
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: Written examination or written examination, seminar paper (4-5 pages) and poster

Module Examination:
- Form(s) of assessment: Written examination (100 %) or written examination (70 %), seminar paper (15 %), poster (15 %)
- Components of final grade: Written examination
- Form of module retake examination:

Language: English

MP-016-EN	MP-016-EN Quality Assessment of Raw Plant Material Quality Assessment of Raw Plant Material	6 CP
Core Module / Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Agronomy and Plant Breeding II Offered for the first time: WS 2015/16 Intake capacity: 40	1.-4. Sem.;

Frequency and Duration: WS, 1 Semester

Module Coordinator: Chair of Agronomy and Crop Physiology

Applies to the Study Programmes: Profil, Master (1.-4.); Profil GT, WW, Master (1.-4.);

Prerequisites for Participation: None (recommended: Knowledge of crop production and plant foods)

Learning Outcomes:
The students

- possess in-depth knowledge of the chemical and nutritional composition of plant-based foods as well as industry-specific quality requirements;
- are able to independently conduct practical laboratory analyses on plant-based raw materials and professionally evaluate the results;
- have sound knowledge of measures and factors influencing the quality of plant-based foods during production and primary processing, including agricultural, environmental, genetic, and process-related aspects;
- understand the design and function of selected processing equipment and are familiar with their impact on the properties and quality of plant-based foods.

Module Content:

- Regulations, equipment, and ISO guidelines for sampling and sample division: Understanding of standards and the use of equipment for accurate and consistent sampling and sample division in accordance with ISO guidelines.
- Sensory evaluation of analytical materials: Conducting sensory assessments to evaluate and interpret the quality characteristics of analyzed materials.
- Indirect and direct methods for product quality analysis: Application of both indirect and direct analytical techniques to assess the quality parameters of various products.
- Quality requirements and quality assurance measures for plant-based raw materials: Comprehensive knowledge of quality standards and quality assurance practices for cereals, brewing and ethanol grains, oilseeds, edible legumes, table, starch and industrial potatoes, sugar crops, and specialty crops.
- Technological processes for the production of sugar beets and edible oil: Understanding of the technological workflows involved in the extraction and processing of sugar beets and the production of edible oils.

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	30	60
Seminar		
Practical training	30	60
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:

- Form(s) of assessment: Written examination
- Components of final grade: Written examination (100%)
- Form of module retake examination: Written examination

Language: English

MP-029-EN	MP-029-EN Plant-Microbe Interactions	6 CP
	Plant-Microbe Interactions	
Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Phytopathology	2./4. Sem.;
	Offered for the first time: SS 2016	
	Intake capacity: 60	

Frequency and Duration: SS, 1 Semester

Module Coordinator: Chair of Phytopathology

Applies to the Study Programmes: Profil, Master (2./4.); Profil englisch, Master (2./4.);

Prerequisites for Participation: None (recommended: basics in microbiology and phytopathology)

Learning Outcomes:
The Students
- are familiar with interactions of parasitic and symbiotic biocenoses;
- are able to discuss the application of alternative measures for reduction of pesticide and chemical fertilizers;
- are familiar with concepts of modern interdisciplinary approaches to the use of microorganisms in disease control.

Module Content:
- physical and chemical conditions in the rhizosphere (pH, O2, exudate gradients)
- root pathogens (fungi, bacteria)
- pest control strategies on roots
- growth promotion of rhizospheric microorganisms (N2 fixation, regulation of the nif gene, plant-promoting factors, mycorrhiza)
- resistance mechanisms
- possibilities and limitations of inoculation with VAM or N2-fixing bacteria
- interaction with beneficial microorganisms (PGPR, BCAs)
- microbial interactions with lower plants (mosses, lichens, etc.)
- methods for the study of uncultivable microorganisms on/in plant tissues

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	45	90
Seminar	15	30
Practical training		
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Written examination and Presentation (10-20 min.)
- Components of final grade: Written examination (75 %), Presentation (25 %)
- Form of module retake examination: Oral or written examination

Language: English

MP-090-EN	MP-090-EN Biotechnology for Pest Control	6 CP
	Biotechnology for Pest Control	
Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Insect Biotechnology	1./3. Sem.;
	Offered for the first time: WS 2015/16	
	Intake capacity: 40	

Frequency and Duration: WS, 1 Semester

Module Coordinator: Chair of Insect Biotechnology in Plant Protection

Applies to the Study Programmes: Profil, Master (1./3.); Profil englisch, Master (1./3.);

Prerequisites for Participation: None (recommended: basic knowledge in zoology, biotechnology, and genetics)

Learning Outcomes:
The Students

- get an introduction to insect biotechnology;
- know about biotechnological applications of insect-derived bioresources in medicine, agriculture, and industry;
- know about the importance of genetic and epigenetic tools in model insect species;
- know about diseases transmitted by insets and comparative genomic analysis;
- know how to synthesize and prepare the seminar work on insect biotechnology and molecular entomology.

Module Content:

- concepts of insect biotechnology and relevant basics in insect immunity, physiology and epigenetics
- application of insect-derived bioresources in medicine, agriculture and industry
- a detailed view on environment friendly methods of pest control including molecular, transgenic and gene editing technologies

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	36	72
Seminar	24	48
Practical training		
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:

- Form(s) of assessment: Written examination and presentation (7-20 min. + discussion 5-10 min.)
- Components of final grade: Written examination (50 %), presentation (50 %)
- Form of module retake examination: Oral examination or written examination or presentation

Language: English

MP-098-EN	MP-098-EN Molecular Plant Breeding	6 CP
	Molecular Plant Breeding	
Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Agronomy and Plant Breeding I	1.-4. Sem.;
	Offered for the first time: WS 2015/16	
	Intake capacity: 30	

Frequency and Duration: WS, 1 Semester

Module Coordinator: Chair of Plant Breeding

Applies to the Study Programmes: Profil, Master (1.-4.); Profil englisch, Master (1.-4.);

Prerequisites for Participation: Biotechnology and Genomics (MK 016) / (recommended: Plant Breeding: Special Topics of Resistance and Quality Breeding (MP 020))

Learning Outcomes:
The students
- will gain practical and/or theoretical experience in DNA and RNA extraction and analysis techniques, PCR, genetic mapping and QTL analysis, DNA hybridisation, gene expression and next-generation sequencing
- will learn practical applications of biotechnological and molecular genetic methods in plant breeding
- will obtain the necessary practical background to apply experimental molecular genetics, biotechnological and gene technological methods in plant breeding

Module Content:
- Next-generation DANN sequencing
- Molecular marker analysis, genome mapping and QTL analysis
- DNA filter hybridisation, genome libraries
- Quantitative real-time PCR
- New methods of gene technology in plant breeding: Genome editing, cis-genestics

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	30	30
Seminar		
Practical training	40	80
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Oral examination and lab book (30-50 pages)
- Components of final grade: Oral examination (50 %), lab book (50 %)
- Form of module retake examination: Oral examination

Language: English

MP-149-EN	MP-149-EN Molecular Techniques Molecular Techniques	6 CP
Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Insect Biotechnology Offered for the first time: WS 2017/18 Intake capacity: 40	1./3. Sem.;

Frequency and Duration: WS, 1 Semester

Module Coordinator: Chair of Insect Biotechnology in Plant Protection

Applies to the Study Programmes: Profil, Master (1./3.); Profil englisch, Master (1./3.);

Prerequisites for Participation: None (good knowledge in genetics recommended)

Learning Outcomes:
The students
- have a basic knowledge of molecular biology;
- know important vector and plasmid systems;
- know important molecular pathways as well as cloning strategies;
- have a good knowledge of molecular techniques used in insect biotechnology.

Module Content:
- Fundamentals in molecular biology
- History and evolution of plasmids and DNA cloning
- Molecular biology and their benefits in biotechnology
- Transformation possibilities and transgenesis in insects
- "From plasmids to biotechnologically modified insects"
- Current molecular tools in insect biotechnology and their risk assessment

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	28	56
Seminar	24	48
Practical training		
Exercises	8	16
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Written examination
- Components of final grade: Written examination (100 %)
- Form of module retake examination: Written examination

Language: English

MP-150-EN	MP-150-EN Milestones of Insect Biotechnology & Bioresources	6 CP
	Milestones of Insect Biotechnology & Bioresources	
Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Insect Biotechnology	2./4. Sem.;
	Offered for the first time: SS 2018	
	Intake capacity: 40	

Frequency and Duration: SS, 1 Semester

Module Coordinator: Chair of Insect Biotechnology in Plant Protection

Applies to the Study Programmes: Profil, Master (2./4.); Profil englisch, Master (2./4.);

Prerequisites for Participation: None

Learning Outcomes:
The students
- have an overview of currently discussed relevant topics in science and industry in the field of insect biotechnology;
- have an overview of currently discussed relevant topics in science and industry in the field of bioresources;
- Get an overview of research and presentation of current relevant publications and discussion within the context of the lecture, classification of potential industrial and social relevance.

Module Content:
- Discussion of regulatory and ethical topics on the use of insect biotechnology and the generation of novel products for pest control and human health
- presentation and discussion of currently important topics in insect biotechnology & bioresources
- literature research and presentation of currently relevant topics in pharmaceutical and industrial biotechnology based on publications

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	54	108
Seminar		
Practical training		
Exercises		
Excursion	6	12
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Written examination
- Components of final grade: Written examination (100 %)
- Form of module retake examination: Written examination

Language: English

MP-151-EN	MP-151-EN Antibiotics: Present, Past and Future	6 CP
	Antibiotics: Present, Past and Future	
Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Insect Biotechnology	2.-4. Sem.;
	Offered for the first time: WS 2018/19	
	Intake capacity: 30	

Frequency and Duration: WS, 1 Semester

Module Coordinator: Chair of Natural Substance Research with a Focus on Insect Biotechnology

Applies to the Study Programmes: Profil, Master (2.-4.); Profil englisch, Master (2.-4.);

Prerequisites for Participation: Natural Product Discovery Platforms (MK 090)

Learning Outcomes:
The students
- get comprehensive insight into the main chemical classes of antibiotics used in human and veterinary medicine as well as for agricultural applications.

Module Content:
- Main chemical classes (ß-lactams, tetracyclins, aminoglycosides, macrolides, peptide antibiotics, 'hybrid' structures, others) of antibiotics used in human and veterinary medicine as well as for agricultural applications;
- Microbial secondary metabolism as the primary source of antibiotics, including biosynthesis of the most important classes;
- Modes of action and target sites of important classes of antibiotics;
- Resistance to antibiotics and novel strategies to overcome antibiotic resistance;
- Optimizing the effectiveness of antibiotics by chemical and biosynthetic modification (partial synthesis, precursor-directed biosynthesis etc.);
- Design & optimization of antibiotic fermentation processes;
- History of antibiotic research and to antimicrobial metabolites from other than microbial sources;

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	48	96
Seminar	12	24
Practical training		
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Written examination, presentation (10-15 min.) and project work (group work: video tutorial, 4-10 min. or written coursework, 1500-2000 words)
- Components of final grade: Written examination (50 %), presentation (30 %), project work (20 %)
- Form of module retake examination: Written examination or oral examination

Language: English

MP-153-EN	MP-153-EN Food Analysis Food Analysis	6 CP
Optional Module	Biology and Chemistry / Institute of Food Chemistry and Food Biotechnology Offered for the first time: WS 2017/18 Intake capacity: 11	3. Sem.;

Frequency and Duration: WS, 1 Semester

Module Coordinator: Working group for biochemical and molecular biological food analytics and biotechnology

Applies to the Study Programmes: Profil englisch, Master (3.);

Prerequisites for Participation: None

Learning Outcomes:
The students
- learn sophisticated analytical procedures used in the working groups of the Institute of Food Chemistry and Food Biotechnology
- gain detailed knowledge of analytical quality assurance and GLP
- present their research results in form of a protocol

Module Content:
- Research-related methods of modern food chemistry
- Food Chemical trace- and other high-performance analytical methods
- Electrophoretic techniques
- Methods in molecular biology

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture		
Seminar	6	12
Practical training	108	54
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Project work (Laboratory Journal)
- Components of final grade: Project work (100 %)
- Form of module retake examination: Revision of the project work

Language: English

MP-156-EN	MP-156-EN Laboratory Course I Laboratory Course I	6 CP
Optional Module	THM / Institute of Bioprocess Engineering and Pharmaceutical Technology Offered for the first time: WS 2017/18 Intake capacity: not limited	1.-4. Sem.;

Frequency and Duration: WS and SS (Block), 1 Semester

Module Coordinator: Chair of Pharmaceutical Technology

Applies to the Study Programmes: Profil Insect Biotechnology and Bioresources, Master (1.-4.);

Prerequisites for Participation: see https://www.uni-giessen.de/en/faculties/f09/studies/pdf-studies/ibb-guide-lab-course.pdf

Learning Outcomes:
The students
- acquire specific research-relevant laboratory knowledge
- improve their cooperative work skills across groups

Module Content:
- cooperation with different work groups
- training of modern laboratory techniques and autonomous lab work in specialized topics
- topic specific literature research and presentation

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture		
Seminar	10	10
Practical training	80	30
Exercises		50
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Presentation or project work
- Components of final grade: Presentation (100 %) or project work (100 %)
- Form of module retake examination: Presentation or project work

Language: English

MP-157-EN	MP-157-EN Laboratory Course II Laboratory Course II	6 CP
Optional Module	Fachbereich/Institut Offered for the first time: WS 2017/18 Intake capacity: not limited	1.-4. Sem.;

Frequency and Duration: WS and SS (Block), 1 Semester

Module Coordinator: …

Applies to the Study Programmes: Profil Insect Biotechnology and Bioresources, Master (1.-4.);

Prerequisites for Participation: see https://www.uni-giessen.de/en/faculties/f09/studies/pdf-studies/ibb-guide-lab-course.pdf

Learning Outcomes:
The students
- acquire specific research-relevant laboratory knowledge
- improve their cooperative work skills across groups

Module Content:
- cooperation with different work groups

training of modern laboratory techniques and autonomous lab work in specialized topics
topic specific literature research and presentation

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture		
Seminar	10	10
Practical training	80	30
Exercises		50
Excursion		
Total:	180	

Prerequitistes for Examination: None

MP-158-EN	MP-158-EN Insects for Food and Feed Production Systems Insects for Food and Feed Production Systems	6 CP
Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Insect Biotechnology Offered for the first time: WS 2018/19 Intake capacity: 30	1.-4. Sem.;

Frequency and Duration: WS, 1 Semester

Module Coordinator: Chair of Applied Entomology

Applies to the Study Programmes: Profil, Master (1.-4.); Profil englisch, Master (1.-4.);

Prerequisites for Participation: None

Learning Outcomes:
The students
- learn analytical procedures used in the area of food and feed
- gain insight into processing systems for food production
- learn to identify edible insects and get information about their morphology, physiology, and ecology
- gain knowledge on strategies to convert waste to food
- present their research results in the form of a seminar talk

Module Content:
- biology of edible insects and introduction to different insect rearing systems
- basic methods used in modern food analysis
- Analysis of available databases and literature for suitable insects, protein requirements and improved waste management

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	42	84
Seminar	18	36
Practical training		
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Writen examination and presentation (15 min.)
- Components of final grade: Writen examination (75%), presentation (25%)
- Form of module retake examination: Writen examination

Language: English

MP-175-EN	MP-175-EN Effect-directed Analysis by HPTLC-Assay-HRMS Effect-directed Analysis by HPTLC-Assay-HRMS	6 CP
Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Nutritional Sciences Offered for the first time: WS 2018/19 Intake capacity: not limited	1.-4. Sem.;

Frequency and Duration: WS, 1 Semester

Module Coordinator: Chair of Food Sciences

Applies to the Study Programmes: Profil, Master (1.-4.); Profil englisch, Master (1.-4.);

Prerequisites for Participation: None

Learning Outcomes:
The students

- understand possible options and the importance of effect-directed analysis;
- know the advantages and disadvantages of the different techniques;
- recognise the diversity of in-situ or on-surface assays;
- know the streamlined workflow on one plate, i.e. separate complex samples in parallel, detect and characterise active substances;
- recognize the highly efficient combination of of high performance thin layer chromatography (HPTLC) coupled with biological and biochemical assays;
- can understand the rapid effect-directed profiling of samples (5-15 min per sample);
- understand how metabolization of samples and effect-directed profiling of samples can be performed and linked together;
- know how to perform adherent human cell assays on-surface;
- understand how to go from parallel screening of many samples to molecular formulae of the bioactive compounds on a single plate.

Module Content:

- Theoretical basics of the different options for the performance of effect-directed analysis,
- Advantages of coupling the different assays with HPTLC,
- Different options for couplings to mass spectrometry (MS),
- Training in the HPTLC-UV/Vis/FLD assay-MS workflow using different types of assays:
    1. Antimicrobial compounds against Gram-negative bacteria via the Aliivibrio fischeri bioassay.
    2. Antimicrobial compounds against Gram-positive bacteria via the Bacillus subtilis bioassay
    3. Hormonally active compounds via planar yeast estrogen/androgen screens (pYES/pYAS)
    4. Multiplex assays to detect and clarify antagonistic and synergistic effects
    5. Enzyme inhibition assays for the inhibition of acetylcholinesterase, butyrylcholinesterase, tyrosinase, a- or ß-glucosidase, a-amylase and ß-glucuronidase
    6. Digestion of samples by means of NanoGIT+active
    7. Metabolization or toxification/detoxification by the S9 liver enzyme system
    8. Adherent human cell assays
- Optional lab day with illustration of effect-directed experiments

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	56	120
Seminar		
Practical training	4	
Exercises		
Excursion		

Total:	180
Prerequitistes for Examination: None	
Module Examination: • Form(s) of assessment: Writen examination • Components of final grade: Writen examination (100 %) • Form of module retake examination: Writen examination	
Language: English	

MP-196	MP-196 Internship Berufspraktikum	12 CP
Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Offered for the first time: WS 2019/20 Intake capacity: not limited	1. - 4. Sem.;

Frequency and Duration: WS and SS, 1 Semester

Module Coordinator: Study deanery

Applies to the Study Programmes: Profil englisch, Master (1. - 4.); Profil, Master (1. - 4.);

Prerequisites for Participation: Keine

Learning Outcomes:
The Students
- gain in-depth experience as interns in future fields of activity and professions;
- have practical knowledge and skills from their internship companies and understand the connection between study and practice;
- concretise their personal career perspectives (career planning).

Module Content:
- Development of future occupational fields
- Practical experience in companies in the fields of agricultural sciences, environmental sciences, ecotrophology and nutritional sciences
- Reflection on one's own practical professional activity

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture		
Seminar		
Practical training	360	
Exercises		
Excursion		
Total:	360	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Internship report (tasks, activities, acquired knowledge and skills, reflection). The report must be assessed as "passed".
- Components of final grade: Formation of the module mark: ungraded performance
- Form of module retake examination: Revision of the internship report

Language: German and/or English

MP-234-EN	MP-234-EN Crop Abiotic Stresses	6 CP
	Crop Abiotic Stresses	
Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Agronomy and Plant Breeding I	1.-4. Sem.;
	Offered for the first time: SS 2022	
	Intake capacity: 30	

Frequency and Duration: SS, 1 Semester

Module Coordinator: Chair of Agronomy and Crop Physiology

Applies to the Study Programmes: Profil, Master (1.-4.); Profil englisch, Master (1.-4.);

Prerequisites for Participation: None

Learning Outcomes:
The students
- are able to understand the cause of abiotic stresses occurring in crops production;
- know how to design experiments to evaluate the performance of different genotypes under specific stress conditions;
- know how to monitor plant physiological parameters including photosynthesis, leaf spectral reflectance and development;
- are able to conduct physiological and biochemical analyses on plant samples in the lab;
- are able to perform statistical analyses on the data from screening experiments to understand the effects of treatment, genotype and treatment by genotype interaction;
- know how to design scientific posters and write reports for presenting research results.

Module Content:
- Responses to abiotic stressesIn of rice and maize
- different types of abiotic stresses (drought, submergence, salinity, iron toxicity and cold)
- screening experiments under the stress conditions
- phenotyping devices to evaluate the performance of plants under optimal and stress conditions
- physiological and biochemical analyses

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture		
Seminar	10	20
Practical training	30	60
Exercises	20	40
Excursion		
Total:	180	

Prerequitistes for Examination: Attendance rate of the practical activities must be more than 90%.

Module Examination:
- Form(s) of assessment: Poster with presentation (max. 10 minutes) and seminar paper (8-12 pages)
- Components of final grade: Poster with presentation (50 %), seminar paper (50 %)
- Form of module retake examination: Revision of the seminar paper

Language: English

MP-235-EN	MP-235-EN Practical Genome Sequencing and Bioinformatics	6 CP
	Practical Genome Sequencing and Bioinformatics	
Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Agronomy and Plant Breeding I	1.-4. Sem.;
	Offered for the first time: SS 2022	
	Intake capacity: 30	

Frequency and Duration: SS, 1 Semester

Module Coordinator: Chair of Agrobioinformatics

Applies to the Study Programmes: Profil, Master (1.-4.); Profil englisch, Master (1.-4.);

Prerequisites for Participation: Biotechnology and Genomics (MK-016-EN) oder Analysis of DNA and RNA Sequencing Data (MK-128-EN)

Learning Outcomes:
The students
- are familiar with practical experimental techniques related to genome sequencing and genomic data analysis;
- know how to extract plant DNA samples and check DNA quality using standard molecular biology techniques;
- know the principles for generating DNA libraries suitable for high-throughput DANN sequencing;
- know how analyse resulting genomic data using bioinformatics methodologies;
- are familiar with the Linux operating system and high performance computing necessary for bioinformatics analysis;
- know the principles of scientific record keeping and lab reporting based on the experiments performed.

Module Content:
- DNA extraction
- DNA quantification using RT-PCR
- Library preparation
- High-throughput DNA sequencing
- Bioinformatics analysis of sequencing data
- Molecular biology quality control techniques (PCR, gel electrophoresis, etc)
- Production of lab books and practical reports

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	10	20
Seminar		
Practical training	50	100
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: Participation in laboratory classes

Module Examination:
- Form(s) of assessment: Seminar paper (3000 words minimum) and lab book (4 to 6 experiments)
- Components of final grade: Seminar paper (60 %), lab book (40 %)
- Form of module retake examination: Revision of seminar paper and lab book

Language: English

MP-236-EN	MP-236-EN Quantitative Genetics	6 CP
	Quantitative Genetics	
Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Agronomy and Plant Breeding II	1.-4. Sem.;
	Offered for the first time: SS 2022	
	Intake capacity: not limited	

Frequency and Duration: SS, 1 Semester

Module Coordinator: Chair of Biometry and Population Genetics

Applies to the Study Programmes: Profil englisch, Master (1.-4.); Profil, Master (1.-4.);

Prerequisites for Participation: None

Learning Outcomes:
The students
- know quantitative genetic models to decompose the genotypic value;
- understand the basics of quantitative inheritance and genome-wide prediction;
- understand models of selection theory;
- can estimate the expected response to selection.

Module Content:
- Additive, dominance, and epistasic effects
- Performance prediction of selection candidates
- Estimation of variance components and heritability
- Direct selection, indirect selection, multistage selection, index selection

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	30	60
Seminar		
Practical training	30	60
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Assignments (4) or written examination
- Components of final grade: Assignments (100 %) or written examination (100%)
- Form of module retake examination: Written examination

Language: English

MP-246-EN	MP-246-EN Transition to a Sustainable Bioeconomy	6 CP
	Transition to a Sustainable Bioeconomy	
Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Agronomy and Plant Breeding I	1.-4. Sem.;
	Offered for the first time: WS 2022/23	
	Intake capacity: not limited	

Frequency and Duration: WS, 1 Semester

Module Coordinator:

Applies to the Study Programmes: Profil, Master (1.-4.); Profil englisch, Master (1.-4.);

Prerequisites for Participation: None

Learning Outcomes:
The students
- have knowledge of origin and evolution of the Bioeconomy;
- have insight into genetic and environmental factors influencing primary production in agricultural crops;
- have an overview of Knowledge base for biobased value chains;
- have an appreciation of Bioeconomy strategies and Policies.

Module Content:
- History and development of bioeconomy: Policies and progress in different countries
- Overview of crop types: annual v perennial, C3 v C4
- Biomass yield: potential, attainable and actual with crop modelling
- Biomass utilisation cascades: actual and potential
- Recent projects running in different countries
- Sustainability criteria, life cycle assessment

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	20	
Seminar	10	
Practical training	4	
Exercises		
Excursion	12	
Total:	46	

Prerequitistes for Examination:

Module Examination:
- Form(s) of assessment:
- Components of final grade:
- Form of module retake examination:

Language: English

MP-248-EN	MP-248-EN Fruit Breeding	6 CP
	Fruit Breeding	
Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Agronomy and Plant Breeding II	1.-4. Sem.;
	Offered for the first time: WS 2022/23	
	Intake capacity: 30	

Frequency and Duration: WS, 1 Semester

Module Coordinator: Chair of Biometry and Population Genetics

Applies to the Study Programmes: Profil, Master (1.-4.); Profil englisch, Master (1.-4.);

Prerequisites for Participation: None

Learning Outcomes:
The students
- have insight into the objectives and peculiarities of fruit breeding;
- have knowledge on the origin, evolution and domestication of the most important European fruit species;
- have broad application knowledge of processes of species specific breeding programs.

Module Content:
- History, economic significance and methods of fruit breeding
- Plant variety protection and marketing of plant material
- Phylogenetic origin of important fruit species
- The use of genetic resources for fruit breeding
- State of the art fruit breeding technologies
- Fruit breeding explained with selected examples

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	36	72
Seminar	6	12
Practical training	6	12
Exercises	4	8
Excursion	8	16
Total:	180	

Prerequitistes for Examination: Written assignement (protocol and questionnaire, 4 pages within 2 weeks)

Module Examination:
- Form(s) of assessment: Written examination
- Components of final grade: Written examination (100 %)
- Form of module retake examination: Written examination

Language: English

MP-268-EN	MP-268-EN Animal Venomics Animal Venomics	6 CP
Core Module / Optional Module	Agricultural Sciences, Nutritional Sciences, and Environmental Management / Department of Insect Biotechnology Offered for the first time: SS 2026 Intake capacity: 30	1.-4. Sem.;

Frequency and Duration: SS, 1 semester

Module Coordinator: Chair of Applied Entomology

Applies to the Study Programmes: Profil englisch, Master (1.-4.); Profil, Master (1.-4.);

Prerequisites for Participation: None

Learning Outcomes:
The Students
- have an in-depth understanding of the concepts and mechanisms of animal venomics;
- understand the biochemistry from genes to proteins and higher-level biological processes;
- are familiar with fundamental bioanalytical methods, from sample preparation to legal considerations;
- recognize the importance of biological resources, from basic research to the One Health approach;
- are able to communicate and discuss scientific information across disciplines.

Module Content:
- Fundamentals and methodology of animal venomics
- Bioecological background of venoms and toxins
- Basics of molecular and genetic evolutionary biology
- Fundamentals of bioanalytics (from genomics to metabolomics)
- Applied and translational science

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	30	60
Seminar	30	60
Practical training		
Exercises		
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Oral examination
- Components of final grade: Oral examination (100%)
- Form of module retake examination: Oral examination

Language: English

THM-02-EN	**THM-02-EN Quality Management**	6 CP
	Quality Management	
Core Module / Optional Module	THM / Institute of Bioprocess Engineering and Pharmaceutical Technology	2./4. Sem.;
	Offered for the first time: SS 2019	
	Intake capacity: 30	

Frequency and Duration: SS, 1 Semester

Module Coordinator: Chair of Pharmaceutical Technology

Applies to the Study Programmes: Profil Insect Biotechnology and Bioresources, Master (2./4.);

Prerequisites for Participation: None

Learning Outcomes:
The students
- can safely deal with the concepts and definitions of quality management
- understand the meaning and importance of quality management
- can perform and analyze risk assessments
- know how to identify critical process steps
- can accompany qualifications and validations in companies
- can develop steps for risk reduction

Module Content:
- Basic concepts for risk and quality management
- Quality management systems (DIN ISO)
- Strategies for handling and managing risks in manufacturing companies
- Risk assessment by FMEA, HACCP, Kepner-Tregoe, FTA
- Quality-related strategies (TQM, EFQM, TPM, KVP)
- Further qualification and validation phases
- Internal / external quality audits
- certification

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture		
Seminar	45	90
Practical training		
Exercises	15	30
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:
- Form(s) of assessment: Written examination
- Components of final grade: Written examination (100 %)
- Form of module retake examination: Written examination

Language: English

THM-05-EN	THM-05-EN Bioprocess Engineering Bioprocess Engineering	6 CP
Core Module / Optional Module	THM / Institute of Bioprocess Engineering and Pharmaceutical Technology Offered for the first time: SS 2019 Intake capacity: 30	2. Sem.;

Frequency and Duration: SS, 1 Semester

Module Coordinator: Chair of of Bioprocess Engineering

Applies to the Study Programmes: Insect Biotechnology and Bioresources, Master (2.);

Prerequisites for Participation: None

Learning Outcomes:
Lecture/Exercises:
The students show competences in:

- basics concerning prokaryotic and eukaryotic cells and enzymes in biotechnological processes
- essential mathematical model concepts to gather cell growth and metabolism
- special aspects of fermentation processes and bioreactors
- basics of essential unit operations of downstream processes
- basic possibilities of process design, characterization, description, and monitoring in up- and downstream of biotechnological production processes

Lab work:
The students learn:

- the handling of bioreactors and their tools within the concept and application of cellular/ microbial cultivations
- application of essential bioanalytical methods for cell growth and metabolism analysis
- concepts of downstream operations

Module Content:
Lecture/Exercises:

- Industrial application of microbial and cell cultures, enzymes
- Process kinetics
- Batch-, Fed-batch and continuous processes, models and kinetics
- Heat and mass transfer including the combination with biological reactions
- Bioreactors and their choice
- Sterilisation: technologies, construction, hygienic design
- Methods of cell separation and product purification (lysis, sedimentation, centrifugation, filtration, chromatography, extraction)

Lab work:

- Bioreactor cultiviation including process monitoring
- Exemplary downstream processing with various tools
- Presentation and discussion of results within the seminar

Forms of Instruction:	Contact hours	Preparation and follow-up work
Lecture	30	60
Seminar		
Practical training	20	40
Exercises	10	20
Excursion		
Total:	180	

Prerequitistes for Examination: None

Module Examination:

- Form(s) of assessment: Written examination
- Components of final grade: Written examination (100 %)
- Form of module retake examination: Written examination

Language: English