Annotated module catalogue

Master of Science (M.Sc.)

AGROBIOTECHNOLOGY

2006-03-15

Study course:	*Agrobiotechnology*
Module name:	*Biostatistics and Bioinformatics*
Abbreviation:	*MKAB1 / MKP 07*
Subtitel:	
Lectures:	
Recommended standing:	*1st semester / WS*
Responsible:	*Prof. Dr. Wolfgang Köhler*
Lectures:	*Köhler, Schachtel, Pons-Kühnemann*
Language:	*English*
Allocation to curriculum:	
Class format:	*Lecture (50%), exercises with practical computer assignments (50%), 4 hours, number of participants: 30 (lecture), 15 max. 30 (practical courses) / 4 SWS*
Workload:	*Lectures (30 hours), tutorials (30 hours), independent completion of assigned exercises (60 hours), preparation and follow-up study (60 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*Basics in Mathematics, Statistics, and Computer Science*
Course goals:	*Students will* • *be able to plan experiments statistically (experimental design)* • *be familiar with descriptive and inferential statistical methods* • *be able to handle large data sets in Molecular Biology* • *be familiar with standard procedures in Bioinformatics*
Course contents:	• *Uni- and multivariate statistical analysis* • *Use of statistical program packages* • *Databases and software tools in Molecular Biology* • *Sequence alignments* • *Microarray expression analysis*
Grading:	*Weekly assigned exercises, written examination*
Media types:	*Video projector, computer lab*
Literature:	*Sokal, Rohlf: Biometry. Freeman, San Francisco CA;* *Baxevanis, Ouellette: Bioinformatics. Wiley, New York;*

Module name:	*Special Biochemistry I*
Abbreviation:	*MKE 01*
Subtitel:	
Lectures:	
Recommended standing:	*1st semester / WS*
Responsible:	*Prof. Dr. med. Katja Becker-Brandenburg*
Lectures:	*Becker-Brandenburg, Rahlfs, Gromer*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (50%), seminar (50%) / 4 SWS*
Workload:	*lecture (30 hours), seminar (30 hours), preparation (40 hours), follow-up study (40 hours), small-group work (40 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*none*
Course goals:	*Students will* • *have knowledge of principles of metabolic regulation on a cellular level* • *have knowledge of the flow of genetic information as well as structure and function of enzymes, hormones and membranes* • *be able to discuss the organ-specific regulation of nutrient metabolism* • *understand immunological processes*
Course contents:	• *transcription and translation* • *structure and function of biological membranes, compartmentalization of metabolism* • *signal transduction, transport mechanisms* • *enzymes (structure, catalytic strategies)* • *hormones (mechanisms of action and functions)* • *organ-specific metabolism (gastrointestinal tract, blood, liver, fat and muscle tissue, kidney)* • *acid-base equilibrium* • *immunology (antigens, immunglobulins, T-cells, B-cells)*

grading:	*oral and written examination*
Media types:	*Overhead, Beamer*
Literature:	*Stryer, Biochemistry (Freeman and Company) 1995* *Lehninger, Nelson, Cox, Lehninger Biochemie (Springer);* *Sambrook, Fritsch, Maniatis; Molecular Cloning: A Laboratory Manual (CSHLP);*

Study course:	*Agrobiotechnology*
Module name:	*Bioengineering and Plant Protection*
Abbreviation:	*MP 26*
Subtitel:	
Lectures:	
Recommended standing:	*1st semester / WS*
Responsible:	*Prof. Dr. Karl-Heinz Kogel*
Lectures:	*Lane (BASF AG), Kogel, Vilcinskas*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (25%), seminar (50%), exercises (25%) / 4 SWS*
Workload:	*lecture (15 hours), seminar (30 hours), exercises (15%), preparation and follow-up study (120 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*Basic knowledge in plant pathology and molecular biology*
Course goals:	*Students will* • *be able to understand and evaluate biotechnological processes involved in plant protection and pest control* • *have practical experience with basic biotechnological processes, such as tissue culture, high-throughput screening and marker applications* • *be able to produce culture tissue samples* • *be able to execute basic biotechnological laboratory methods unassisted* • *have a conception of the field of biotechnology in the area of plant protection* • *have a command of the most important transformation techniques in the production of genetically modified plants*
Course contents:	• *transgenic plants* • *agronomically significant genes* • *transformation techniques* • *biotechnological pest control techniques* • *tissue techniques and tissue cultures* • *high-throughput screening methods*

Grading:	*written examination*
Media types:	*Overhead, Beamer*
Literature:	*Buchanan et al. 2000, Biochemistry & Molecular Biology of Plants (American Society of Plant Biologists)* *Oerke et al. 1994, Crop Production and Crop Protection (Elsevier)*

Study course:	*Agrobiotechnology*
Module name:	*Biotechnology and Genomics*
Abbreviation:	*MP 21*
Subtitel:	
Lectures:	
Recommended standing:	*2nd semester / SS*
Responsible:	*Prof. Dr. Dr. h.c. Wolfgang Friedt*
Lectures:	*Friedt, Snowdon, Wagner*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (50%), exercises (50%) / 4 SWS*
Workload:	*lecture (30 hours), exercises (30 hours), preparation and follow-up study (120 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*none*
Course goals:	*Students will* • *have in-depth theoretical knowledge in genetics as well as plant cell and molecular biology* • *have insight into the potential applications of biotechnological and molecular-genetic methods in plant breeding* • *have the requisite experimental skills to apply biotechnological, molecular-biological and genetic engineering methods to plant cultivation*
Course contents:	• *special genetics as well as plant cell and molecular biology* • *methods and techniques of experimental biotechnology and molecular biology in plant breeding and cultivation* • *molecular plant breeding: structure and function of plant genomes, molecular markers, QTL analysis, genetic and physical genome mapping techniques* • *genetic engineering methods in plant breeding: gene isolation, gene transfer (transformation techniques), detection methods*
Grading:	*oral examination*
Media types:	*Overhead, Beamer*
Literature:	*Richards, 2002, Plant Breeding Systems (Chapman, Hall)*

Study course:	*Agrobiotechnology*
Module name:	*Microbial-Food-Biotechnology*
Abbreviation:	*MKAB2 / MP 57*
Subtitel:	
Lectures:	
Recommended standing:	*2nd semester / SS*
Responsible:	*Prof. Dr. Dr. Peter Kämpfer*
Lectures:	*Schnell, Kämpfer, Benckiser*
Language:	*English*
Allocation to curriculum:	
Class format:	*Vorlesung/Lecture 50% / 2SWS* *Practical Course 50% / 2SWS*
Workload:	*Lecture (30 h), Practical course (30 h), Self-study (120 h)*
Credit points:	*6 ECTS*
Prerequisites:	*none*
Course goals:	*Students will* • *have knowledge of the industrial microbiological processes employed in industrial settings, including genetic engineering applications* • *be familiar with advanced application-oriented microbiological methods within the scope of industrial microbiology*
Course contents:	***Lecture Contents*** *Food fermentations* *Selected examples: Dairy products, wine, fermented vegetables, soy sauce* *Microbial production systems* *Vinegar, citric acid, acetone, amino acids as primary products of microbial metabolism* *Antibiotics, toxins (e.g. as insecticides) as secondary products of microbial metabolism* *Microbial production of polyester and polysaccharides* *Microbial transformation and biocatalysis* *Genetic engineering of microorganisms for optimal production* *Foodborne pathogenic bacteria* *Selected examples: Salmonella, enterohemorrhagic bacteria, Clostridium*

	Epideminology of foodborne illness *Insects and other vectors (?) for microbial spoilage* *Preservatives and Preservation methods* *Inhibition of microbial growth by physical or chemical methods* *Remove or inactivation of undesired microrganisms* *Environmental application* *Sewage and wastewater, degradation of xenobiotics, control of industrial pollutant, microbial metal leaching, microbial removal of heavy metals from aqueous effluents* *Laws and Quality control* *Laws* *Classical quality control by microbial growth tests* *Molecular detection of microorganisms by various methods:* *Specific PCR assay, molecular finger print methods, FISH* *Contents of practical lab course* *Isolation of antibiotic-producing microorganisms from soil* *Demonstration of antibiotic resistance development with pure cultures* *Quantification of microorganisms in various environmental samples (various cultivation methods)* *Quantification of microbial processes in environmental samples (Quantitative measurements of soluble and gaseous products)* *Identification of microorganisms using physiological growth tests and molecular methods (PCR of 16S rDNA and sequencing) and microscopic analysis (FISH analysis)*
Grading:	*Oral examination*
Media types:	*Overhead, Beamer*
Literature:	*Brock, Madigan, Martinko, Parker: Biology of Microorganisms (Prentice Hall);* *Doyle, Beuchat, Montville: Food Microbiology, ASM Press Washington;*

Study course:	*Agrobiotechnology*
Module name:	*Risk Assessment, Ethics and Patent Law*
Abbreviation:	*MKAB3*
Subtitel:	
Lectures:	
Recommended standing:	*3rd semester / WS*
Responsible:	*Prof. Dr. Karl-Heinz Kogel*
Lectures:	*PD Meyer EU Parlament, Straßburg* *Dr. Groß, Biologische Bundesanstalt Dossenheim*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (25%), seminar (50%), exercises (25%) / 4 SWS*
Workload:	*lecture (15 hours), seminar (30 hours), exercises (15 hours), preparation and follow-up study (120 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*none*
Course goals:	*Students will* • *have broad knowledge of various processes in the field of technology assessment of agricultural products* • *have fundamental knowledge of the structure of the authorizing agencies for plant protection products* • *be able to explain the structure and the tasks of the different institutions responsible for evaluation of suitability, risk assessment, environment protection, farmer and consumer protection, and food security* • *be able to understand the ethic aspects of technology assessment* • *know fundamental principles of the European Patent Law* • *be able to understand the evaluation and authorisation procedures for plant protection products according to European Union Council Directives*
Course contents:	• *Development of guidances for the risk management of plant protection products* • *Evaluation of suitability of plant protection products* • *Tasks and structure of the EU Ethic and Food Safety Authority Commission* • *Tasks and structure of the Federal Institute for Consumer Protection and Food Security (BVL)* • *Tasks and structure of the Federal Institute for Risk Assessment (BfR), Environmental Agency (UBA), and Biological Research Centre for Agriculture and Forestry (BBA)* • *Tasks and structure of the European and Mediterranean*

	Plant Protection Organization (EPPO) • *Assessment of different strategies in development of pest resistance of cultivated plants: Gene technology vs. plant breeding* • *Ecotoxicological studies of side effects of plant protection products (e.g. surface water pollution, effects on beneficial insects, ...)* • *Federal and European Patent Law* • *TA studies on transgenic plants and food* • *TA studies on environmental problems of agriculture* • *TA studies on renewable energies* • *TA and SD studies on agriculture, food chains and food* • *ways to deal with uncertainty, lack of knowledge and different values and interests* • *ways to develop different options for action* • *Terms and conditions for organic farming and Integrated Pest Management* • *Release and marketing of genetically modified organisms*
Grading:	*oral and written examination*
Media types:	*Overhead, Beamer, Video projector, computer lab*
Literature:	*Decker, M.; Ladikas, M. (Hrsg.): Bridges between science, society and policy. Technology assessment - Methods and impacts. Berlin Heidelberg New York: Springer, 2004 (Wissenschaftsethik und Technikfolgenbeurteilung, Bd. 22)* *Grunwald, A. Technikfolgenabschätzung – eine Einführung. Berlin: edition sigma, 2002* *Bröchler, S.; Simonis, G.; Sundermann, K. (Hrsg.):Handbuch Technikfolgenabschätzung. Berlin: edition sigma, 1999*

Study course:	*Agrobiotechnology*
Module name:	*Molecular Entomology*
Abbreviation:	*MKAB4*
Subtitel:	
Lectures:	
Recommended standing:	*3rd semester / WS*
Responsible:	*Prof. Dr. Andreas Vilcinskas*
Lectures:	*Altincicek, Vilcinskas*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (25%), seminar (25%), laboratory work (50%) / 4 SWS*
Workload:	*lecture (15 hours), seminar (15 hours), laboratory work (30 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*Basic knowledge in zoology*
Course goals:	*Students will* • *learn biochemical and microbiological methods for the identification of antimicrobial molecules in insects* • *detect and quantify virulence factors in cultures of entomopathogenic bacteria and fungi* • *know the role and fuction of virulence factors from entomopathogens* • *be able to screen for entomopathogens suited for control of pest insects*
Course contents:	• *identification of antimicrobial molecuels in insects* • *detection and quantification of virulence factors from entomopathogenic bacteria and fungi* • *molecular interactions between entomopathogens and the insect immune system* • *application of insect defense molecules in modern pest management strategies*
Grading:	*graded written experimental protocols*
Media types:	*Overhead, Beamer*
Literature:	*Hoy, Insect Molecular Genetics: An Introduction to Principles and Applications, (Second Edition)*

Study course:	*Agrobiotechnology*
Module name:	*Special Biochemistry II*
Abbreviation:	*MP 01*
Subtitel:	
Lectures:	
Recommended standing:	*SS*
Responsible:	*Prof. Dr. med. Katja Becker-Brandenburg*
Lectures:	*Becker-Brandenburg, Iozef, Rahlfs*
Language:	*English*
Allocation to curriculum:	
Class format:	*seminar (20%), laboratory (80%) / 4 SWS*
Workload:	*seminar (12 hours), lab (48 hours) preparation (40 hours), follow-up study (60 hours), small-group work (20 hours)*
Credit points:	*6 ECTS*
Prerequisites:	
Course goals:	*Students will* • *have knowledge and proficiency in the application of spectrophotometric and chromatographic methods relevant to the nutritional sciences* • *be experienced and proficient in techniques of molecular biology and protein biochemistry* • *have knowledge of the qualitative and quantitative value of biochemical and molecular-biological analytic processes*
Course contents:	• *photometric determination of riboflavin status (ERGAC) and hemoglobin concentration* • *enzyme kinetics, inhibitor studies* • *determination of glutatione concentrations and total antioxidant capacity in biological material* • *PCR, restriction digest, ligation, transformation, heterologous expression of genes* • *2-dimensional gel electrophoresis* • *crystallization of proteins, x-ray diffraction analysis*
Grading:	*oral examination*
Media types:	*Overhead, Beamer*
Literature:	*Berg , Tymoczko, Stryer, Biochemie (Spektrum);* *Lehninger, Nelson, Cox, Lehninger Biochemie (Springer);* *Sambrook, Fritsch, Maniatis; Molecular Cloning: A Laboratory Manual (CSHLP).*

Study course:	*Agrobiotechnology*
Module name:	*Molecular Biology and Genetic Variation*
Abbreviation:	*MP 02*
Subtitel:	
Lectures:	
Recommended standing:	*WS*
Responsible:	*Prof. Dr. med. Katja Becker-Brandenburg*
Lectures:	*Becker-Brandenburg, Rahlfs, Urig*
Language:	*English*
Allocation to curriculum:	
Class format:	*seminar (60%), exercises (40%) / 4 SWS*
Workload:	*seminar (36 hours) and exercises (24), preparation (50 hours), follow-up study (40 hours), small-group work (30 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*Special Biochemistry I (MKE 01)*
Course goals:	*Students will* • *have knowledge of the biosynthesis of nucleotides, and of DNA and RNA as carriers of genetic information* • *understand the structure of DNA and RNA as well as principles of DNA replication, mutation and repair, RNA synthesis and splicing processes* • *be able to discuss the control of gene expression in prokaryotes as well as mechanisms of gene expression in eukaryotes* • *have knowledge of the most important microbiological methods, genetically linked diseases relevant to the nutritional sciences, and principles of gene therapy*
Course contents:	• *structure and function of DNA and RNA* • *transcription and translation* • *control of gene expression in prokaryotes* • *gene expression in eukaryotes* • *genetically linked metabolic disorders* • *genetic disposition, gene therapy, microarrays* • *restriction endonucleases, ligation, PCR, transformation, heterologous expression, DNA extraction, determination of DNA content*
Grading:	*oral examination*
Media types:	*Overhead, Beamer*
Literature:	*Ganten, Ruckpaul, 1998, Handbuch Molekulare Medizin (Springer)* *Rehner, Daniel 2002, Biochemie der Ernährung (Spektrum)*

Study course:	*Agrobiotechnology*
Module name:	*Physiological Evaluation of Food II*
Abbreviation:	*MP 04*
Subtitel:	
Lectures:	
Recommended standing:	*WS*
Responsible:	*Prof. Dr. Clemens Kunz*
Lectures:	*Kunz, research associates*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture with discussion (50%), seminar (50%) / 4 SWS*
Workload:	*lecture (30 hours), seminar (30 hours), preparation (30 hours), follow-up study (30 hours), small-group work (60 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*none*
Course goals:	*Students will* • *be able characterize and classify various foods (traditional food, functional food, nutritional supplements, and novel food)* • *be able to critically evaluate preventive measures using traditional and functional food on the basis of physiological reactions in humans* • *have the ability to conduct research on a selected topic, to draft scientific papers and presentations on the topic*
Course contents:	• *definition and differences between food groups and other nutrient sources* • *methods to physiologically evaluate the efficacy of food ingredients* • *influence of food components on organ functions* • *potentials of (functional) foods to influence nutrition-related diseases (e.g., adiposity, metabolic syndrome, atherosclerosis, osteoporosis)* • *modification of food and their impact on nutrition in various age groups and life stages* • *regulatory aspects of functional food*
Grading:	*written examination*
Media types:	*Overhead, Beamer*
Literature:	*Michael J. Gibney, Ian A. Macdonald, Helen M . Roche (eds). Nutrition and Metabolism (Blackwell Science, Oxford 2003). Arnoldi A (ed) Functional Foods, Cardiovascular Disease and Diabetes (CRC Press Boca Raton) 2004* *Remacle C, Reusens B. Fuctinal Foods, Ageing and Degenerative Disease (CRC Press Boca Raton) 2005.*

Study course:	*Agrobiotechnology*
Module name:	*Economic Development and World Agricultural Markets*
Abbreviation:	*MP 13*
Subtitel:	
Lectures:	
Recommended standing:	*SS*
Responsible:	*Prof. Dr. P. Michael Schmitz*
Lectures:	*Schmitz, Herrmann*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (90%), exercises (10%) / 4 SWS*
Workload:	*lecture (54 hours), exercises (6 hours), preparation and follow-up study (120 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*none*
Course goals:	*Students will* • *be able to analyze and systematize the problem of development in its various dimensions and to establish connections to poverty, hunger and malnutrition* • *be able to provide explanatory approaches to the existence of underdevelopment, poverty and food insecurity* • *be able to assess agricultural and developmental policy measures and problem-solving strategies* • *be able to understand the characteristics of world agricultural markets as well as price formation on and interdependencies between such markets* • *be able to explain the influence of national and international agricultural market policy on world agricultural trade* • *understand the relationship between agricultural trade and economic development*
Course contents:	• *underdevelopment, poverty and hunger: a survey* • *causes of underdevelopment, poverty and hunger* • *micro- and macroeconomic development strategies* • *role of the agricultural sector and agricultural policy in the developing world* • *agricultural policies of industrialized countries and development* • *sustainable development* • *growth, transformation and development* • *globalization from the perspective of the developing world* • *features of world agricultural markets (price instability, terms of trade)* • *influence of national agricultural policies, agricultural development policy and international commodity agreements on world agricultural trade* • *activities of international organizations and their influence on world agricultural trade* • *supply, demand and pricing in major world agricultural*

	markets
Grading:	*written examination*
Media types:	*Overhead, Beamer*
Literature:	*Herrmann, R., K. Burger and H.P. Smit (1993), International commodity Policy: A Quantitative Analysis (London: Routledge)* *Todaro, M.P.(1992), Economics for a Developing World. An Introduction to Principles, Problems and Policies for Development (Third edition, London, New York: Longman)*

Study course:	*Agrobiotechnology*
Module name:	*Medicinal and spice plants*
Abbreviation:	*MP 17*
Subtitel:	
Lectures:	
Recommended standing:	*WS*
Responsible:	*Prof. Dr. Bernd Honermeier*
Lectures:	*Honermeier, Yan*
Language:	*English*
Allocation to curriculum:	
Class format:	*Lecture (60 %), seminar (20 %), exercises (20 %) / 4 SWS*
Workload:	*Lecture (48 hours), seminars (12 hours), preparation and follow-up study (120 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*none*
Course goals:	*Students will* • *recognize significant relationships in the provided field of knowledge* • *possess basic knowledge of taxonomy, morphology, identification and cultivation of medicinal and spice plants* • *possess knowledge of biochemistry and pharmacology of vegetable drugs*
Course contents:	• *Taxonomy and morphology of most important medicinal, dye and spice plants* • *Systematic and native ingredients of drugs (root, leave, herb, flower, fruit, rind and seed drugs)* • *Pharmacology and phytomedicine of vegetable drugs and their ingredients (essential oil, flavonoids, alkaloids, saponin, fatty acids, tanning agents)* • *Cultivation, storage and processing* • *Identification of vegetable drugs by microscopy and chromatography* • *Quality analysis of vegetable drugs by steam distillation, photometry, GC and HPLC*

Grading:	*written examination*
Media types:	*Overhead, Beamer*
Literature:	*Ross: Medicinal plants of the world, chemical constituents, traditional and modern medicinal uses;* *Blumenthal: Herbal medicine: expanded commission E monographs;* *Karch: Toxicology and clinical pharmacology of herbal products;* *Padulosi (editor): Oregano. Proceedings of the IPGRI Intern. Workshop on Oregano, IPGRI Rome 1996* *Diederichsen, A.: Coriander. Proceedings of the IPGRI Intern. Workshop on Oregano, IPGRI Rome 1996* *Purseglove, Brown, Green, Robbins: Spices. volume 1 & 2;* *Margaris, Koedam, Vokon (eds): Aromatic plants: basics and applied aspects;*

Study course:	*Agrobiotechnology*
Module name:	*Plant Breeding: Special Topics of Resistance and Quality*
Abbreviation:	*MP 20*
Subtitel:	
Lectures:	
Recommended standing:	*SS*
Responsible:	*Prof. Dr. Dr. h.c. Wolfgang Friedt*
Lectures:	*Friedt, Töpfer, Wagner, N.N.*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (25%), exercises (75%) / 4 SWS*
Workload:	*lecture (15 hours), exercises (45 hours), preparation and follow-up study (120 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*MP21*
Course goals:	*Students will* • *have knowledge of breeding goals involving resistance and quality of significant crop plant species (cereals, oil & protein crops, grapevine)* • *have knowledge of the major breeding methods, particularly for achieving appropriate resistance and quality properties* • *be familiar with biotechnological, molecular-biological as well as genetic engineering techniques with respect to the optimisation of resistance and quality properties of significant crops*
Course contents:	• *natural variation and genetics of resistance against pests and pathogens in crops and related species (annual and perennial)* • *methods of developing resistance against major pathogens* • *natural variation and genetics of quality characteristics in plants, e.g. cereals and other starch plants, oil & protein crops, grapes)* • *methods of developing quality characteristics in major crop plants* • *methods of promoting genetic variation (e.g. mutagenesis)* • *cell and tissue culture techniques in resistance and quality breeding*

	• *molecular resistance and quality breeding (marker-based selection, QTL analysis, gene isolation)* • *genetic engineering methods in resistance and quality breeding*
Grading:	*oral examination*
Media types:	*Overhead, Beamer*
Literature:	*Richards, 2002, Plant Breeding Systems (Chapman, Hall)* *Taji et al, 2001. In vitro Plant Breeding (Food Products Press)*

Study course:	*Agrobiotechnology*
Module name:	*Molecular Biology of Plant Nutrition*
Abbreviation:	*MP 24*
Subtitel:	
Lectures:	
Recommended standing:	*WS*
Responsible:	*Prof. Dr. Karl-Hermann Mühling*
Lectures:	*Mühling*
Language:	*English*
Allocation to curriculum:	
Class format:	*laboratory (33%), lecture (33%), exercises (33%) / 4 SWS*
Workload:	*lecture (20 hours), lab (20 hours), guided exercises (20 hours), preparation and follow-up study (120 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*MKP04*
Course goals:	*Students will* • *have theoretical knowledge of molecular-biological aspects of plant nutrition* • *know methods of research in molecular biology*
Course contents:	• *gene regulation* • *gene cloning and sequencing* • *techniques in molecular biology (blotting techniques, reverse transcription, gel electrophoresis, restriction analysis, PCR, staining techniques*
Grading:	*oral examination*
Media types:	*Overhead, Beamer*
Literature:	*Principles of Plant Nutrition (Mengel and Kirkby, 5th Edition, Kluwer Academic Publishers, 2001)* *Mineral Nutrition of Higher Plants (Marschner, 2nd Edition, Academic Press, 1995)* *Biochemistry & Molecular Biology of Plants (Buchanan et al., 2000, American Society of Plant Biologists)*

Study course:	*Agrobiotechnology*
Module name:	*Host-Microbe Interaction*
Abbreviation:	*MP 29*
Subtitel:	
Lectures:	
Recommended standing:	*SS*
Responsible:	*Prof. Dr. Karl-Heinz Kogel*
Lectures:	*Kogel, Schnell*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (50%), seminar (50%) / 4 SWS*
Workload:	*lecture (30 hours), seminar (30 hours), preparation and follow-up study (120 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*MP26*
Course goals:	*Students will* • *recognize the connections among interactions of parasitic and symbiotic biocenoses* • *be able to discuss the application of alternative measures for pesticide reduction* • *be able to describe the biochemical and molecular-biological mechanisms of incompatibility and compatibility* • *know the prominent significance of the root as a phytomedicinally highly endangered plant organ* • *be familiar with concepts of modern interdisciplinary approaches to research in resistance and the use of microorganisms in pest control* • *be able to under stand review articles in relevant international journals regarding phytopathological and microbiological soil research*
Course contents:	• *morphology and biochemistry of roots* • *physical and chemical conditions in the rhizosphere (pH, O_2, exudate gradients)* • *transport processes in plants* • *root pathogens (protozoa, chromista, fungi)* • *morphology and biochemistry of parasitic seed plants* • *pest control strategies for roots* • *growth promotion through rhizospheric microorganisms (N_2 fixation, regulation of the nif gene, plant-promoting factors, mycorrhiza)* • *resistance mechanisms* • *pest control through microorganisms (bacterial toxins as insecticides)* • *possibilities and limitations of inoculation with VAM or N_2-fixing bacteria* • *cultivation approaches* • *quantitative resistances* • *biomathematics*

Grading:	*written examination on material covered in lecture; oral contributions in Seminar*
Media types:	*Overhead, Beamer*
Literature:	*Buchanan et al. 2000, Biochemistry & Molecular Biology of Plants (American Society of Plant Biologists)* *Agrios 2005, Plant Pathology, Academic Press* *Boland, Kuykendall (eds), Dekker: Plant-microbe interactions and biological control;* *Varma et al. (eds): Plant surface microbiology;* *Glick et al. (eds): Biochemical and genetic mechanisms used by plant growth promoting bacteria;*

Study course:	*Agrobiotechnology*
Module name:	*Resource Economics and Environmental Management*
Abbreviation:	*P 47*
Subtitel:	
Lectures:	
Recommended standing:	*SS*
Responsible:	*Prof. Dr. Ernst Nuppenau*
Lectures:	*Nuppenau*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (67%), exercises (13%), advanced seminar (20%) / 4 SWS*
Workload:	*lecture (40 hours), exercises (8 hours), seminar (12 hours), preparation (50 hours), follow-up study (20 hours), independent studying (50 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*none*
Course goals:	*Students will* • *have foundational knowledge modeling the intertemporal optimization of agricultural resource utilization* • *grasp the basics of management concepts toward the resolution of resource usage conflicts* • *be able to simultaneously model ecological and economic material cycles* • *be able to depict dynamic processes of resource regeneration* • *be able to construct computer simulation models* • *be able to derive economically and ecologically justifiable extraction rates from soil, water and biotic natural resources* • *be able to draw on knowledge of such concepts as sustainability, the introduction of "save minimum standards," etc. to aid efforts in resource management*
Course contents:	• *intertemporal optimization and resource usage* • *economics of non-renewable resources* • *economics of renewable resources* • *open-acess property and extermination of species as biotic resources* • *nature conservancy as common-property management* • *introduction to the economics of sustainable cultivation* • *mathematical formulation of resource-management models* • *programming of optimization models* • *management of cultivated landscapes* • *trade and the environment* • *political questions about the implementation of environmental policy* • *international questions of resource protection* • *resource evaluation*

	• *property rights and institutions*
Grading:	*oral examination, seminar assignments*
Media types:	*Overhead, Beamer*
Literature:	*Lesser, Dodds, Zerbe, Environmental Economics and Policy;* *Pearce, Turner, Economics of Natural Resources and the Environment;* *Bromley, Paavola, Economics. Ethics and Environmental Policy;* *Tietenberg, Environmental and Resource Economics;*

Study course:	*Agrobiotechnology*
Module name:	*Microbiological Diagnostics and Quality Control*
Abbreviation:	*MP 56*
Subtitel:	
Lectures:	
Recommended standing:	*WS*
Responsible:	*Prof. Dr. Dr. Peter Kämpfer*
Lectures:	*Kämpfer*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (50%), seminar (50%) / 4 SWS*
Workload:	*lecture (30 hours), seminar (30 hours), preparation and follow-up study (120 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*none*
Course goals:	*Students will* • *have knowledge of the foundations of microbiological diagnostics and know quality standards and control procedures for industrial microbiology as well as environmental technology*
Course contents:	• *environmental hygiene; communicable diseases; disinfection; sterilization; quality control of drinking water, bathing water, wastewater and air (legal foundations and standards)* • *microbiological diagnostics (classic and molecular-biological procedures in the scope of quality assurance), microbial loading in the environment, in everyday life and in the work environment (legal foundations and standards)*
Grading:	*oral examination, report*
Media types:	*Overhead, Beamer*
Literature:	*Brock, Madigan, Martinko, Parker, Biology of Microorganisms;* *Bergey's Manual of Systematic Bacteriology, Vol. 1 und 2;* *Persing et al., Molecular Microbiology (ASM Press);*

Study course:	*Agrobiotechnology*
Module name:	*Molecular Phytopathology*
Abbreviation:	*MKP 02*
Subtitel:	
Lectures:	
Recommended standing:	*WS*
Responsible:	*Prof. Dr. Karl-Heinz Kogel*
Lectures:	*Kogel, Hückelhoven*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (50%), seminar (25%), exercises (25%) / 4 SWS*
Workload:	*lecture (30 hours), seminar (15 hours), exercises (15 hours), preparation and follow-up study (120 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*MP26*
Course goals:	*Students will* • *have in-depth knowledge of the biochemical and molecular foundations of host-parasite interactions* • *be able to describe the structure and function of resistance and avirulence genes* • *be able to discuss possible means by which plants and their parasites coevolved* • *be able to describe mechanisms of disease resistance on biochemical and molecular-biological levels* • *have and understanding of the modern strategies pursued in pest control and breeding research*
Course contents:	• *cytological, biochemical and molecular-biological foundations of host-parasite reactions* • *mechanisms of plant defensive reactions* • *structure and function of resistance, avirulence and defensive genes* • *principles of modern pest control processes on the basis of induced resistance and genetic engineering techniques* • *mechanisms of function of active agents: (resistance inductors)* • *antagonism* • *pathogenesis factors* • *elicitors, suppressors* • *physiological changes in disease-afflicted plants*
Grading:	*written examination*
Media types:	*Overhead, Beamer*
Literature:	*Buchanan et al. 2000, Biochemistry & Molecular Biology of Plants (American Society of Plant Biologists)* *Agrios 2005, Plant Pathology (Academic Press)*

Study course:	*Agrobiotechnology*
Module name:	*Biochemistry and Biotechnology in Plant Production*
Abbreviation:	*MKP 04*
Subtitel:	
Lectures:	
Recommended standing:	*WS*
Responsible:	*Prof. Dr. Karl-Hermann Mühling*
Lectures:	*Mühling, Friedt, Kogel*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (50%), seminar (20%), exercises (30)%) / 4 SWS*
Workload:	*lecture (30 hours), seminar (10 hours), guided exercises (20 hours), preparation and follow-up study (120 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*none*
Course goals:	*Students will* • *have theoretical knowledge of key biochemical processes in plant production* • *have practical experience in biotechnological techniques*
Course contents:	• *enzyme kinetics and enzyme regulation* • *signal chains* • *gene transfer*
Grading:	*written examination*
Media types:	*Overhead, Beamer*
Literature:	*Alberts et al. 2001, Lehrbuch der Molekularen Zellbiologie (Wiley-VCH Verlag)* *Brown 1996, Gentechnische Methoden (Nicholl, 1995, Spektrum Akademischer Verlag)*

Study course:	*Agrobiotechnology*
Module name:	*Applied Statistics and Environmental Informatics*
Abbreviation:	*MKU 08*
Subtitel:	
Lectures:	
Recommended standing:	*WS*
Responsible:	*Prof. Dr. Wolfgang Köhler*
Lectures:	*Köhler, Schachtel*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (50%), exercises with practical computer assignments (50%) / 4 SWS*
Workload:	*lectures (30 hours), tutorials (30 hours) independent completion of assigned exercises (60 hours), preparation and follow-up study (60 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*none*
Course goals:	*Students will* • *be able to plan complex experiments statistically* • *be able to prepare multivariate data graphically and numerically* • *be familiar with the reduction of multivariate data* • *be familiar with the use of inferential statistics to analyze complex data sets*
Course contents:	• *measures of association and distance* • *application and analysis of multi-factorial experiments* • *cluster analysis* • *variogram analysis and kriging* • *covariance analysis* • *multiple regression* • *discriminance and principal component analysis* • *application of statistical software packages*
Grading:	*weekly assigned exercises, written examination*
Media types:	*Overhead, Beamer*
Literature:	Gomez K A, Gomez A A, Statistical Procedures For Agricultural Research, Wiley, New York Snedecor G W, Cochran W C, Statistical Methods, Iowa State UP, Iowa Legendre P, Legendre L, Numerical Ecology, Elsevier, Amsterdam

Study course:	*Agrobiotechnology*
Module name:	*Production and Logistics Management in Agriculture and Food Industries*
Abbreviation:	*MKA 02 / MKEÖ 02*
Subtitel:	
Lectures:	
Recommended standing:	*WS*
Responsible:	*Prof. Dr. Dr. h. c. Friedrich Kuhlmann*
Lectures:	*Kuhlmann, Mau*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (75%), exercises (25%) /*
Workload:	*lecture (45 hours), exercises (15 hours), preparation (40 hours), follow-up-study (80 hours)*
Credit points:	*6 ECTS*
Prerequisites:	*none*
Course goals:	*Students will* • *have a command of linear algebra and analysis for the representation of production functions in manufacturing and physical distribution of goods and services in the agricultural and food sector* • *be able to use spreadsheets and database applications to represent and solve production and logistics decision problems*
Course contents:	• *scope and contents of production and logistics management problems* • *structures of production and logistics systems in agriculture and food industries* • *quantity structures as characteristics for production functions: multi-factorial monoproduction, multifactorial multiproduction, usage intensity of production facilities, impact of non-controllable production factors on biologically determined production systems* • *value structures: product and factor prices* • *managerial production planning: Assessment of cost-performance-relationships for single production processes and complete production systems* • *managerial logistics planning: Assessment of cost-performance-relationships for logistics systems of procurement, production and distribution* • *supply chain management*
Grading:	*written examination, proof of attendance*
Media types:	*Overhead, Beamer*

Literature:	*Kuhlmann, F. (2004). Produktionswirtschaft in der Agrar- und Ernährungswirtschaft - Ein Reader -, Gießen* *Mau, M. (2002): Logistik: mit Übungsaufgaben und Lösungen, WRW-Verlag, Köln* *Domschke, W. (1996): Logistik: Standorte, 4. überarb. und erw. Auflage, R. Oldenbourg Verlag München Wien* *Chain Management, Prozessoptimierung entlang der Wertschöpfungskette, Wiley-Vch Verlag, Weinheim*

Study course:	*Agrobiotechnology*
Module name:	*Industry-Course*
Abbreviation:	
Subtitel:	
Lectures:	
Recommended standing:	*3^{rdt} semester / WS*
Responsible:	*Prof. Dr. Karl-Heinz Kogel*
Lectures:	*Kogel, and scientists from industry*
Language:	*English*
Allocation to curriculum:	
Class format:	*lecture (15%), exercises (85%) / 8 SWS*
Workload:	*lecture (9 hours), exercises (51 hours),* *preparation and follow-up study (120 hours)*
Credit points:	*12 ECTS*
Prerequisites:	*Basic knowledge in laboratory work; basic knowledge in chemistry and biology* *Kernmodule of the 1st and 2nd semester*
Course goals:	*Students will* • *be able to understand and evaluate biotechnological processes in food and Agrobiotechnology* • *have practical experience with extended biotechnological processes, such as tissue culture, high-throughput screening and marker applications, fermentation* • *be able to execute extended biotechnological laboratory methods unassisted* • *have a conception of the problem solution strategies in biotechnology* • *have a command of the most important transformation techniques in the production of genetically modified plants/microorganisms* • *get insight and broad information on technology and strategies used by food and agrobiotechnology industries*
Course contents:	• *transgenic plants/microorganisms* • *agronomically important genes, proteins, and/or other metabolites* • *genetic transformation techniques* • *depending on industry laboratory :* • *biotechnological pest control techniques* • *biotechnological disease control techniques* • *tissue techniques and tissue cultures* • *high-throughput screening methods*

	• *molecular breeding techniques* • *food and feed safety* • *microbial production techniques* • *cell biology techniques* • *visualization techniques by marker genes*
Grading:	*Written Report, oral examination*
Media types:	*Overhead, Beamer*
Literature:	*Sambrook; Fritsch;Maniatis, Molecular cloning: a laboratory manual, Cold Spring Harbor, NY, Cold Spring Harbor Laboratory Press* *Brown, Genomes, Bios Scientific Publishers Ltd, NY* *Watson et al., Molecular Biology of the Gene, CSHL press* *Course specific literature*