UNIVERSITÄT HOHENHEIM

Modulhandbuch

für den Studiengang

Master of Science Bioeconomy

Stand Oktober 2023

Inhaltsverzeichnis

Modul: Advanced Policy Analysis Modelling (4204-420)

Modulverantwortung	Arndt Feuerbacher
Bezug zu anderen Modulen	This is an advanced methodological module which extends on the materials studied in the modules "Agricultural and Food Policy" and "Microeconomics". The knowledge acquired in this module introduces the student to research methods used to analyse political decisions and their impacts empirically and to the tools required for their practical implementation, and provides a solid understanding of the underlying methods and data to allow an educated judgement of the results and conclusions of such studies.
Teilnahmevoraussetzung	A solid introduction to economics and policy analysis, equivalent to the contents of the modules "Basic Microeconomics", "Agricultural and Food Policy" and "Microeconomics" is required.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Agricultural Sciences - Agricultural Economics (Master) 3. Semester, semi-elective Bioeconomy (Master) 3. Semester, elective (profile: Bioeconomy Policy Analysis)
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students will - have an overview about simulation models used in the analysis of agricultural markets and policies and understand which of the different model types are suited to answer specific types of questions, - understand basic mechanisms of linear and non-linear programming models (LP and NLP), - be able to formulate simple LP and NLP models in GAMS, - understand the mechanisms of multi-market models of the agricultural sector,

	- be able to formulate simple multi-market models in GAMS, - understand the mechanisms of general equilibrium models, - be able to formulate simple general equilibrium models in GAMS, - understand the data requirements of simulation models, - understand the driving forces of model results (model mechanisms, parameters, data), - be able to distinguish between conclusions which can and which cannot be derived from model results. Critical and analytical thinking, abstraction, application of sound economic reasoning, structured work with program and data files on a PC.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	The final grade is a weighted grade of two parts: the results from homework assessments (20%) and one 120 minute written final exam (80%). A pass grade is required for each part separately to pass the module.
Studienleistung und Gewichtung	-
Advanced Policy Analysis Modelling (4204-421)	
Person(en) verantwortlich	Arndt Feuerbacher
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	General Equilibrium Modelling (Modelling approaches; Estimations and Assumptions; Regional, National and International Modells), Mathematical Structures and Solution Algorithms, Models for Agricultural Supply and Environment, Modelling the CAP, Modelling International Trade, Institutions and Transactions, Project: Structure your model
Literatur	Lecture notes and additional readings will be distributed in class. There is no text book covering all the material in the course. The following books are only recommended as supplements to what is covered in the lectures:

	• HONKAPOHJA, SEPPO & INGBERG, MIKAEL (1993), Macroeconomic Modelling and Policy implications, North Holland. • HECKELEI, THOMAS ET AL. (2001), Agricultural Sector Modelling and Policy Information Systems, Wissenschaftsverlag Vauk, Kiel. • BROCKMEIER, MARTINA ET AL. (1998), Economic Transition and Greening of Policies. Modelling New Challenges for Agriculture and Agribusiness in a large integrated economy. Proceeding of the 50th European Seminar of the European Association of Agricultural Economics (EAAE), 15-17 Oct. 1996, Gießen (Germany) • ZANDER, PETER M. (2003), Agricultural land use and conservation options, Wageningen. • SCHWARZ, GERALD (2003), The BSE crisis on the European beef market: modelling of changing demand patterns and substituion effects in integrated economics, Aachen. • HART, ROB (2002), Dynamic modelling of environment and economy, Uppsala. • NIEMI, JYRKI (2003), Co-integration and error correction modelling of agricultural commodity trade: the case of ASEAN agricultural exports to the EU, Helsinki. • ECKMAN, SONE (2002), Modelling agricultural production systems using mathematical programming, Uppsala.
Anmerkungen	Lecture + laboratory course with students presentation

Modul: AgFoodTech (1507-450)

Modulverantwortung	Jochen Weiss
Bezug zu anderen Modulen	The module is taught directly following the introductory SPOC, which introduces students to the food system. In the module, students focus on the AgriFood subsegment of this system, from the combined perspectives of agrarian technology and food science. The module enables them to take a systemic-integrative perspective on this subsegment of the Food System. This perspective will be further enriched and fleshed out in two further modules chosen from the pool of electives.
Teilnahmevoraussetzung	Students have to be enrolled in the first semester of the Food Systems master program.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes Semester
Dauer des Moduls	4 Wochen (Block 2)
Studiengänge	M.Sc. Food Systems, 1. Semester, Pflicht M.Sc. Bioeconomy, 2./4. Semester, Wahl (Profil: Transforming Food Systems) M.Sc. Food Science & Engineering, 3. Semester, Wahl M.Sc. Lebensmittelchemie, 3. Semester, Wahl M.Sc. Ernährungsmedizin, 3. Semester, Wahl M.Sc. Medizinische Ernährungswissenschaft, 3. Semester, Wahl M.Sc. Molekulare Ernährungswissenschaft, 3. Semester, Wahl M.Sc. Molekulare Ernährungswissenschaft (ab Studienbeginn WS 23/24), 3. Semester, Wahl M.Sc. Agrarbiologie, 3. Semester, Wahl
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	- Students can organize individual field, post-harvest, and food processing technologies into sequential transformation chains - Students can appraise the functionalities of sequential transformation chains

	- Students can investigate and quantitatively assess key process outcomes of select chains based on given input parameters (e.g. energy, mass, properties of raw materials etc.) - Students can classify and explain key agriculture and food technologies that transform raw material into value added foods - Students can define the role of AgFoodTech in the food system - Making value judgments and sustainability competencies - Creativity skills and competencies - Research skills and competencies - Intellectual transforming skills and competencies
empfohlene Vorkenntnisse	-
Anmerkungen	Sign-up for module: in ILIAS The lectures of this course might be held online. Maximum of participants 15.
Modulprüfung und Gewichtung	Written exam. Oral or online exam optional.
Studienleistung und Gewichtung	-
AgFoodTech (1507-451)	
Person(en) verantwortlich	Jochen Weiss
Lehrform	Vorlesung mit Übung, Praktikum und Exkursion
SWS	4
Inhalt	AgFoodTech combines knowledge and skill from the fields of agrarian technology and food processing. For this, the module reviews the basics of different areas of food and agricultural science. The obtained knowledge is finally merged into a self-learning project.
Literatur	-
Anmerkungen	Please bote, this module is intended for first semester Master of Food Systems students, and includes laboratories and practical exercises in fulfillment of the requirement for their degree. Preference will be given to them, but remaining spaces may be taken by for example incoming guest

	students of other semesters in the Master degree of Food Systems.

Modul: Agricultural and Food Policy (4201-410)

Modulverantwortung	Christine Wieck
Bezug zu anderen Modulen	This module builds on an introduction to economics, e.g. such as in module 4201-440, Introduction to Economics and Environmental Policy. It is a basis for more advanced agricultural policy modules such as International Food and Agricultural Trade (4902-420) and Advanced Policy Analysis Modeling (4201-420).
Teilnahmevoraussetzung	Students need to have a background in economics at an introductory level (BSc). Furthermore, it is helpful to join the module "Microeconomics" (4202-450).
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 semester
Studiengänge	Agricultural Sciences - Agricultural Economics (Master) 2. semester, compulsory Bioeconomy (Master) 2. Semester, elective (profile: Bioeconomy Policy Analysis | Transforming Food Systems)
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	On successful completion of the module students should be able to: - explain the reasons for government intervention in the agri-food sectors of several countries, and identify the policy objectives being pursued; - critically analyse how policy programs affect the agricultural sector, consumers, agribusiness as well as the domestic and world economy; - apply welfare economics in the analysis of agricultural policies; - understand the institutional background and the role of various interest groups in the process of agricultural policy formulation. Students will learn:

	- critical and analytical thinking - application of sound economic reasoning - group work - oral presentation techniques - literature review
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written exam (70%)
Studienleistung und Gewichtung	Presentation with discussion (30%)
Agricultural and Food Policy (4201-411)	
Person(en) verantwortlich	Christine Wieck
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	On successful completion of the module, students should be able to: • explain the reasons for government intervention in the agri-food sector, • identify the policy objectives being pursued, • understand the institutional background and the role of various interest groups in the process of agricultural policy formulation, • critically analyse how public policy programs affect the agricultural sector, consumers, agribusiness as well as the domestic and world economy; • identify suitable policies for specific agricultural problems.
Literatur	Mandatory and additional background readings will be assigned on a regular basis. The material in the mandatory reading is assumed to be known and will not be covered fully in class. Questions to the readings are discussed in class. Exercises will be integral part of the course. Writing small policy memos is an integral part of the class and constitutes an important preparation for the exam.
Anmerkungen	Lecture, project work with students presentation.

Modul: Agricultural Knowledge Systems and Advisory Services (4301-470)

Modulverantwortung	Andrea Knierim
Bezug zu anderen Modulen	Good completion to the module 'Fit for Innovation Support – Concepts, Methods and Skills'
Teilnahmevoraussetzung	none
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Agricultural Sciences in the Tropics and Subtropics (Master,) 3. Semester, elective Agricultural Sciences - Agricultural Economics (Master) 1./3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Innovation and Entrepreneurship in the Bioeconomy) Communication Management and Analysis (Master) 3. Semester, semi-elective
Prüfungsdauer (in Minuten)	30
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After completion of the module, students are able to describe concepts to explain the rural, urban-rural linkages, they understand actors and dynamics of (rural) development and processes contributing / supporting change. They extend their communication skills and are able to advise people in problems-solving. They are able to discuss the importance of concepts for advisory work and sub concepts of advisory work. The students have a better understanding of situation analysis and the role for extension/advisory work. The students have a deeper knowledge about communication methods (individual and group extension) and media for literate and illiterate clients under the angle of intercultural communication with emphasis on attitudes and skills of advisors. knowledge and information systems, extension approaches and their implications; The students can specify the importance of agricultural research (methods) especially in developing and assessing innovations. They have a deeper understanding about organization and finance of

	extension services, specific aspects of monitoring and evaluation of extension services and programs. Students practice time management and self-reliance while learning for the exam and preparing and following up on lectures. During the lectures the students practice communication in different situations, so they learn skills for communication and extension, as well as they practice their listening and paraphrasing skills. While those discussions they practice open communication and give/get helpful feedback. They also practice group working skills under the respect of group dynamics.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	oral exam (50%)
Studienleistung und Gewichtung	Written assignment during the semester (50 %)
Agricultural Knowledge Systems and Advisory Services (4301-471)	
Person(en) verantwortlich	Andrea Knierim Maria Gerster-Bentaya
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	Definition and examples of systems, evolvement of AKIS; different views on Agricultural Knowledge and Innovation Systems: infrastructural, functional, procedural; actors in the system: agents, organisations, networks and their linkages; advisory services: pluralism of providers, funding mechanisms, service delivery modes, innovation support services; Approaches: prinipcle, leements, cases; Governance: acting within the AKIS, responsibilities of actors across levels withing the secotrs and value chains.
Literatur	Lecture notes and additional readings will be distributed in class and uploaded in ILIAS
Anmerkungen	This module provides a macro and meso perspective of Agricultural Knowledge and Innovation Systems and Advisory services; in a second module (Fit for Innovation Services) participants can acquire competences for effectively engage in micro-level communication and interaction situations with clients Open to external participants. The reader is available at the ASTA or can be downloaded under: www.ilias.uni-hohenheim.de/ (look for the respective module).

Modul: Agricultural Production of Biobased Resources (3403-430)

Modulverantwortung	Iris Lewandowski
Bezug zu anderen Modulen	This module provides the basic knowledge on agricultural production of biobased resources that is needed to accomplish the Master Programme in Bioeconomy.
Teilnahmevoraussetzung	See admission regulations for the Master Programme Bioeconomy.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Biobased Products and Bioenergy (Master) 3. Semester, elective Bioeconomy (Master) 1. Semester, semi-elective Earth and Climate System Science (Master), 1. Semester, compulsory
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	52
Selbststudium (in Stunden)	128
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students have a sound knowledge of crop production in various agro-ecological zones and production systems. They are able to understand the conditions of agricultural production for biomass under different ecological and socio-economic settings. They investigate the natural resource base of agricultural production and have the skills to characterize material flows in agricultural systems, including agricultural products and their important links to livestock production. On this basis, they are able to develop concepts for the sustainable production of biomass for the biobased economy. Students are able to deal with complex natural systems. They understand the implications of this complexity on the agricultural production stage of biobased value chains. They gain the analytical skills and practice the critical thinking necessary to engage in the discussion on sustainable land-use systems and the implications of competing uses of biomass on food security. They are able to explain the role of agricultural production in the bioeconomy. They also

	gain skills in oral presentation, scientific writing, team work and interdisciplinary collaboration.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: approx. 55. Prioritiy will be given to students for whom the module is compulsory.
Modulprüfung und Gewichtung	50% written exam
Studienleistung und Gewichtung	25% case study presentation including discussion, 25% case study written report
Agricultural Production of Biobased Resources (3403-431)	
Person(en) verantwortlich	Iris Lewandowski Regina Birner
Lehrform	Vorlesung
SWS	4
Inhalt	The overall objective of the module is to provide fundamental knowledge on the functioning of agricultural systems in different climatic zones for the production of biobased resources for the bioeconomy. Contents of the module include: • º Description, systematics and functioning of agro-ecosystems; º Provision of ecosystem services / hidden agricultural value chains; º Bio-physical principles of agricultural production; º Role of climate and climate change in agricultural production. • º Systematics, description and analysis of agricultural production systems in different agro-ecological regions; º Case studies in crop production; º In- and outputs and material flows in agricultural production systems; º Yields and quality of products from agricultural production; º Biomass supply systems; º Logistic aspects of biomass supply; º Biomass supply in the context of food security.
Literatur	https://link.springer.com/book/10.1007%2F978-3-319-68152-8

Anmerkungen	Limited number of participants (approx. 55) due to intensive supervision of presentations.

Modul: Analysis and Quality Assurance in the Food Production (1504-500)

Modulverantwortung	Mario Jekle
Bezug zu anderen Modulen	Module "Chemische Prinzipien der Lebensmittelverarbeitung" (1504-220)
Teilnahmevoraussetzung	Good scientific basics in organic chemistry, laboratory practice
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 1)
Studiengänge	M.Sc. Food Science and Engineering, 1. Semester, Pflicht M.Sc. Bioeconomy, 3. Semester, Wahl (Profil: Transforming Food Systems)
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Students acquire knowledge on food analytical methods commonly used for quality control during food processing. Reaction mechanisms being essential for the understanding of the corresponding analytical methods, will be studied in detail. Students will acquire advanced laboratory skills, and analytical data obtained will be evaluated with regard to the processing technology.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Exam, colloquium
Studienleistung und Gewichtung	Regular attendance, analytical reports
Theoretical Introduction to the Practical „Analysis and Quality Assurance in Food Production“ (1504-501)	
Person(en) verantwortlich	Mario Jekle
Lehrform	Vorlesung
SWS	1
Inhalt	Students acquire knowledge on food analytical methods, which are be-ing used for quality control during food processing. Reaction mecha-nisms, which are essential for understanding of the

	corresponding ana-lytical methods, will be studied in detail.
Literatur	Notes with recommendations for further literature will be distributed.
Anmerkungen	-
Analysis and Quality Assurance in the Food Production (1504-502)	
Person(en) verantwortlich	Mario Jekle
Lehrform	Praktikum
SWS	3
Inhalt	The students will acquire knowledge on instrumental, chemical, and enzymatic analyses on major and minor food constituents, e.g., lipids, proteins, carbohydrates, water, minerals, vitamins, secondary plant metabolites and others. Students will acquire advanced laboratory skills, and analytical data obtained will be evaluated with regard to the processing technology
Literatur	-
Anmerkungen	-

Modul: Analyzing Sustainability in Agri-Food Systems (4303-410)

Modulverantwortung	Verena Seufert
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	All Master's programs of the Faculty of Agricultural Sciences, 3. semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Sustainability Assessment)
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After completing this module, students are able to: • Understand the different dimensions of sustainability, including different sustainability goals and values. • Understand concepts of justice, fairness, and responsibility as part of the overarching concept of sustainability. • Measure, compare and evaluate different sustainability dimensions using existing sustainability analysis tools. • Interpret the results of the analysis in relation to different sustainability goals and values and identify value differences and trade-offs among different potential courses of actions. By participating in this module, students: • practice their problem-solving and analytical skills, • improve their academic reading and writing and critical-thinking skills, • practice group work and gain communication and collaboration skills,

	• gain normative skills about how to evaluate and negotiate different (and diverging) sustainability values.
empfohlene Vorkenntnisse	Students are welcome from a diversity of backgrounds, but you are expected to have some experience (and motivation) in working with analytical methods. Useful background include courses in systems modelling, introductory statistics, quantitative methods, or GIS.
Anmerkungen	Restricted to max. 50 participants
Modulprüfung und Gewichtung	Computer-based written exam (40 %)
Studienleistung und Gewichtung	Written elaboration in the form of exercises (30 %) Presentation (20 %) Active participation (5 %) Reading questions (5 %)
Analyzing Sustainability in Agri-Food Systems (4303-411)	
Person(en) verantwortlich	Verena Seufert
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	This module provides a comprehensive introduction into sustainability analysis in the agri-food system. Through a series of case studies, the module: • Provides students comprehensive understanding of the different scientific-technological, socio-economic, political-institutional, ethical, and human behavioural perspectives on sustainability in agri-food systems. • Illustrates the diversity of analytical approaches used to understand the social, economic and environmental sustainability dimensions of agri-food systems. • Showcases the diversity of different sustainability values and goals present in agri-food systems and how different analytical tools can help to navigate the interlinkages and potential trade-offs between these.
Literatur	-
Anmerkungen	Restricted to max. 50 participants

Modul: Applied Econometrics (4201-430)

Modulverantwortung	Christine Wieck
Bezug zu anderen Modulen	This module is important for all students who want to carry out empirical economic research and policy analysis.
Teilnahmevoraussetzung	For this module you must have a solid background in statistics and a good understanding of microeconomics. Successfully completed courses in both of these subjects at the undergraduate level are essential and assumed.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Agricultural Sciences - Agricultural Economics (Master) 1. Semester, compulsory Bioeconomy (Master) 3. Semester, elective (profile: Data Science and Artificial Intelligence)
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	The aim of the course is to make students acquainted with econometric techniques frequently used in applied economic research. It provides a modern treatment of methods and models suitable for the analysis of cross-section, time series and panel data. After successfully attending this class, students are expected to be able to select a proper statistical method for investigating an economic problem and to meaningfully interpret the results obtained by using a statistical software package.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	written test (80 %)
Studienleistung und Gewichtung	homework assignment (20 %)

Introductory Econometrics for AgEcon Students (4201-431)

Person(en) verantwortlich	Christine Wieck
Lehrform	Vorlesung
SWS	2

Inhalt	The aim of the course is to make students acquainted with econometric techniques frequently used in applied economic research. It provides a modern treatment of methods and models suitable for the analysis of cross-section, time series, and panel data. After successfully attending this class students are expected to be able to select a proper statistical method for investigating an economic problem and to meaningfully interpret the results obtained by using a statistical software package.
Literatur	• Stock, J.H. and Watson, M.M. (2012) Introduction to Econometrics, Pearson (3rd ed.).
Anmerkungen	-
Applied Econometrics – Practical class (4201-432)	
Person(en) verantwortlich	Christine Wieck
Lehrform	Übung
SWS	2
Inhalt	The aim of the weekly practical class is to repeat important concepts discussed in the lecture and demonstrate their practical application using real world data sets with the help of STATA, a statistical software package. STATA is a commercial software which is available in all PC labs of the university.
Literatur	• Stock, J.H. and Watson, M.M. (2012) Introduction to Econometrics, Pearson (3rd ed.)
Anmerkungen	-

Modul: Artificial Intelligence for Agriculture (4407-470)

Modulverantwortung	Anthony Stein
Bezug zu anderen Modulen	The module advances the knowledge gained in module 4407-440 “Introduction to Artificial Intelligence”.
Teilnahmevoraussetzung	It is highly recommended to successfully complete the module 4407-440 “Introduction to Artificial Intelligence” in order to sensibly participate in this module.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	All Master's programs of the Faculty of Agricultural Sciences, 2. semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Data Science and Artificial Intelligence)
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	The successful participants have gained an overview of specific topics and technical realizations from the field of applications of Artificial Intelligence to agriculture. They can critically review scientific papers. The students learned what happens behind the scenes of scientific conferences and are thus well-prepared for participating in a real conference as contributing researchers. The participants’ competence in giving scientific presentations and to confidently answer technical and critical questions is enhanced (oral expression skills). During the creation of the seminar paper, also the written expression skills are trained. Furthermore, the students train their competence to work independently. They strengthen their ability to critically reflect scientific contents what requires analytical thinking. Since this seminar is given in English, foreign language skills of the participants are also trained.

empfohlene Vorkenntnisse	-
Anmerkungen	The number of participants will be limited to a number that depends on the number of research assistants of the department. The exact number will vary from semester to semester and will be indicated in the corresponding course description in ILIAS.
Modulprüfung und Gewichtung	-
Studienleistung und Gewichtung	Written paper with presentation (50%) Presentation with discussion (40%) Participation in a simulated peer-review process and taking the role of a session chair (10%)
Artificial Intelligence for Agriculture (4407-471)	
Person(en) verantwortlich	Anthony Stein
Lehrform	Seminar
SWS	4
Inhalt	The students work on posed research questions from the domain of Artificial Intelligence applied to agriculture. Recent scientific papers are provided and serve as a starting point for further research on their own. The selected research topics vary every semester. Possible topics comprise: • Machine Learning techniques for crop yield prediction • Swarm robotics as a new approach in crop production • Computer vision for plant disease or weed detection • Reinforcement Learning applied to agricultural robotics
Literatur	Every semester, links to selected scientific articles are provided.
Anmerkungen	-

Modul: Bildanalyse mit Deep Learning (4407-490)

Modulverantwortung	Anthony Stein
Bezug zu anderen Modulen	Das Modul ergänzt inhaltlich die Module 4407-480 "Introduction to Machine Learning with Python" und 4407-440 "Einführung in die Künstliche Intelligenz".
Teilnahmevoraussetzung	-
Lehrsprache	deutsch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Agrarbiologie (Master), 3. Semester, Wahl Agrarwissenschaften (Master), 3. Semester, Wahl Agrarwissenschaften (Master-FR Agrartechnik), 3. Semester, Wahlpflicht Agribusiness (Master), 3. Semester, Wahl Nachwachsende Rohstoffe und Bioenergie (Master), 3. Semester, Wahl Bioeconomy (Master) 3. Semester, Wahl (Profil: Data Science and Artificial Intelligence)
Prüfungsdauer (in Minuten)	20
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Studierende, die dieses Modul erfolgreich absolviert haben, sind in der Lage ein ML-Projekt zur Bildanalyse zu planen und durchzuführen. Weiterhin wird das Programmieren in der Hochsprache Python und unter Verwendung moderner KI-Bibliotheken trainiert. Die Fähigkeit zur Anwendung von State-of-the-Art Verfahren der Bildanalyse/Computer Vision auf Basis von Deep Learning wird erworben, ebenso wie Techniken der Bilddatenvorverarbeitung und Data Augmentation, sowie Methoden der Evaluation und Erklärbarkeit der entwickelten Modelle. Während der Vorlesung werden die Studierenden abstrakte Problemstellungen und konkrete Methoden aus verschiedenen Teilbereichen der KI-gestützten Bildanalyse (Computer Vision) kennenlernen. Durch die gegenseitige Zuordnung von Methoden zu abstrakten Problemstellungen, wird die Fähigkeiten des kritischen Bewertens und

	des analytischen Denkens trainiert. Die Bearbeitung der vorlesungsbegleitenden Übungsaufgaben stärkt die Fähigkeit zur selbstständigen Arbeit. Die Organisationsfähigkeit wird gestärkt, indem die Studierenden am Ende der Veranstaltung ein KI-basiertes Bildanalyseprojekt selbstständig planen und durchführen.
empfohlene Vorkenntnisse	Vor Belegung des Moduls wird ein erfolgreicher Abschluss der Module 4407-480 "Introduction to Machine Learning with Python" und 4407-440 "Einführung in die Künstliche Intelligenz" empfohlen.
Anmerkungen	-
Modulprüfung und Gewichtung	Prüfungsgespräch (50%)
Studienleistung und Gewichtung	Semesterbegleitende bewertete Übungsaufgaben/ Assignments (50%)
Bildanalyse mit Deep Learning (4407-491)	
Person(en) verantwortlich	Anthony Stein
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	Diese Veranstaltung soll die Studierenden ohne fundierte Vorkenntnisse in der Bildverarbeitung sowie im Bereich des maschinellen Lernens an das Gebiet des Deep Learning-basierten Bildanalyse (Computer Vision) heranführen. Um die Studierenden an moderne Deep Learning-Verfahren zur Bildanalyse heranzuführen, wird ein didaktischer Schwerpunkt auf eine integrierte Vermittlung der jeweils zugrundeliegenden Basistechniken gesetzt, welche während der Vorlesung sowohl theoretisch-intuitiv, als auch praktisch-angewandt im Rahmen der begleitenden Übung vermittelt werden. Es werden folgende Themen behandelt: • Motivation, Anwendungen und kurzer historischer Abriss der computergestützten Bildanalyse • Basiswissen der Bildverarbeitung • Basiswissen der Bildanalyse mittels maschineller Lernverfahren, insb. Künstliche Neuronale Netze (Deep Learning) • Bildklassifikation, Objektdetektion und -lokalisierung sowie Semantische Segmentierung mit Convolutional Neural Networks (CNNs) • Data Augmentation • Explainable AI • Prozess- und Vorgehensmodell für Machine Learning-Projekte.

Literatur	Szeliski, Richard, Computer Vision: Algorithms and Applications, 2nd ed., Springer, 978-3030343712 Goodfellow, Ian, Bengio, Yoshua, Courville, Aaron. Deep Learning, MIT Press, 978-0262035613
Anmerkungen	-

Modul: Bioeconomy Discourses (3403-480)

Modulverantwortung	Iris Lewandowski
Bezug zu anderen Modulen	This module is related to all compulsory modules in the Bioeconomy Master program and serves to put the contents of these modules in context.
Teilnahmevoraussetzung	The module is intended primarily for students on the Master study programme "Bioeconomy" or on study programmes with related topics.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Bioeconomy (Master) 1./3. Semester, elective (profile: Bioeconomy Policy Analysis | Sustainable biomass production systems | Sustainability assessment | Innovation and Entrepreneurship) Biobased Products and Bioenergy (Master) 3. Semester, elective Environmental Protection and Agricultural Food Production (Master) 3. Semester, elective
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	The overall goal of the course is for students to gain an understanding of the different perspectives on and discourses around bioeconomy concepts, and also the relationship between the bioeconomy and sustainability. Students acquire the argumentation and critical skills necessary to participate in the on-going bioeconomy dialogue at various levels. The course integrates systems, normative and transformative dimensions of knowledge essential for future bioeconomists to pave the way towards a truly sustainable transition. Students become acquainted with a “tool box” of methods and their application to enable them to participate in and contribute to bioeconomy discourses. On completion of the course, students should:

	• understand bioeconomy discourses • be able to tackle a dispute or controversial debate on the bioeconomy • be able to contribute to a bioeconomy discourse / sustainability discourse / a discourse on a wicked problem or challenges related to sustainability • be able to identify relevant stakeholders in a discourse and develop means for relevant communication • understand and be able to contribute to the value discussion • be able to develop their own position on bioeconomy-related subjects • be able to develop (policy) recommendations Students obtain an overview of different methods applied to analyse, participate in and make a constructive contribution to bioeconomy discourses. The methods conveyed in the course include: • discourse analysis • cluster analysis (understanding of consumer behaviour) • writing a policy paper • stakeholder analysis • communication tools
empfohlene Vorkenntnisse	-
Anmerkungen	Number of participants limited to 40. The module is intended for students on the Master progamme "Bioeconomy". Participation for students on other courses of study will be granted if sufficient places are available. Please note that the examinable component is composed of the 3 elements: presentation (25%), report (25%) and written examination (50%).
Modulprüfung und Gewichtung	written examination, individually (50%)
Studienleistung und Gewichtung	Presentation of discourse analysis on a selected topic, in teams of about 3 students (25%); Report to be written on the selected topic, in teams of about 3 students (25%)
Bioeconomy Discourses (3403-481)	
Person(en) verantwortlich	Iris Lewandowski
Lehrform	Seminar mit Übung
SWS	4
Inhalt	-
Literatur	

	-
Anmerkungen	-

Modul: Combining Ecological Models and Data (3201-590)

Modulverantwortung	Jörn Pagel Frank Schurr
Bezug zu anderen Modulen	This module prepares for modelling-based projects in the module Project in Landscape Ecology (3201-610).
Teilnahmevoraussetzung	Participants need a basic understanding of population dynamics and experience with the programming language R as acquired in the module Landscape Ecology (3201-560) or equivalent courses.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 weeks (block 1)
Studiengänge	Environmental Science - Soil, Water, and Biodiversity (Master) 2. Semester, compulsory for Specialization “Ecosystems and Biodiversity” Landscape Ecology (Master) 2. Semester, semi-elective Bioeconomy (Master) , 3. Semester, elective (Profil: Data Science and Artificial Intelligence)
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	70
Selbststudium (in Stunden)	155
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The module provides an overview of modelling approaches in the environmental and ecological sciences and introduces modern statistical methods that can be used to parameterize and evaluate such models with empirical data. A range of examples deepens the understanding of theoretical concepts in landscape and population ecology. Hands-on exercises familiarize the participants with the practical basics of scientific programming. Participants gain insights into the iterative process of formulating quantitative models and confronting them with empirical data as an integral part of the scientific method. They learn that the awareness and communication of uncertainties, which are attached to any study results and derived predictions, are crucial in both scientific and professional projects. Course projects improve their skills in work

	organization, data management and (in particular graphical) presentation of own findings.
empfohlene Vorkenntnisse	-
Anmerkungen	Participants are required to register for this module on ILIAS before 24th March.
Modulprüfung und Gewichtung	oral (20%) and written (60%)
Studienleistung und Gewichtung	written homework (20%)
Combining Ecological Models and Data (3201-591)	
Person(en) verantwortlich	Frank Schurr Jörn Pagel
Lehrform	Übung
SWS	5
Inhalt	.
Literatur	-
Anmerkungen	-

Modul: Computational Thinking (1511-400)

Modulverantwortung	Christian Krupitzer
Bezug zu anderen Modulen	No previous knowledge is expected for this module.
Teilnahmevoraussetzung	
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	M.Sc. Food Biotechnology, 3. Semester, Wahl M.Sc. Food Science and Engineering, 3. Semester, Wahl M.Sc. Lebensmittelchemie, 3. Semester, Wahl M.Sc. Food Systems, 3. Semester, Wahl M.Sc. Bioeconomy, 3. Semester, Wahl (Profil: Transforming Food Systems | Data Science and Artificial Intelligence)
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	63
Selbststudium (in Stunden)	162
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	This module will provide essential knowledge of the technological foundations of information systems. Based on this, students will be able to assess technology but also to develop software and acquire fundamentals for learning machine learning techniques. The students will learn basic concepts of computer hardware (von Neumann architecture) and system software (operating systems concepts), programming fundamentals (Java or Python), as well as algorithms and data structures (searching, sorting, lists, hash-tables, trees). This includes an understanding of the basic architectures of modern information systems, software implementation, and how to model problems in algorithms/software and how solve them using modern programming languages.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written examination: 100%

Studienleistung und Gewichtung	-
Computational Thinking (1511-401)	
Person(en) verantwortlich	Christian Krupitzer
Lehrform	Vorlesung mit Übung
SWS	6
Inhalt	The students will learn basic concepts of computer hardware (von Neumann architecture) and system software (operating systems concepts), programming fundamentals (Java or Python), as well as algorithms and data structures (searching, sorting, lists, hash-tables, trees). This includes an understanding of the basic architectures of modern information systems, software implementation, and how to model problems in algorithms/software and how solve them using modern programming languages.
Literatur	List of English literature will be provided at start of course.
Anmerkungen	No previous knowledge is expected for this module.

Modul: Crop Production Systems (4905-420)

Modulverantwortung	apl. Prof. Dr. Jürgen Kroschel
Bezug zu anderen Modulen	Module is of importance for improving sustainability in crop production, understanding crop physiology, resource protection and food security in tropical regions
Teilnahmevoraussetzung	B.Sc or equivalent degree, basic knowledge of plant production
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Agricultural Sciences in the Tropics and Subtropics (Master) 1. Semester, compulsory Crop Sciences - Plant Nutrition and Protection (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Sustainable biomass production systems)
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After successfully completing the module, students can define the constraints and potentials of enhancing crop production in tropical farming systems to support the need of a growing food demand. They can illustrate and discuss the relationships between crop management and yield in tropical cropping systems mainly using rice and cassava as examples. They are able to assess under which conditions tropical legumes fix atmospheric nitrogen and enhance soil fertility for subsequent crops. They can develop the potential of traditional and innovative techniques to increase crop yield, to improve quality and resistance to environmental stress and pest problems. The students can apply advanced agricultural crop production techniques to improve productivity by means of adequate soil, nutrient and water management. The students are further able to define alternative and future cropping scenarios and apply and judge them in an integrated dynamic modelling environment.

	Students have acquired an ability to critically assess the validity and potential of proposed alternative solutions based on their enhanced scientific understanding and the gained practical experience in simulations. They have enhanced communication and team building skills based on interdisciplinary group work experiences and joint presentations. They have acquired further software skills including linking different software tools.
empfohlene Vorkenntnisse	-
Anmerkungen	The contents of the lectures are available at ILIAS under Faculty of Agricultural Sciences > Institute of Agricultural Sciences in the Tropics (Hans-Ruthenberg-Institute) (490) > Plant Production in the Tropics and Subtropics (490e) and the corresponding module number. Access to the materials is provided upon request via ILIAS.
Modulprüfung und Gewichtung	Written exam (75%)
Studienleistung und Gewichtung	Presentation in groups (20 %) with discussion (5 %); compulsory attendance at exercises and the seminar
Crop Production Systems (4905-421)	
Person(en) verantwortlich	apl. Prof. Dr. Jürgen Kroschel
Lehrform	Vorlesung mit Übung und Seminar
SWS	4
Inhalt	• Introduction: potentials and constraints of intensification in world food production, principles of plant production in the tropics. • Crops and Nutrition: importance of cereals and root crops for human nutrition, importance of minor crops and plant genetic resources for a sustainable development. • Cropping Systems: Crop rotation and mixed cropping; Interactions in multiple plant component systems. • Methods of quantifying plant growth. • Plant Growth and Resource Use: Eco-physiology of rice and cassava. • Plant Improvement: Plant adaptation mechanisms to stress. • º Legumes - source of food security and sustainability; º Nutrient management and environmental services; º Resource protection on sloping land. • Alternative Plant Production Systems: Fibers; Biofuel and industrial applications.

	• Crop Modelling: Concepts; Application in crop production. • º Case studies; º Group computer modelling exercises. • Interdisciplinary case studies: Students seminar.
Literatur	• Webster, C.C. & N. Wilson (1998): Agriculture in the Tropics. 3rd edition. Blackwell Science, UK; • Huxley, P. 1999. Tropical Agroforestry. Blackwell Science, Oxford; • Rehm, S. and G. Espig (1991): The cultivated plants of the Tropics and Subtropics. Verlag Josef Margraf, Weikersheim, Germany; • Alvim, de T, P. and T.T. Kozlowski (1977): Eco-physiology of Tropical Crops. Academic Press, New York; • Booth, V. (1993): Communicating in science - Writing a scientific paper and speaking at scientific meetings, 2 nd Ed., Cambridge University Press; • Lal, R. (1990): Soil erosion in the tropics - principles and management. McGraw - Hill, New York; • Lal, R. (1994): Soil Erosion Research Methods. Soil and Water Conservation Society, Ankeny; • Rehm, S. (1986. Grundlagen des Pflanzenbaus in den Tropen und Subtropen. Band 3. Verlag Eugen Ulmer, Stuttgart, Germany; • Rehm, S. (1989): Spezieller Pflanzenbau in den Tropen und Subtropen. Band 4. Verlag Eugen Ulmer, Stuttgart, Germany; • Sinclair, T.R. 1998. Principles of Ecology in Plant Production. CAB International, UK; • Smartt, J. and N.W. Simmonds (1995): Evolution of crop plants. 2nd edition: Longman Scientific & Technical, Harlow; • Thornley, J.H.M. and I.R. Johnson (1990): Plant and crop modelling - a mathematical approach to plant and crop physiology. Clarendon Press, Oxford;
Anmerkungen	-

Modul: Debate Seminar (1201-570)

Modulverantwortung	Volker Wulfmeyer
Bezug zu anderen Modulen	All compulsory modules of the first semester.
Teilnahmevoraussetzung	Active participation in the lectures.
Lehrsprache	englisch
ECTS	2
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	M.Sc. Earth System Science, 2. Semester, Pflicht M.Sc. Earth and Climate System Science, 2. Semester, Pflicht M.Sc. Bioeconomy, 3. Semester, Wahl (Profil: Innovation and Entrepreneuship in the Bioeconomy)
Prüfungsdauer (in Minuten)	45
Präsenzstudium (in Stunden)	30
Selbststudium (in Stunden)	30
Arbeitsaufwand (in Stunden)	60
Lern- und Qualifikationsziele	The students learn the standard formats of debates such as the British and Open Parliamentary Styles. They elaborate their own speeches based on rhetorical tools. Standard knowledge about the structure of speeches is acquired as well. By practical debates, they examine their skills to appear convincingly in discussions about topics in Earth System Science such as global and climate change.
empfohlene Vorkenntnisse	None.
Anmerkungen	Maximum number of participants: 10 Registration via ILIAS. Registration is open from the end of the winter semester until the beginning of the summer semester.
Modulprüfung und Gewichtung	Presentation
Studienleistung und Gewichtung	Preparing and conducting debates
Debate Seminar (1201-571)	
Person(en) verantwortlich	Volker Wulfmeyer
Lehrform	Seminar
SWS	2

Inhalt	In this seminar, the students learn to prepare and to perform a debate. Generally, the debate is performed based on the style of the "Open Parlamentary Debate". After the definition of a debate, the main ingredients of a good speech are presented based on the well-known and still applicable introductions of Aristotle. Then, the preparation, organization, and performance of a high-quality speech is trained including a good behavior of the speaker. One week in advance, a topic of the debate is formulated by the students, which relates to the contents of this class and is matter of a controversial discussion among experts and/or in the public. By a draw it is selected whether the students belong to the government, the opposition or to the free speakers in the debate. These groups perform the final preparation of he debate together and independently, i.e., they allocate arguments and arrange their appearance in the debate. In the debate, the speakers of these parties present their arguments within a prescribed time schedule. The lecture is closed with an open discussion between the audience and all students.
Literatur	The specific rules are handed out and explained to students in written form during a preliminary meeting.
Anmerkungen	-

Modul: Ecology and Agroecosystems (4906-410)

Modulverantwortung	Ingo Graß
Bezug zu anderen Modulen	This module will link-up knowledge from different subject areas in order to enable students to interpret reactions within agroecosystems coherently.
Teilnahmevoraussetzung	Basic knowledge of farming and/or closely related topics. This module is designed to accommodate a range of experience and knowledge levels in both ecology and agriculture. Students with only basic knowledge in ecology and biology should enlarge them before starting in this module. To maintain the high quality of this module and due to time and space constraints in planned group work, seminar presentations, and excursions we only accept a maximum of 50 students. Access is on a "first come first serve" basis, allowing students for which the module is compulsory, semi-elective, and, thereafter, elective to enter the course.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Agricultural Sciences in the Tropics and Subtropics (Master) 1. Semester, compulsory Biobased Products and Bioenergy (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Sustainable biomass production systems) Earth System Science (Master) 3. Semester, elective Earth and Climate System Science (Master) 3. Semester, elective Environmental Protection and Agricultural Food Production (Master) 1. Semester, semi-elective Environmental Science - Soil, Water, and Biodiversity (Master) 1. Semester, elective Environmental Science - Soil, Water, and Biodiversity (Master) 3. Semester, semi-elective Landscape Ecology (Master) 3. Semester, elective Organic Agriculture and Food Systems (Master) 3. Semester, elective
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180

Lern- und Qualifikationsziele	After completion of the module, students are able to explain the principles of ecological agents that regulate the functioning of natural and agricultural ecosystems and to demonstrate the complex biotic interactions in natural landscapes and agro-ecosystems. Further, they are able to explain how to apply ecological concepts and principles to design and manage sustainable agro-ecosystems with improved long-term reliability in agricultural production. During preparation for the exam, while preparing and following up on lectures and while preparing the seminar, students practice self-reliance, time management, personal responsibility and cooperation. They hereby also adopt needful skills in fields, also including communication skills and (foreign) language proficiency. Students learn and practice both critical and analytical thinking and reading of scientific literature in the seminar and their ability to explore a scientific issue. Through the seminar presentation, students improve their oral articulateness and their ability to discuss scientific matters. Finally, students acquire expertise to permit the competent application of technical knowledge and are of use in the solution of practical problems.
empfohlene Vorkenntnisse	-
Anmerkungen	Please register online via ILIAS as the module is restricted to 40 participants. The registration will be open until the end of the first week of the module. A waiting list will be maintained and implemented on the first day of the course. You will receive an electronic confirmation once you have been accepted into the module.
Modulprüfung und Gewichtung	Written exam (70 %)
Studienleistung und Gewichtung	Presentation in groups (20 %) with handout (5 %) and discussion (5 %)
Ecology and Agroecosystems (4906-411)	
Person(en) verantwortlich	Ingo Graß
Lehrform	Vorlesung mit Seminar
SWS	4
Inhalt	• Ecology - outline • Climatically caused diversity of tropical and subtropical ecozones • Agro-ecological zoning system • Plants and environmental factors • Interaction between agriculture and natural ecosystems

	• Principles of ecosystem functions • Interactions in agroecosystems: Species interactions • Agroecosystems of the tropics and subtropics • Wildlife and rangeland ecology • Practical methods in agroecology
Literatur	• Altieri, M.; 1995: Agroecology. Cambridge University Press, Cambridge. • Gliessmann, S.R.; 2000: Agroecology: Ecological processes in sustainable agriculture. CRC Press LLC, USA. • Gliessmann, S.R.; 2000: Field and laboratory investigations in Agroecology. CRC Press LLC, USA. • Krebs, Ch.J.; 2001: Ecology: The Experimental Analysis of Distribution and Abundance, Benjamin Cummings, San Francisco. • Martin, K. und J. Sauerborn; 2006: Agrarökologie, Verlag Eugen Ulmer, Stuttgart. • Ricklefs, R.E. and Miller, G.L.; 2000: Ecology. W.H. Freemann and Company, New York, USA.
Anmerkungen	• º Lectures - to provide fundamental knowledge relevant to agro-ecosystems º Group assignment - to encourage broader interdisciplinary thinking and design in a group context º Examination - the final test of competency • º written exam 70%; seminar presentation 30%

Modul: Economic Policy Analysis of the Bioeconomy (5213-510)

Modulverantwortung	Franziska Schünemann
Bezug zu anderen Modulen	Basierend auf dem Modul "Economics and Management" (1. Semester). Das Modul passt inhaltlich zum Modul Seminar Bioeconomy Policies, beide Module können parallel belegt werden, aber sind keine Voraussetzung füreinander.
Teilnahmevoraussetzung	Grundlegende Kenntnisse der Mikroökonomie, welche unter anderem im Modul "Economics and Management" (1. Semester) erlangt werden können.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (Master, PO vom 01.10.2014) 2. Semester, Pflicht Economics (Master, PO vom 21.11.2018), 2./4. Semester, Wahl
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Nach erfolgreichem Abschluss verstehen die Studierenden die Herausforderungen der Transformation zu einer bio-basierten Wirtschaftsweise, die hinsichtlich Klimawandel, Ressourcenknappheit und Ernährungssicherheit nachhaltig ist. Sie können analysieren, welche Zielkonflikte sich für Nahrungsmittelproduktion und Ökosystemdienstleistungen durch Nutzungskonkurrenzen bezüglich Biomasse und der Ressourcen Land und Wasser ergeben. Die Studierenden können komplexe Fragestellungen in berechenbare mathematische Modelle umsetzen und erlangen grundlegende analytische Fähigkeiten, die sie optimal auf eigenständiges Arbeiten in ihrer Masterthesis und in ihren späteren Berufsfeldern in Forschung, Wirtschaft und dem öffentlichen Sektor vorbereiten.
empfohlene Vorkenntnisse	-
Anmerkungen	Anmeldung über Ilias.
Modulprüfung und Gewichtung	Klausur

Studienleistung und Gewichtung	-
Economic Aspects of the Bioeconomy (5213-511)	
Person(en) verantwortlich	Franziska Schünemann
Lehrform	Vorlesung
SWS	2
Inhalt	Die Studierenden erlangen ein Systemverständnis für die Bioökonomie und ihre Auswirkungen auf Wirtschaft, Gesellschaft und Umwelt. In einem theoretischen Teil werden Nachhaltigkeitskonzepte und Politikinstrumente der Energie-, Umwelt- und Klimaschutzpolitik zur Korrektur von Marktversagen behandelt und mögliche Zielkonflikte für Nahrungsmittelproduktion und Biodiversität aufgrund von wirtschaftlichen und ökologischen Verflechtungen identifiziert. Darauf aufbauend werden die praktische Umsetzung dieser Interventionen und die tatsächlichen Effekte im Hinblick auf bereits implementierte und aktuelle Politik analysiert. Die Studierenden verstehen, wie sich lokale Bioökonomiepolitiken durch die Globalisierung auf andere Länder auswirken und welche Rolle Treiber wie Wirtschaftswachstum, Bevölkerungswachstum und Klimawandel für den nachhaltigen Erfolg von Politikmaßnahmen spielen.
Literatur	Wird in der Veranstaltung bekannt gegeben.
Anmerkungen	Anmeldung über Ilias.
Model-based Analysis of Bioeconomy Policies (5213-512)	
Person(en) verantwortlich	Franziska Schünemann
Lehrform	Übung
SWS	2
Inhalt	Mit Hilfe von computergestützten ökonomischen Modellen werden die Auswirkungen von Bioökonomiepolitiken auf Produzenten, Haushalte, Wirtschaftssektoren und nationale Volkswirtschaften untersucht. Die Studierenden erlernen die Grundlagen der mathematischen Programmierung und Modellierung mit der algebraischen Modellierungssoftware GAMS (General Algebraic Modelling System). In anwendungsorientierten Beispielen wird untersucht, wie sich die Transformation zu einer bio-basierten Wirtschaft durch die wirtschaftlichen Verflechtungen auf Produkt- und Faktormärkten auf andere Sektoren, Haushalte und die gesamte Volkswirtschaft auswirken kann.

Literatur	Wird in der Veranstaltung bekannt gegeben.
Anmerkungen	Anmeldung über Ilias

Modul: Economics and Environmental Policy (4902-440)

Modulverantwortung	Kirsten Boysen-Urban
Bezug zu anderen Modulen	Due to its introductory character, this module is a basis for more advanced economic modules such as "Microeconomics", "Agricultural and Food Policy" or "Environmental and Resource Economics".
Teilnahmevoraussetzung	This is an introductory module without any specific prerequisites.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Organic Agriculture and Food Systems (Master) 1. Semester, compulsory Environmental Protection and Agricultural Food Production (Master) 1. Semester, compulsory Environmental Science - Soil, Water, and Biodiversity (Master) 3. Semester, semi-elective Agricultural Sciences - Agricultural Economics (Master) 1. Semester, elective Earth and Climate System Science (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Bioeconomy Policy Analysis)
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After completing this module, students are able to explain basic principles and concepts of microeconomics, environmental economics and environmental policy. In addition, students are able to translate these concepts into complex real world situations (market imperfections, policy design, policy distortions, linkage between agriculture and the environment). Students can further comparatively assess different policy options to address environmental problems/resource use. Finally, students are proficient in analysing the limits of economic concepts and their relevance in policy design. During preparation for the exam and while preparing and following up on lectures, students practice time

	management and self-reliance. They learn and practice critical and analytical thinking and learn to apply sound economic reasoning.
empfohlene Vorkenntnisse	-
Anmerkungen	Learning objectives are enhanced by the distribution of exercises and solutions, as well as a voluntary tutorial in order to support students in the application of economic concepts to real world problems.
Modulprüfung und Gewichtung	Written exam (100 %)
Studienleistung und Gewichtung	-
Basic Microeconomics (4902-441)	
Person(en) verantwortlich	Kirsten Boysen-Urban
Lehrform	Vorlesung
SWS	2
Inhalt	This lecture comprises the basic microeconomic concepts of household theory, theory of the firm, and the theory of markets under perfect and imperfect competition, as well as the economics of the public sector (public goods, externalities). These concepts are applied in many examples to the agricultural and food sector of developing and developed economies with a focus on interactions between agriculture and the environment. It will be shown how to apply microeconomic concepts to real world situations and policy challenges. This lecture is enhanced by the distribution of exercises and solutions, as well as a voluntary tutorial in order to support students in the application of microeconomic concepts.
Literatur	The lecture is organized along the microeconomic part of "Principles of Economics" by Gregory Mankiw. The textbook "Economics" by Samuelson/Nordhaus has a similar content. The mathematical concepts used (differential and integral calculus) are well explained in "Fundamental Methods of Mathematical Economics" by Alpha C. Chiang.
Anmerkungen	Basic microeconomics is implemented as in-class lectures. ILIAS will be used as the teaching platform. In the Basic Microeconomics section, you will find teaching material, a forum where questions are answered, and exercise sheets which will be discussed in the tutorial sessions. The lecture and the tutorial material will be updated on a weekly basis as the course proceeds. More information is given in the Syllabus that you can find under the tab „documents“.

Environmental Policy (4902-442)	
Person(en) verantwortlich	Christian Lippert
Lehrform	Vorlesung
SWS	2
Inhalt	In the light of applied economic theory current resource use problems will be analysed. The lecture introduces to basic concepts of environmental and natural resource economics, cost-benefit analysis with respect to environmental resources, the concept of sustainable resource use, as well as to the theory of optimal resource extraction. Moreover, the most important environmental policy instruments will be presented and discussed.
Literatur	• Perman, R., Ma, Y., McGilvray, J., Maddison, D. and M. Common (2011): Natural Resource and Environmental Economics. 4th Edition, Pearson Education.
Anmerkungen	This lecture takes place in the second half of the semester (4 hours per week). A voluntary tutorial is offered.
Exercises to Basic Microeconomics (freiwillig) (4902-443)	
Person(en) verantwortlich	Kirsten Boysen-Urban
Lehrform	Übung
SWS	1
Inhalt	.
Literatur	-
Anmerkungen	-
Exercises to Environmental Policy (freiwillig) (4902-444)	
Person(en) verantwortlich	Christian Lippert
Lehrform	Übung
SWS	1
Inhalt	.
Literatur	-
Anmerkungen	-

Modul: Economics and Management (5205-410)

Modulverantwortung	Franziska Schünemann
Bezug zu anderen Modulen	This module introduces to basic concepts used in Economics and Management required to accomplish the MSc Bioeconomy. It doing so, it (i) complements the semi-elective modules imparting basic knowledge in the agricultural and natural science, and (ii) forms the basis for the more advanced compulsory modules “Internal and External Costs & Benefits of Biobased Products” and “Markets, Innovation and Social Acceptance of Biobased Products”, and for elective modules from the fields of Economics and Management.
Teilnahmevoraussetzung	keine
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (ab WS 16/17) (Master, PO vom 01.04.2017) 1. Semester, Wahlpflicht Earth & Climate System Science (ab WS21/22) (Master, PO vom 17.07.2021), 1. Semester, Pflicht
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students have a sound knowledge of basic ideas and concepts of economics and corporate finance. They can communicate these ideas and concepts in interdisciplinary teams. They are able to employ methods used in economics and corporate finance to construct solutions to real-world problems that arise the context of organizing the biobased economy. On this basis, they are prepared to follow more advanced Economics and Management courses. Students are able to communicate and to work in interdisciplinary and international teams. They can think analytically and critically and employ quantitative methods to solve economic, business, and social issues. They are able to carve out important and to abstract from less important channels.

empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written exam (60 Minutes, 50%) and case study with oral presentation in class (50%)
Studienleistung und Gewichtung	-
Basic Economic Concepts for Bioeconomists (5205-413)	
Person(en) verantwortlich	Franziska Schünemann
Lehrform	Vorlesung mit Übung
SWS	2
Inhalt	This course enables students to understand the operations of value chains in the national and the global context. In order to make the interdependencies of value chains transparent, this course introduces students to the functioning of markets and the role of governments. While the economic concepts we deal with apply more generally, we have a special eye on applications to the bioeconomy. We will use quantitative methods, but economic math tends to be simpler than Math taught to undergraduates at universities. The course paves the ground for subsequent semi-elective Economics modules.
Literatur	To be announced in the lecture.
Anmerkungen	-
Financial Management (5205-414)	
Person(en) verantwortlich	Niklas Lampenius
Lehrform	Vorlesung
SWS	2
Inhalt	The overall objective of the module „Corporate Finance" is to provide a basic understanding of corporate finance and managerial responsibilities. The lectures cover qualitative as well as quantitative aspects of decision making with a focus on sustainability. Contents of the module include: • Capital budgeting • Cash management • Performance management • Risk management (financial as well as operational risks) • Resulting consequences for managerial decision making
Literatur	Stephen Ross, Randolph Westerfield, Jeffrey Jaffe (latest edition), Corporate Finance, Mcgraw-Hill/Irwin.

Anmerkungen	The lectures take place in the first half of the semester (4 hours per week).

Modul: Economics of Innovation 1 (5209-410)

Modulverantwortung	Andreas Pyka
Bezug zu anderen Modulen	"Innovation Economics" complements "Growth Economics" by offering deeper insights into the mechanisms and dynamics of innovation driven development on the industry as well as the firm level. Furthermore "Innovation Economics" corresponds closely with the module "Industrial Organisation and Competition Theory" by focussing on the innovation dimension of strategic behaviour and competition.
Teilnahmevoraussetzung	Es bestehen keine Teilnahmevoraussetzungen.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (vor WiSe 2020/2021) (Master, PO vom 01.10.2014) 1. Semester, Wahl Bioeconomy (ab WiSe 2020/2021) (Master, PO vom 01.10.2014) 1. Semester, Wahl Bioeconomy (ab WiSe 2021/2022) (Master, PO vom 01.10.2014) 1. Semester, Wahl Bioeconomy (ab WiSe 2023/2024) (Master, PO vom 01.10.2014) 3. Semester, Wahl (Profil: Innovation and Entrepreneuship in the Bioeconomy)
Prüfungsdauer (in Minuten)	60 Minuten
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	123
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Die Studierenden haben vertiefte Kenntnisse in der modernen innovationsökonomischen Forschung und sind mit ihrem Methodenwissen in der Lage, aktuelle Forschungsergebnisse zu verstehen und einzuordnen. Insbesondere verfügen Sie über ein Problembewusstsein für innovationsökonomische Fragestellungen. Sie verfügen über Kenntnisse der in der innovationsökonomischen Forschung herangezogenen Konzepte und können Aussagen im Rahmen der neoklassischen sowie der neo-schumpeterianischen Innovationsökonomik einordnen und interpretieren. Im Vordergrund steht vor allem die Anwendung innovationsökonomischer Konzepte auf aktuelle Fragestellungen im Bereich der Wachstums- und Industriepolitik. Sie sind in

	der Lage innovationsbezogene Fragestellungen fachgerecht zu identifizieren und zu kommunizieren.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Klausur
Studienleistung und Gewichtung	-
Innovation Economics: Theory and Empirics (5209-411)	
Person(en) verantwortlich	Andreas Pyka
Lehrform	Vorlesung
SWS	2
Inhalt	Innovation Economics: Theory and Empirics Für die Verbesserung des Verständnisses bezüglich der Ursachen der Wettbewerbsfähigkeit von Unternehmen, Regionen und ganzen Volkswirtschaften ist eine Auseinandersetzung mit der Entstehung und Ausbreitung von Wissen notwendig. Die hinter der Wissensbildung und -diffusion stehenden Prozesse sind komplex und beeinflussen das wirtschaftliche Ergebnis über mannigfache Vor- und Rückkopplungen. Das Ziel des Kurses ist es, die Studierenden mit den theoretischen Konzepten und empirischen Methoden für die Analyse von Innovationsprozessen vertraut zu machen. Zu diesem Zweck führt der Kurs in innovationsrelevante Phänomene auf der makro-, der industrie- und der mikroökonomischen Ebene ein. Einen wichtigen Aspekt bildet die industrielle Organisation von Innovationsprozessen in sogenannten Innovationsnetzwerken.
Literatur	Tidd, J., Bessant, J. Pavitt, K. (2005), Managing Innovation - Integrating Technological, Market and Organizational Change, 3rd. edition, Wiley Freeman, C., Soete, L. (1997), The Economics of Industrial Innovation, 3rd edition, Pinter Publisher. Supplementary recommended readings Fagerberg, J., Mowery, D.C. and Nelson, R.R. (eds.) (2005), The Oxford Handbook of Innovation, Oxford University Press.
Anmerkungen	-
Innovation Economics: Theory and Empirics (5209-412)	
Person(en) verantwortlich	Andreas Pyka

Lehrform	Übung
SWS	2
Inhalt	Die Veranstaltung ist als begleitende Übung zur Vorlesung konzipiert. In der Veranstaltung werden einschlägige Texte zu den in der Vorlesung besprochenen Konzepten und Theorien gelesen und diskutiert.
Literatur	x
Anmerkungen	-

Modul: Economics of Innovation 2 (5209-510)

Modulverantwortung	Andreas Pyka
Bezug zu anderen Modulen	"Innovation Economics" complements "Growth Economics" by offering deeper insights into the mechanisms and dynamics of innovation driven development on the industry as well as the firm level. Furthermore "Innovation Economics" corresponds closely with the module "Industrial Organisation and Competition Theory" by focussing on the innovation dimension of strategic behaviour and competition.
Teilnahmevoraussetzung	Es bestehen keine Teilnahmevoraussetzungen
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (ab WiSe 2023/2024) (Master, PO vom 01.10.2014) 3. Semester, Wahl (Profil: Innovation and Entrepreneuship in the Bioeconomy)
Prüfungsdauer (in Minuten)	60 Minuten
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	180 Stunden 56 Stunden Präsenzstudium 124 Stunden Selbststudium
Lern- und Qualifikationsziele	Die Studierenden haben vertiefte Kenntnisse in den empirischen und theoretischen Methoden, die in der modernen Innovationsökonomik herangezogen werden. . Sie verfügen über Kenntnisse in der Patentanalyse, der Netwerkanalyse sowie in numerischen Modellierungsansätzen. Ein besonderen Schwerpunkt stellt die Einführung in Methoden der Simulationsanalyse dar, wobei Agenten-basierte Simulationsmodelle im Vordergrund stehen. Die Methoden werden durch verschiedene Anwendungen auf innovationsökonomische Fragestellungen im Kurs vertieft. Sie sind in der Lage die Methoden auf innovationsökonomische Probleme selbstständig anzuwenden und Schlussfolgerungen daraus zu ziehen.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	
Studienleistung und Gewichtung	Klausur
Recent Developments in Advanced Innovation Economics (5209-521)	

Person(en) verantwortlich	Andreas Pyka
Lehrform	Vorlesung
SWS	2
Inhalt	Die jüngsten Entwicklungen in der innovationsökonomischen Forschung eröffnen ein breites und unklar abgegrenztes Betätigungsfeld. Innovationen und ihre Auswirkungen müssen über die Zeit, über Industrien und Regionen hinweg betrachtet werden. In diesem Kurs liegt der Schwerpunkt auf der anwendungsorientierten Erarbeitung unterschiedlicher Methoden zur Analyse innovativer Industrien und Regionen. Ein weiterer Schwerpunkt der Veranstaltung liegt auf dem Konzept der vernetzten Innovation. Dabei geht es unter anderem um die Wechselwirkung zwischen Innovation und dem institutionellen Rahmen in einem sogenannten koevoltionären Prozess.
Literatur	Chapters from Hanusch, H. and Pyka, A. (eds.), Elgar Companion to Neo-Schumpeterian Economics, Edward Elgar Publisher
Anmerkungen	-

Recent Developments in Advanced Innovation Economics (5209-522)

Person(en) verantwortlich	Andreas Pyka
Lehrform	Übung
SWS	2
Inhalt	In der Lehrveranstaltung werden die Studierenden mit dem spezifischen Instrumentarium zur Analyse von Innovationsprozessen vertraut gemacht. In einem ersten Abschnitt geht es um Verfahren zur Analyse der Heterogenität von Innovationssystemen. Danach werden die Studierenden mit den Verfahren der sozialen Netzwerkanalyse vertraut gemacht, welche es ermöglichen, mit Hilfe von Indikatoren die komplexe Architektur und Dynamik von Innovationsnetzwerken zu beschreiben. Im Rahmen der Modellanalyse geht es um Verfahren der sogenannten Systemdynamik, mit deren Hilfe ökonomische Wachstumsprozesse durch die Entstehung von neuen Industrien modelliert werden können. Ein zentrales Element im Bereich der numerischen Analyse stellen Agenten-basierte Simulationen dar, mit deren Hilfe Innovations- und Wissenserwerbsprozesse auf Unternehmens- und Netzwerkebene modelliert und analysiert werden können.

Literatur	Die Literatur wird in Ilias/ der Vorlesung bekannt gegeben.
Anmerkungen	-

Modul: Entrepreneurship (5703-510)

Modulverantwortung	Andreas Kuckertz
Bezug zu anderen Modulen	Entrepreneurial Marketing, Unternehmensplanspiel
Teilnahmevoraussetzung	Keine
Lehrsprache	deutsch/englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	Master für das wirtschaftswissenschaftliche Lehramt (Master, PO vom 01.10.2009) 2. Semester, Pflicht Master für das wirtschaftswissenschaftliche Lehramt (Master, PO vom 01.10.2009) 4. Semester, Pflicht International Business and Economics (Erstzulassung WS 16/17) (Master, PO vom 01.10.2016) 4. Semester, Pflicht International Business and Economics (Erstzulassung WS 16/17) (Master, PO vom 01.10.2016) 2. Semester, Pflicht Management (Erstzulassung WS 16/17) (Master, PO vom 01.10.2016) 2. Semester, Pflicht Management (Erstzulassung WS 16/17) (Master, PO vom 01.10.2016) 4. Semester, Pflicht International Business and Economics (Erstzulassung WS 17/18) (Master, PO vom 01.10.2016) 4. Semester, Pflicht International Business and Economics (Erstzulassung WS 17/18) (Master, PO vom 01.10.2016) 2. Semester, Pflicht Management (Erstzulassung WS 17/18) (Master, PO vom 01.10.2016) 2. Semester, Pflicht Management (Erstzulassung WS 17/18) (Master, PO vom 01.10.2016) 4. Semester, Pflicht Master für das wirtschaftswissenschaftliche Lehramt (Master, PO vom 01.10.2016) 2. Semester, Pflicht Master für das wirtschaftswissenschaftliche Lehramt (Master, PO vom 01.10.2016) 4. Semester, Pflicht Wirtschaftsinformatik (Master, PO vom 01.10.2012) 4. Semester, Wahlpflicht Wirtschaftsinformatik (Master, PO vom 01.10.2012) 2. Semester, Wahlpflicht Agribusiness (ab Studienbeginn SS 2019) (Master, PO vom 01.04.2019) 2. Semester, Wahlpflicht Bioeconomy (ab WiSe 2023/2024) (Master, PO vom 01.10.2014) 3. Semester, Wahl (Profil: Innovation and Entrepreneuship in the Bioeconomy)

Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	180 Stunden 42 Stunden Präsenzstunden 138 Stunden Selbststudium.
Lern- und Qualifikationsziele	Die Studierenden haben vertiefte Kenntnisse über den Prozess der Unternehmensgründung und die verschiedenen Formen, in denen sich unternehmerisches Verhalten realiter zeigt. Sie verfügen über detailliertes Wissen bezüglich der unternehmerischen Gelegenheit, können eine Unternehmensgründung planen und fehlende Ressourcen einwerben, wissen mit dem Unternehmenswachstum umzugehen und können den Ausstieg aus dem Unternehmen gestalten. Sie verfügen damit über das notwendige Rüstzeug, eine Unternehmensgründung von Anfang bis Ende sinnvoll zu steuern. Sie sind in der Lage, theoretische Konzepte des Entrepreneurship zu erläutern und auf praktische Anwendungsfälle zu transferieren.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Klausur (Planspiel)
Studienleistung und Gewichtung	-
Entrepreneurship (5703-511)	
Person(en) verantwortlich	Andreas Kuckertz
Lehrform	Vorlesung mit Übung
SWS	3
Inhalt	Die Lehrveranstaltung gibt einen Überblick über die Grundlagen von Entrepreneurship, den Gründungsprozess sowie die verschiedenen Formen von Entrepreneurship in der Praxis (Unternehmensgründung, Intrapreneurship, Corporate Entrepreneurship, Social Entrepreneurship). Dabei werden auch Geschäftsmodelle und die Motivation des Entrepreneurs, unternehmerisch tätig zu werden, behandelt.
Literatur	Die Literatur wird in Ilias/ der Vorlesung bekannt gegeben.
Anmerkungen	-

Modul: Environmental and Ecological Statistics (3402-480)

Modulverantwortung	Hans-Peter Piepho
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Basic knowledge of statistics, e.g. quantitative methods course, and basic knowledge of R, e.g. statistics with R course.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Agricultural Biology (Master) 3. Semester, elective Agricultural Sciences in the Tropics and Subtropics (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Sustainability Assessement) Environmental Protection and Agricultural Food Production (Master) 3. Semester, elective Environmental Science - Soil, Water, and Biodiversity (Master) 3. Semester, elective Landscape Ecology (Master) 3. Semester, elective
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After this module, students are able to understand and apply various important statistical methods to environmental and ecological data, present and interpret the results. Students can determine why, when and how to apply particular statistical methods to environmental and ecological data. Students can design and analyze observational field studies in environmental and ecological sciences. Students will be able to critically analyze assumptions and work independently. Students will deepen their communication skills through effective use of graphical visualizations for presentation of results.
empfohlene Vorkenntnisse	-
Anmerkungen	-

Modulprüfung und Gewichtung	Written exam (40 %)
Studienleistung und Gewichtung	Written paper (30 %) Presentation (30 %)
Environmental and Ecological Statistics (3402-481)	
Person(en) verantwortlich	Hans-Peter Piepho
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	Correlation, Linear Regression, General Linear Models, Generalized Linear Models (GLMs), Generalized Linear Mixed Models (GLMMs), Generalized additive models (GAMs)-Semiparametric Models, Generalized Additive Mixed Models (GAMMs)-Semiparametric Regression Models, Nonlinear Regression, Spatial Data Analysis, Repeated Measures, Longitudinal Data Analysis, Environmental and Ecological Time Series, Spatio-Temporal Modelling, Multivariate Methods, Basic Bayesian Methods, Structural Equation Modelling, Design of Observational Studies in Environmental and Ecological Sciences; Data Visualisation in graphics
Literatur	• Gbur, E.E., Stroup, W.W., McCarter, K.S. et al. 2020. Analysis of generalized linear mixed models in the agricultural and natural resources sciences (Vol. 156). John Wiley & Sons. • Donovan, T.M. and Mickey, R.M., 2019. Bayesian statistics for beginners: A step-by-step approach. Oxford University Press, USA. • McGarigal, K., Cushman, S.A. and Stafford, S., 2013. Multivariate statistics for wildlife and ecology research. Springer Science & Business Media.
Anmerkungen	-

Modul: Environmental Modelling (3103-510)

Modulverantwortung	Thilo Streck
Bezug zu anderen Modulen	Participation is useful for students who want to gain some insight in computer-based analysis of environmental systems. Possible follow-up module: 3103-450 Spatial data analysis with GIS.
Teilnahmevoraussetzung	REGISTRATION FOR THIS MODULE THROUGH THE ILIAS SYSTEM IS MANDATORY.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Agricultural Sciences - Soil Science (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Sustainable biomass production systems and profile sustainablity assessement) Environmental Protection and Agricultural Food Production (Master) 1. Semester, compulsory Environmental Science - Soil, Water, and Biodiversity (Master) | Home. 1. Semester, compulsory Environmental Science - Soil, Water, and Biodiversity (Master) | Host - Specialization: Soil Resources and Land Use. 3. Semester, semi-elective Environmental Science - Soil, Water, and Biodiversity (Master) | Host - Specialization: Climate Change. 3. Semester, semi-elective Environmental Science - Soil, Water, and Biodiversity (Master) | Host - Specialization: Ecosystems and Biodiversity. 3. Semester, semi-elective Landscape Ecology (Master) 3. Semester, elective
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students learn to analyse and model environmental systems. Emphasis is put on matter cycles and the fate of environmental chemicals in agro-ecosystems. Students are able to set up simple system analytical models for environmental problems. They can run simulations and can interpret thei results. They are able to become acquainted with more complex state-of-the-art-models.
empfohlene Vorkenntnisse	-

Anmerkungen	PARTICIPATION IN THE COMPUTER EXERCISES IS MANDATORY. You will not be allowed to take the exam if not having participated regularly in the computer exercises.
Modulprüfung und Gewichtung	Written (100%)
Studienleistung und Gewichtung	-
Environmental Modeling (lecture) (3103-511)	
Person(en) verantwortlich	Thilo Streck
Lehrform	Vorlesung
SWS	2
Inhalt	Analysis of agro-ecosystems dynamics with emphasis on matter cycles - Environmental systems analysis - Mathematical modelling of dynamic systems - Applications (predator-prey systems, matter cycles, plant growth, fate of environmental chemicals, global change, spatial modeling)
Literatur	• Deaton, M.L. and J.I. Winebreake. Dynamic Modeling of Environmental Systems. Springer, New York, Berlin, 1999. • Müller, C. Modelling Soil-Biosphere Interactions. CABI Publishing, Wallingford, UK, 2000. • Downloadable lecture notes
Anmerkungen	-
Environmental Modeling (computer exercises) (3103-512)	
Person(en) verantwortlich	Thilo Streck
Lehrform	Übung
SWS	2
Inhalt	• Analysis of agro-ecosystems dynamics with emphasis on matter cycles • Environmental systems analysis • Mathematical modelling of dynamic systems • Applications (predator-prey systems, matter cycles, plant growth, fate of environmental chemicals, global change, spatial modeling) Registration at ILIAS course
Literatur	Deaton, M.L. and J.I. Winebreake. Dynamic Modeling of Environmental Systems. Springer, New York, Berlin, 1999. Müller, C. Modelling Soil-Biosphere Interactions. CABI Publishing, Wallingford, UK, 2000.

Anmerkungen	-

Modul: Ethical Reflection on Food and Agriculture (4302-420)

Modulverantwortung	Claudia Bieling
Bezug zu anderen Modulen	Global Agri-food Systems (4302-460) and other modules that deal with interdisciplinary aspects of food and agriculture
Teilnahmevoraussetzung	Since the number of participants is limited to 20, students are asked to submit a short letter of motivation to participate in the module; for further info see course description, 4302-421. We will give priority to students that take this module as part of their semi-elective programme and will prioritize Master level students as well as participants of the students' initiative FRESH (given their contribution to developing this module). Criteria for the selection process will be the quality of the motivation letter and, in a second step, the order of submission. Signing up in ILIAS will only be possible after the selection process.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Environmental Science - Soil, Water, and Biodiversity (Master) 3. Semester, semi-elective Agribusiness (Master) 3. Semester, elective Agricultural Sciences - Agricultural Economics (Master) 3. Semester, elective Agricultural Sciences - Animal Sciences (Master) 3. Semester, elective Agricultural Sciences - Major: Crop Production Systems (Master) 3. Semester, elective Agricultural Sciences - Soil Science (Master) 3. Semester, elective Agricultural Sciences in the Tropics and Subtropics (Master) 3. Semester, elective Biobased Products and Bioenergy (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Innovation and Entrepreneurship | Transforming Food Systems) Crop Sciences - Plant Breeding and Seed Science (Master) 3. Semester, elective Crop Sciences - Plant Nutrition and Protection (Master) 3. Semester, elective Earth and Climate System Science (Master) 3. Semester, elective Earth System Science (Master) 3. Semester, elective

	Environmental Protection and Agricultural Food Production (Master) 3. Semester, elective Landscape Ecology (Master) 3. Semester, elective Organic Agriculture and Food Systems (Master) 3. Semester, elective
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After completing this module, students have basic knowledge of ethical theory and frameworks for ethical analysis, as well as of their application to the field of contemporary food and agricultural research and practice. Furthermore, course participants are familiar with identifying ethical issues and their underlying moral principles, and with ethical reasoning and evidence-based argumentation with respect to the multi-functionality of agriculture. Drawing on teaching methods that combine theory and on-the-ground experiences from lecturers and guest speakers, this module creates a space to critically discuss current ethical issues related to food and agriculture. Following an interactive didactic approach, students learn to identify the impact of concurrent global challenges on the different members of society (small and large scale farmers, consumers, civil society organizations, industry and retailers, the public sector, and scientists) and the environment, as well as define the roles and responsibilities of the various actors in meeting these challenges. Engaging participants in discussions with lecturers and guest speakers, and comprising a group work assignment that includes independent literature research, classification/prioritization of evidence and information, oral presentations and argumentation in plenary debates, as well as an individual journal exercise, this module enables students to further develop the following soft skills: - communication skills - logical and analytical abilities - critical and analytical reading of scientific literature - evidence-based argumentation

	- teamwork capacity - intercultural competence - scientific journal-based literature research - scientific writing skills - (media-supported) presentation skills - organization and time management skills
empfohlene Vorkenntnisse	-
Anmerkungen	Please note that the number of participants is limited to 20. Therefore, students are asked to submit a short letter of motivation to participate in the module (see above/further info in course description, 4302-421). Signing up in ILIAS will only be possible after the selection process.
Modulprüfung und Gewichtung	Written paper in the form of an individual learner's journal (50 %)
Studienleistung und Gewichtung	Presentation in groups (40 %), contributions to seminar discussions (10 %)
Ethical Reflection on Food and Agriculture (4302-421)	
Person(en) verantwortlich	Claudia Bieling
Lehrform	Seminar mit Übung
SWS	4
Inhalt	The module is broadly structured in two parts: Part I is dedicated to the theoretical foundations of ethical thinking. Under the guidance of an ethicist from the International Center of Ethics in the Sciences and Humanities (IZEW, University of Tübingen), students will become acquainted with basic knowledge of ethical theory and tools for ethical analysis and argumentation, including: - prudence, justice and the good life as principles for ethical assessment - from fact to values and norms: how to build an argument - dealing with non-knowledge. In parallel to the lectures of the first part, students will practice the application of these theories and tools by elaborating case studies (group work) on an ethical

	issue of their choice (e.g. animal welfare, GMOs, biofuels). In Part II, students will further enhance their capacity to identify ethical issues related to the field of food and agriculture and critically reflect on them. For this, guest speakers are invited to share their experiences and perspectives, e.g. as an ethicist working in science or on providing food aid to developing countries. A particular emphasis will be on “solutions” or ways forward for reducing ethical problems and conflicts. As part of this, we will for instance explore the potential of taxation as a means for including ethical concerns in policy as well as alternative economic models that call for a more just economic order.
Literatur	Readings will be provided via ILIAS.
Anmerkungen	Please note that this module is limited to 20 students and can be taken only after applying with a motivation letter! Applications for participation in WS 2023/24 should be submitted from October 2-15, 2023. Please send your letter of motivation to claudia.bieling@uni-hohenheim.de stating the following: 1) Your name 2) Your country of origin 3) Your study programme (and specialization, if applicable) 4) Study programme level (M.Sc./B.Sc./Ph.D.) 5) Statement of motivation: I want to take the course 'Ethical Reflection on Food and Agriculture' because... (around 150 words). The decision about participation will be communicated to applicants by Oct 16, 2023. We will give priority to students that take this module as part of their semi-elective programme, and will prioritize Master level students. Since this module was developed on initiative of the students' group FRESH, FRESH members will be prioritized as well. Please mention if you are an active member of FRESH in your motivation letter. Criteria for the selection process will be the quality of the motivation letter and, in a second step, the order of submission.

Modul: Farm Economics and Value Chain Development (4101-460)

Modulverantwortung	Christian Lippert
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	See admission regulations for the Master Programme Bioeconomy. Knowledge of basic concepts in Economics as taught in the module “Economics and Management”. This module may be attended by other students in MSc programmes at Hohenheim in agreement with the responsible module coordinator.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 semester
Studiengänge	Bioeconomy (Master) 2. Semester, compulsory
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	In the first part of the module students learn to evaluate internal and external costs and benefits of renewable resources for (new) biobased products and processes. Various methods of investment appraisal will be applied to optimise cultivation and harvest of permanent crops by means of adequate bioeconomic models. In the second part of the module students learn basic principles of Life-cycle Sustainability Assessment (LCSA) and are introduced to Risk Management at farm level and to stochastic risk analysis. Critical analytical thinking.
empfohlene Vorkenntnisse	-
Anmerkungen	This module is compulsory for all students of the Bioeconomy Master programme.
Modulprüfung und Gewichtung	Written exam (100%)
Studienleistung und Gewichtung	-

Resource Use Optimisation for Permanent Crops and Forests (4101-461)	
Person(en) verantwortlich	Christian Lippert
Lehrform	Vorlesung mit Übung
SWS	2
Inhalt	Biological growth of permanent crops and woodland resources will be modelled. These models will be combined with investment appraisals (e.g. calculating net present values and land rent) to derive optimised single and infinite rotations for different kinds of plantations. In addition, the optimum use of natural forests will be analysed taking all external and internal net benefits into account. The lectures deal with adequate bioeconomic concepts. The accompanying, in-class computer exercises enable the students to apply introduced theoretical concepts to real-world problems by means of spreadsheet modelling.
Literatur	Perman, R., Yue, M., Common, M., Maddison, D. and J. McGilvray (2011): Natural Resource and Environmental Economics, 4th Edition, Pearson Education.
Anmerkungen	-

Value Chain Development and Risk Management in the Bioeconomy (4101-462)	
Person(en) verantwortlich	Iris Lewandowski Christian Lippert
Lehrform	Vorlesung mit Übung
SWS	2
Inhalt	In the value chain development part of this semimodule, students will be introduced to the concepts of value chain and webs in the context of the Bioeconomy. By looking at examples of biobased value chains and webs from research and practical perspectives, the need of a multi-dimensional and context-dependent systems approach for the sustainable design and development of these systems will be demonstrated. In the Risk Management part, first definitions of risk and uncertainty, ways to assess farmers' risk attitudes and concepts for decision making under risk are presented. Second, major types and causes of risk in modern agriculture are analyzed together with available risk reducing instruments at farm level. Finally, an introduction to stochastic risk analysis is

	given. The contents presented are illustrated by in class Excel exercises.
Literatur	Up to date literature will be introduced in the lecture.
Anmerkungen	-

Modul: Farm System Modelling (4904-460)

Modulverantwortung	Thomas Berger
Bezug zu anderen Modulen	n/a
Teilnahmevoraussetzung	Proficiency in using spreadsheet applications (MS-Excel or LibreOffice), basics of microeconomics
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1st half of semester
Studiengänge	Agricultural Sciences - Agricultural Economics (Master) 1. Semester, compulsory Bioeconomy (Master) 3. Semester, elective (profile: Sustainability Assessment) Environmental Science - Soil, Water, and Biodiversity (Master) 3. Semester, semi-elective
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students are familiar with the basic concepts of constrained optimization. They are able to analyze typical decision problems in farm systems and formulate them as mathematical programming models. They are able to implement and solve MP problems using spreadsheet software, assess the stability and sensitivity of the solution, and interpret the results in the context of the farm-system decision problem. By developing their own case study, students apply analytical thinking and aquire various scientific skills (e.g., literature search and reading, data handling, processing and analysis, oral presentation).
empfohlene Vorkenntnisse	Basic knowledge of agricultural systems
Anmerkungen	Laptop required for computer exercises in class
Modulprüfung und Gewichtung	80% Own case study (D1-D6); 20% Peer feedback on other studies (D7)
Studienleistung und Gewichtung	The Portfolio contains seven deliverables: D1. Short presentation of farm-system and decision problem (Slides/Poster) D2. Data base for implementing the problem (Spreadsheet)

	D3. Model implementation (Spreadsheet) D4. Model results, Sensitivity analysis, Assessment (Spreadsheet) D5. Presentation and Interpretation of Results (Slides/Poster) D6. Video presentation of the Portfolio (Video) D7. Peer feedback on intermediate results of case studies of two other course participants.
Farm System Modelling (4904-461)	
Person(en) verantwortlich	Thomas Berger
Lehrform	Vorlesung
SWS	2
Inhalt	• Introduction to farm management and modeling • Theory of agricultural production • Mathematical Programming • Farm investment analysis • Advanced farm system modeling
Literatur	-
Anmerkungen	-
Modelling of Land Use Decisions with Mathematical Programming (4904-462)	
Person(en) verantwortlich	Thomas Berger
Lehrform	Übung
SWS	2
Inhalt	Modelling of land use decisions with mathematical programming.
Literatur	-
Anmerkungen	-
Introduction to Excel Spreadsheet Models (freiwillig) (4904-463)	
Person(en) verantwortlich	Thomas Berger
Lehrform	Übung
SWS	2
Inhalt	Introduction to Excel Spreadsheet Models.
Literatur	

	-
Anmerkungen	-

Modul: Food and Nutrition Security (4902-430)

Modulverantwortung	Kirsten Boysen-Urban
Bezug zu anderen Modulen	This module will be of particular interest for students with a specialization in development economics and policy.
Teilnahmevoraussetzung	Students should be familiar with the basics in microeconomics and macroeconomics. Furthermore, some previous exposure to aspects related to poverty and economic development is assumed.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Bioeconomy (Master) 3. Semester, elective (profile: Bioeconomy Policy Analysis |Transforming Food Systems within the Bioeconomy)) Food Biotechnology (Master) 3. Semester, elective Agricultural Sciences in the Tropics and Subtropics (Master) 3. Semester, elective Agricultural Sciences - Agricultural Economics (Master) 3. Semester, semi-elective
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students will become familiar with the multidimensional problems of hunger and malnutrition, including global trends, measurement concepts, causes, and economic implications. Furthermore, policies to improve food and nutrition security will be analyzed and discussed. Students will acquire communication and cooperation skills within a multicultural framework. They will be instructed to think critically and analytically about the multidimensionality of hunger and malnutrition. Students will be able to effectively evaluate and communicate the problems and challenges of food security.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written (100%)
Studienleistung und Gewichtung	-

Food and Nutrition Security (4902-431)	
Person(en) verantwortlich	Manfred Zeller Kirsten Boysen-Urban
Lehrform	Vorlesung
SWS	4
Inhalt	This module focuses the socio-economic aspects of malnutrition and overnutrition, including causes, consequences and remedies. It also discusses the different drivers of food supply and demand in the world market. Students are expected to be familiar with the basics of micro- and macro-economics and to have some prior knowledge of aspects of poverty and economic development. Overview of main topics covered: • Global Perspective on Hunger and Food Insecurity • Concepts of Hunger and Malnutrition: Measurement Approaches and Nutrition-Health Linkages • The World Food Equation: Factors of Global Food Supply and Demand • Trade Policies in Developing Countries; Poverty and Trade • Multidimensionality of Hunger and Poverty: Food Security-Poverty Linkages • Access to Rural Finance: Empowerment, Participation and Gender • Targeting of Rural Development Policies • Food Demand Analysis: Empirical Approaches and Data Collection • Food and Nutrition Policies • Multidimensionality of Hunger and Poverty: Risk and Vulnerability • Institutional Change: Access to Land and Water Resources • The Challenge of Food Security Through the lectures and discussion of case studies you will become familiar with the multidimensional problems of hunger and malnutrition, including global trends, measurement concepts, causes, and economic implications.
Literatur	• Leathers, H.D., and P. Foster (2009): The World Food Problem: Towards Ending Undernutrition in the Third World. 4th edition. Lymne Rienner Publishers, Boulder.

	• Leathers, H.D., and P. Foster (2004): The World Food Problem: Tackling the Causes of Undernutrition in the Third World, 3rd edition, Lymne Rienner Publishers, Boulder. • Southgate, D., D.H. Graham and L. Tweeten (2010): The World Food Economy. Oxford, Blackwell Publishing. • Thirlwall, A.P. (2006): Growth and Development. With Special References to Developing Economies. 8th edition. Palgrave Macmillian, New York. • Todaro, M. P. and S. C. Smith (2009): Economic Development. 10th edition. Pearson, London.
Anmerkungen	-

Modul: Food Process Design I - Efficient Processing and Transport Phenomena (1503-520)

Modulverantwortung	Reinhard Kohlus
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Technical basics, process engineering, physical chemistry or thermody-namics of multiphase systems
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 3)
Studiengänge	Food Science and Engineering (Master, PO vom 01.10.2013) 1. Semester, Pflicht Bioeconomy (Master, PO vom 01.10.2014) 3. Semester, Wahl (Profil: Transforming Food Systems) Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 3. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 3. Semester, Wahl Bioeconomy (ab WS 16/17) (Master, PO vom 01.04.2017) 3. Semester, Wahl Food Systems (Master, PO 01.10.2019) 1. Sem., Wahl
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	80
Selbststudium (in Stunden)	145
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The students know the fundamentals of thermal separation processes. They are capable of applying physical-chemistry fundamentals, to design the processes. The laws of energy and mass and momentum transfer are known and can be applied to standard problems. The fundamental calculation methods are mastered.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 50

Modulprüfung und Gewichtung	oral exam (20 minutes), optional written exam (120 minutes)
Studienleistung und Gewichtung	-
Food Process Design I - Efficient Processing and Transport Phenomena (1503-521)	
Person(en) verantwortlich	Reinhard Kohlus
Lehrform	Vorlesung mit Übung
SWS	6
Inhalt	Lecture: Application of the fundamentals of thermal separation processes, multiphase flow and food process design. Specifically covered topics are drying technology, distillation and rectification, extraction, crystallization, heat transfer processes. Fundamentals: Equilibria equations, Phase and state diagrams, mass transfer equations, Multiphase flows: especially gas –liquid flows, Mass transfer in multiphase systems, two film theory, surface renewance theory Design of rectification system: McCabe Thiele Diagram, hydrodynamic design of rectification columns. Description of residence time distributions, prediction of RTD's Drying, coupling of heat and mass transfer, Glass transition temperature, sorp-tion isotherms. Optimisation of energy requirements, coupling of heat flows- Design and decision taking of heat transfer systems. Exercises and problems in the above given areas will be covered using calcu-lation and engineering software.
Literatur	Sattler; Thermische Trennverfahren; VCH Verlag Kraume, Kraume, M: Transportvorgänge in der Verfahrenstechnik, Grundlagen und Apparative Umsetzung , Springer Verlag 2004
Anmerkungen	-

Modul: Food Process Design II - Process Integration and Scale up (1503-500)

Modulverantwortung	Reinhard Kohlus
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Knowledge of equivalent to Food Process Design I, e.g. Basics of fluid mechanics, mass and heat transfer, unit operations in food processing.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 3)
Studiengänge	Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Science and Engineering (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl Food Systems (Master, PO vom 01.10.2019) 2. Semester, Wahl Bioeconomy (Master), 2. Semester, Wahl (Profil: Transforming Food Systems within the Bioeconomy)
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The students will learn to structure a line design problem and place it in the economical context. They will be able to make a systematic construction based on the main process-product interactions. They know the principles of the design of experiment approach and can apply these to a process design question. The students are able to solve scale up problems by principles of similitude. The learned skills focus on applicable knowledge which is based on strong basic / theoretical foundations allowing to apply it in a wide context.

	A key skill needed in this context is the ability to combine the set of tools to appropriately tackle a complex process design problem. Key competencies addressed in this module are threefold: decision making and dealing with complexity, understanding different roles in project management and team work and lastly professional communication with business partner.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 24 Registration via ILIAS
Modulprüfung und Gewichtung	oral exam (20 minutes), optional written exam (120 minutes)
Studienleistung und Gewichtung	-
Food Process Design II - Process Integration and Scale up (1503-501)	
Person(en) verantwortlich	Reinhard Kohlus
Lehrform	Vorlesung mit Übung
SWS	5
Inhalt	Set-up of requirement lists, systematic construction processes (i.e. conceptual process design), apparatus and plant engineering and construction, Process-product interactions, Robust plant design, Process scale up, Design of experi-ments for process modelling. Hygienic design rules and cleaning considera-tions (cip, wip, sip), process control strategies and process optimization.
Literatur	Blass, E.; Entwicklung Verfahrenstechnischer Prozesse; Springer, Berlin (1997) Zlokarnik, M.; Scale up ; WILEY-VCH Verlag GmbH (2005) Kleppmann, W.; Taschenbuch Versuchsplanung; Hanser Verlag 2008 Douglas, J.,M. ; Conceptual Design of Chemical Prozesses; Mac GrawHill, Boston 1976 Hauser, G.; Hygienische Produktgestaltung; WILEY-VCH Verlag GmbH (2007)
Anmerkungen	List of English literature will be provided at start of course

Modul: Food Product Development: From Concept Ideation to Product Launch (1507-520)

Modulverantwortung	Jochen Weiss
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Student of one of the above mentioned Master programes with good command in English language
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 4)
Studiengänge	M.Sc. Food Systems, 1./3. Semester, Wahl M.Sc. Bioeconomy, 3. Semester, Wahl Profil: Transforming Food Systems M.Sc. Food Biotechnology, 3. Semester, Wahl M.Sc. Food Science & Engineering, 3. Semester, Wahl M.Sc. Lebensmittelchemie, 3. Semester, Wahl M.Sc. Molekulare Ernährungswissenschaft, 3. Semester, Wahl M.Sc. Molekulare Ernährungswissenschaft (ab Studienbeginn WS 23/24), 3. Semester, Wahl M.Sc. Ernährungsmedizin, 3. Semester, Wahl M.Sc. Medizinische Ernährungswissenschaft, 3. Semester, Wahl
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	70
Selbststudium (in Stunden)	155
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Students will also be able to identify and respond to market needs based on a basic understanding on. Holistic insights food product development and business creation into this topic will give them the tools to critically assess tasks in the field of product development and improvement, as well as entrepreneurial challenges to bring products to the market. This will allow them to develop leadership qualities and to work together as a team. Furthermore they will know technical terms and prerequisites related to these fields.
empfohlene Vorkenntnisse	-
Anmerkungen	Number of participants: 20

	Registration via ILIAS (4 weeks before module start) Place allocation: Eligibility and registration order in ILIAS Please note: In winter semester, this module is offered as a block (1507-521). In summer semester, this module is offered during the whole semester (1507-522).
Modulprüfung und Gewichtung	written business case (60%) and oral presentation (40%)
Studienleistung und Gewichtung	-
Food Product Development: From Concept Ideation to Product Launch (1507-521)	
Person(en) verantwortlich	Lisa Berger Jochen Weiss
Lehrform	Vorlesung
SWS	4
Inhalt	The module will cover different topic areas, such as: - Ideation in Start-Ups (conceptualization; start-up hub & entrepreneurial spirit) - Current Trends (market analysis, market trends, consumer trends) - Applied Product Development (emerging materials, emerging technologies, labelling & claims, sensory analysis, case studies, food safety, legal assessments and IP, challenges) - Corporate Identity (brand development, PR & marketing) - Innovations in Packaging (packaging materials science, packaging trends) - External Demands on Start-Ups (investment, targeting the retail) - Start-Up Case Studies (pre-seed, seed invest, invested & scaled, established businesses)
Literatur	Will be provided during the module

Anmerkungen	In winter semester, this module is offered as a block. In summer semester, this module is offered during the whole semester.

Modul: Global Agri-food Systems: Conventional, Organic, and Beyond (4302-460)

Modulverantwortung	Claudia Bieling
Bezug zu anderen Modulen	This module is of particular interest for students who intend to choose the module "Ethical Reflection on Food and Agriculture" and other modules in the field of social sciences.
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 semester
Studiengänge	Organic Agriculture and Food Systems (Master) 2. Semester, compulsory Earth System Science (Master) 4. Semester, elective Earth and Climate System Science (Master) 4. Semester, elective Bioeconomy (Master) 2. Semester, elective (profile: Sustainable biomass production systems | Transforming food systems within the Bioeconomy)
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	In this course, students are provided with the conceptual tools (most importantly: Food Regime Theory, Food Systems) to understand the sociological bases around which a future world of agriculture, food and broader land use will possibly take shape. After completing this course, students have a comprehensive understanding of agri-food systems and the paradigmatic shifts within. Students are in particular able to specify the diverse motivations and politics that have led farmers, consumers, and policy makers toward (or away from) more sustainable agri-food systems. They are familiar with the geographical, sociological, historical, political, legal, and economic aspects of how and why individuals, groups, and industries make (or are involved in) certain choices about food throughout the food chain (production, processing, trade, consumption). Finally, they are able to explain basic

	concepts and theories related to organic agriculture and sustainability and have an understanding for the complexity of agriculture and food as it relates –among others– to the politics of resources, the environment and social justice. During preparation for the oral exam (video production), while writing their essay (written paper), peer-reviewing an essay of a fellow student and preparing and following up on the seminar, studetns practice self-reliance, time management and team work. During discussions in class, students practice and improve their capability of exploring a scientific issue and of orally presenting an academic argument. With the help of dedicated tutorials, students are further supported with creating an essay plan and essay writing, quoting, referencing, and using academic and non-academic sources (therefore avoiding plagiarism).
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written paper (essay 50 %)
Studienleistung und Gewichtung	Video production: 40%, Peer review: 10%
Global Challenges & Local Answers – Approaches for Sustainable Human-Nature-Relations (4302-461)	
Person(en) verantwortlich	Claudia Bieling
Lehrform	Vorlesung
SWS	2
Inhalt	Land Grabbing, soil desertification, precarization of rural livelihoods, and rising global inequality – these are just some examples that show the challenges of today's agriculture and food systems. In this module, we want to undertake a historical and geographical journey to learn more about the roots of these problematics and to discover some 'bright spots' in different regions that show that more sustainable forms of agriculture and land-use are possible. In the first section of the module, students will acquire knowledge on two different theoretical approaches to viewing food systems and their challenges (and solutions) – food regime theory and food systems thinking. Food regime theory offers a historical and global overview of the making of the current agri-food system, as well as the new and emerging social movements that search for more sustainable and just proposals. Parting from theoretical perspectives of political economy and

	political ecology, we analyze the historical phases of food regimes and their colonial embeddedness in the 18th, 19th, and 20th century. Students will gain an inside-view into food regime theory and learn how to connect it with current problematics of the global agri-food system, such as the industrialization of food production and unequal world trade dynamics. Food systems thinking, instead, provides a framework that allows to better describe, understand and analyze complex systems and their non-linear behaviors, fuzzy boundaries and feedback loops. By helping to better understand the relationships between food, humans and the natural environment, food systems theory can help unveil unexpected feedbacks, unsustainable lock-ins, as well as potential leverage points for the sustainable transformation of these systems.
Literatur	-
Anmerkungen	-

Past and future of food systems: perspectives of political economy (4302-462)	
Person(en) verantwortlich	Claudia Bieling
Lehrform	Seminar
SWS	2
Inhalt	After the introduction into Food Regime Theory and Food Systems Thinking, the second section of the module offers insights into social movements that are developing alternative visions to transform the global agri-food system. The focus will be on approaches of Organic Farming, Agroecology, Food Sovereignty, Alternative Food Networks (AFN), and the Food Justice movement. We want to analyse these approaches from a conceptual point of view, considering intersectional and postcolonial perspectives, and discussing ethical dilemmas, such as the tension between institutionalization, commercialization by labelling and strengthening transformative potentials. In the final discussion on Food Futures we will reflect upon questions on what these proposals could mean for transitions towards sustainable development on different scales, regarding global debates (e.g. Sustainable Development Goals), as well as the relevance for our society, region and daily life as students.
Literatur	Course-relevant readings will be made available or uploaded in ILIAS if possible.
Anmerkungen	Because of limited space available (70 students), students must register via ILIAS. A waiting list will be

	available if the number of registrations will exceed expectations.
Tutorial Global Agri-food Systems: Conventional, Organic, and Beyond (freiwillig) (4302-463)	
Person(en) verantwortlich	Claudia Bieling
Lehrform	Tutorium
SWS	2
Inhalt	-
Literatur	-
Anmerkungen	-

Modul: Global Change Issues (3202-420)

Modulverantwortung	Andreas Schweiger
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Extremely important: you have to be present on the first day of the module in order to be enroled for the module. This is mandatory because of organisational reasons. We will not accept any student for the module who is not present on the first day of the module. General requirements: Ability to think in an interdisciplinary way, background knowledge in natural sciences at least at Bachelor level, basic knowledge and interest in social sciences and economy, readiness for active contribution of knowledge from the students home countries.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Biobased Products and Bioenergy (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Bioeconomy Policy Analysis) Earth and Climate System Science (Master) 3. Semester, elective Environmental Science - Soil, Water, and Biodiversity (Master) 1. or 3. Semester, elective Environmental Science - Soil, Water, and Biodiversity (Master) 3. Semester, semi-elective in Specialization "Environmental Impacts" Environmental Science - Soil, Water, and Biodiversity (Master) 3. Semester, semi-elective in Specialization "Climate Change" Environmental Protection and Agricultural Food Production (Master) 3. Semester, semi-elective Landscape Ecology (Master) 3. Semester, elective
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	The aim of the module is to give a solid understanding of global change including global climate change, its impacts on species and

ecosystems and ecological services, and the consequences for human society. This module has a natural science focus but covers societal and economic aspects of global change including mitigation and adaptation strategies as well as current approaches in international treaties.

After completing the course the student will:

- know the drivers of global change and global climate change and distinguish between natural and human impact
- understand the perturbations of the global carbon, nitrogen, and water cycles
- know and understand the major threats to ecosystems and ecological services and the potential impacts on the human society.
- understand the effects of climate change on natural and anthropogenic (mainly agricultural) ecosystems including the most important feedbacks between ecosystem structure and processes and climatic conditions
- be familiar with international treaties to combat climate change and understand mitigation and adaptation strategies to climate change
- know methodological tools to investigate global change and its ecological impacts and feedbacks

The student will be furthermore able to:

- combine knowledge from different disciplines of natural science to analyze the extent and socio-ecological consequences of climate change
- think across scales both in time and space to evaluate global change issues
- judge about the severity of climate change and its effects compared to other drivers of ecosystem functionality
- perform experimental research on ecological effects of climate change with a focus on plants
- acquire, evaluate and summarize information from scientific literature and present this information in scientific presentations.

	The structure of the module provides the following competences: • The students will be able to discuss ecological, social, political and economic aspects of global change. • They are furthermore able to develop and communicate mitigation and adaptation strategies to combat the socio-ecological consequences global change and foster sustainable development. • The students will be able to co-operate and to work independently. • They will be able to evaluate critically data and model outputs on emissions, regulatory measures and treaties and suggest improvements. • The students will furthermore acquire intercultural competence by working in groups with international students.
empfohlene Vorkenntnisse	-
Anmerkungen	The module consists of a lecture (Introduction to Global Change, 2SWS), a seminar (Emerging Topics in Global Change Research, 1 SWS) and a practical part (Experiments on Global Change, 1 SWS). The practical part will be conducted in Hohenheim according to the applicable safety regulations. The number of participants is limited to a maximum of 15. Participants will be selected with regard to the study program and the number of semesters. Enrolment will take place via ILIAS. Information on how to access the lectures/seminar will be provided via ILIAS in October.
Modulprüfung und Gewichtung	Written exam (70%)
Studienleistung und Gewichtung	Presentation (15%) Exercise (15%)
Global Change Issues (3202-421)	
Person(en) verantwortlich	Andreas Fangmeier Petra Högy
Lehrform	Vorlesung mit Seminar und Praktikum
SWS	4
Inhalt	Introduction to Global Change Introduction to Global Change is a lecture introducing to the students the most important knowledge and current research on global change with a special focus on global climate change.

Contents of the lectures cover:

- Human population and land-use change
- Greenhouse gas emissions
- The concept of radiative forcing and global warming
- Sea level rise
- Global carbon, water and nitrogen cycling and future projections
- Effects on natural and seminatural ecosystems
- Effects on agriculture
- Health impacts
- Mitigation options
- International legislation
- Emission trading

Emerging Topics in Global Change Research

This seminar is thought to complement the lecture "Introduction to Global Change" with some most recent findings from current publications in the scientific literature and will cover current challenges and emerging topics in global change research. The actual content will vary from year to year but may cover issues such as the latest findings on disturbance of the global carbon cycle and its implications for climate, ecological footprints, state of international negotiations, case studies on climate change effects on selected ecosystems, ecosystem services, habitats etc.

The students will prepare a powerpoint presentation on a selected topic, they will present and discuss it and get feed-back not only on the scientific content but also on the didactics of their presentation.
Experiments on Global Change

In this practical part of the module the students will plan and conduct their own greenhouse experiment (Hohenheim) in which one of the most important resources to plant growth - water – will be manipulated. Water shortage is one of the major expected side effects of climate change and therefore represents a scientifically sound and relevant example on how to study climate change effects on plants. The students will analyze the response of C3 and C4 species to water shortage and learn about water cycling, water use efficiency

	and physiological adaptation of vegetation to resource deficiency. Furthermore, they will conduct ecophysiological investigations (leaf gas exchange measurements) with increasing atmospheric CO2 concentrations to evaluate primary plant responses to elevated CO2. The students will prepare a powerpoint presentation on the results of their experiments and discuss it and get feed-back not only on the scientific content but also on the didactics of their presentation.
Literatur	Introduction to Global Change Literature on global change is numerous and almost immediately outdated when recommendations are written down somewhere. Nevertheless, as basic literature for understanding the current state of the art in science and recommendations to policy makers the latest reports of the IPCC are recommended (download at http://ipcc.ch/). Further literature is provided on the ILIAS e-learning platform Emerging Topics in Global Change Research Ever changing and updated; students are assisted to find relevant literature and other sources; sources will be made available via the ILIAS e-learning platform.
Anmerkungen	-

Modul: Governance of Sustainable Agri-Food Systems (4903-520)

Modulverantwortung	Regina Birner
Bezug zu anderen Modulen	Good completion to Rural Communication and Extension
Teilnahmevoraussetzung	none
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Bioeconomy (Master) 3. Semester, elective (profile: Sustainability Assessement) Agricultural Sciences - Agricultural Economics (Master) 1. Semester, semi-elective
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students are able to use concepts of organizational theory, new institutional economics, and administrative sciences to analyze the governance challenges of public, private and community-based institutions and organizations in the agricultural sector. They have a sound knowledge of the strategies that can be used to promote institutional change, improve organizational efficiency and address the governance challenges inherent in agricultural development.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Oral exam (100%)
Studienleistung und Gewichtung	-

Governance of Sustainable Agri-Food Systems (4903-521)

Person(en) verantwortlich	Regina Birner Maria Gerster-Bentaya
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	The module will focus on institutions and organizations that are essential for small-holder-based agriculture, such as organizations that provide public goods and services for crop and

	livestock development, institutions that link smallholder farmers to markets, institutions that enable sustainable natural resource management, and regulatory institutions that address market failures. The module will also address cross-cutting governance issues, such as voice and accountability, and control of corruption in the agricultural sector.
Literatur	Module reader. The module reader will be shortly available at the ASTA!
Anmerkungen	Lecture with short demonstrations and exercises. OHP, video-projector, interactive exercises, short inputs, alternating working forms (individual, partner, group work, plenary sessions), feedback. Handouts, pinboards, flipchart, "metaplan" material. Willingness to participate in the various activities/ exercises determine the extent to which knowledge and specifically additional skills can be acquired and deepened. This module is open to external participants.

Modul: Innovations for Sustainable Agri-Food Systems (4903-510)

Modulverantwortung	Regina Birner
Bezug zu anderen Modulen	This module will enable the students to better understand innovation processes in agriculture. The module will cover innovations that are relevant in agricultural engineering as well as crop and livestock production.
Teilnahmevoraussetzung	B.Sc. in agricultural sciences or related fields, B.Sc. modules covering the basics of agricultural engineering; English language skills
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 semester
Studiengänge	Agricultural Sciences in the Tropics and Subtropics (Master) 2. Semester, elective Agricultural Sciences - Soil Science (Master) 2. Semester, elective Agricultural Sciences - Major: Crop Production Systems (Master) 2. Semester, elective Agricultural Sciences - Animal Sciences (Master) 2. Semester, elective Agricultural Sciences - Agricultural Engineering (Master) 2. Semester, elective Agricultural Sciences - Agricultural Economics (Master) 2. Semester, elective Bioeconomy (Master) 2. Semester, elective (profile: Sustainable biomass production systems | Innovation and Entrepreneurship) Agricultural Sciences (Bachelor) 4./6. Semester, semi-elective Agricultural Biology (Bachelor) 4./6. Semester, semi-elective Biobased Products and Bioenergy (Bachelor) 4./6. Semester, semi-elective
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	The students gain a thorough understanding of the following topics:

	• Definitions, concepts, typologies and indicators of innovation; • theories of innovation and innovation systems; • driving forces and goals of innovation; specific features of innovations in agriculture; • role of innovations in agricultural development; • analysis of innovation processes using illustrative case studies from agriculture in industrialized and developing countries. The students are familiar with important driving forces of innovation, such as demographic change, increasing demand for agricultural products and limited availability of natural resources. They are aware of the different types and specific features of innovations in agriculture and understand innovation processes, starting from the idea for an invention to its large-scale adoption in practice. The students are able to apply an innovation systems perspective, which underlines the role of the policy environment, the role of the private sector, and the role of social and cultural factors in enabling innovation in agriculture. By participating in excursions and by analyzing practical examples of innovations, such as precision farming, automation, biotechnology, and conservation agriculture, the students become aware of the economic, ecological, socio-cultural and political dimensions that shape the role of innovation in the quest for sustainable development. • organizational skills • self-reliance • critical and analytical thinking • foreign language skills • written and oral expression • communication and cooperation skills
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Oral exam (70%)
Studienleistung und Gewichtung	Presentation (30%)
Innovations for Sustainable Agri-Food Systems (4903-511)	
Person(en) verantwortlich	Regina Birner Karlheinz Köller
Lehrform	Vorlesung
SWS	4

Inhalt	Definition of innovation and differentiation of types of innovation, motivations and goals of innovation, specifics of innovation in agriculture, what drives innovation and how it is implemented, supported with many illustrative examples from agriculture.
Literatur	-
Anmerkungen	-

Modul: Intelligente Robotik für die Landwirtschaft (4407-510)

Modulverantwortung	Anthony Stein
Bezug zu anderen Modulen	Das Modul ergänzt inhaltlich die Module 4407-440, 4407-470, 4407-480 ---------- The module extends the content of modules 4407-440, 4407-470, 4407-480.
Teilnahmevoraussetzung	-
Lehrsprache	deutsch/englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Alle Masterprogramme der Fakultät Agrarwissenschaften, 3. Semester, Wahlmodul Bioeconomy (Master) 3. Semester, Wahl (Profil: Data Science and Artificial Intelligence) ---------- All Master's programs of the Faculty of Agricultural Sciences, 3. semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Data Science and Artificial Intelligence)
Prüfungsdauer (in Minuten)	20
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Studierende sind in der Lage, mit Hilfe ihrer erworbenen Kompetenzen aus den Bereichen der Informatik, Sensortechnik und Regelungstechnik, grundlegende landwirtschaftliche Anwendungsfälle mit einer Roboterplattform zu automatisieren. Der Hauptanwendungsfall ist hierbei die autonome Navigation im Feld. Hierfür werden den Studierenden Kenntnisse in der Programmierung in Python, der Nutzung von ROS2 und dem Einsatz von Sensorik gezeigt, die sie anhand von semesterbegleitenden Übungsaufgaben weiter vertiefen und mittels Übungsrobotern testen können. Mit Hilfe einer praxisnahen Simulationsumgebung in Gazebo, können die Studierende ihre Navigationstechniken weiterentwickeln und Techniken der KI, zur Objekt Detektion oder des Reinforcement Learning, einsetzen.

	Während der Vorlesung werden die Studierenden vor konkreten Problemstellungen stehen, die sie mit Hilfe der in der Vorlesung gezeigten Methoden lösen müssen, wodurch die Fähigkeiten des analytischen Denkens gestärkt wird. Die Bearbeitung der vorlesungsbegleitenden Übungsaufgaben stärkt die Fähigkeit zur Organisation als auch der Kooperationsfähigkeit, da die Übungsaufgaben in Gruppen absolviert werden müssen. Durch einen internen Roboterwettkampf am Ende des Semesters, wird die Kreativität und die Organisationsfähigkeit der Studierenden gefordert, um die erlernten Kompetenzen zielgerichtet einzusetzen. _____ Students are able to automate basic agricultural use cases with a robot platform using their acquired competencies from the fields of computer science, sensor technology and control engineering. The main use case here is autonomous navigation in the field. For this purpose, students learn programming in Python, the use of ROS2 and the application of sensor technology, which they can further deepen by means of semester-long exercises and test by means of practice robots. Using a hands-on simulation environment in Gazebo, students will be able to further develop their navigation techniques and apply techniques of AI, for object detection or reinforcement learning. During the lecture, students will be faced with concrete problems that they need to solve using the methods demonstrated in the lecture, strengthening analytical thinking skills. Working on the exercise problems that accompany the lecture will strengthen the ability to organize as well as the ability to cooperate, since the exercise problems must be completed in groups. Through an internal robotics competition at the end of the semester, the creativity and organizational skills of the students are challenged in order to use the learned skills in a targeted manner.
empfohlene Vorkenntnisse	Eine Belegung des Moduls ist erst nach erfolgreichem Abschluss der Module 4407-480 und 4407-440 sinnvoll. ---

	This module should not be taken until modules 4407-480 and 4407-440 have been successfully completed.
Anmerkungen	Teilnahmebegrenzung: 15 Studierende Anmeldung zum Modul und Auswahlverfahren über ILIAS Plätze werden nach vorher belegten Modulen bzw. einschlägiger Programmiererfahrung in Python bzw. C/C++ vergeben --------- Maximum number of participants: 15 students Registration for the module and selection procedure via ILIAS Places are assigned according to previously attended modules or relevant programming experience in Python or C/C++.
Modulprüfung und Gewichtung	Mündliche Prüfung (25 %) --------- Oral examination (25 %)
Studienleistung und Gewichtung	Semesterbegleitende Übungsaufgaben + Abschlussprojekt mit Präsentation (75 %) --------- Accompanying exercises throughout the semester + final project with presentation (75 %)
Intelligente Robotik für die Landwirtschaft (4407-511)	
Person(en) verantwortlich	Anthony Stein
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	Diese Veranstaltung soll die Studierenden mit Vorkenntnissen in der Künstlichen Intelligenz sowie im Bereich des maschinellen Lernens in das Gebiet der mobilen Robotik einführen. Um die Studierenden an moderne Konzepte und Ansätze für intelligente mobile Roboter, insbesondere Feldroboter, heranzuführen, wird ein didaktischer Schwerpunkt auf eine integrierte Vermittlung der jeweils zugrundeliegenden Basistechniken gesetzt, welche während der Vorlesung sowohl theoretisch-intuitiv, als auch praktisch-angewandt im Rahmen

	der semesterbegleitenden Projektarbeit vermittelt werden. Es werden folgende Themen behandelt: Motivation und Anwendungen der Robotik mit Fokus auf die mobile Robotik, Grundlagen der Roboterprogrammierung mit Python und ROS2, Robotersimulation mit Gazebo, Anwendungen mobiler Robotik in der Landwirtschaft inkl. Basiswissen entsprechender Sensorik und Aktorik zur Umgebungswahrnehmung und -modifikation, Fokus auf State-of-the-Art Bildverarbeitung mit Deep Learning insb. Objektdetektion und semantische Segmentierung, Explainable AI, kognitive/KI-basierte Robotersteuerung (Navigation, Pfadplanung), sowie erweiterte Konzepte aus der Forschung, wie z.B. Evolutionäre Robotik oder Schwarmrobotik. _____ This course is designed to introduce students with prior knowledge of artificial intelligence as well as machine learning to the field of mobile robotics. In order to introduce students to modern concepts and approaches for intelligent mobile robots, especially field robots, a didactic focus is placed on an integrated teaching of the respective underlying basic techniques, which are taught during the lecture both theoretically-intuitively, as well as practically-applied in the context of the semester-long project work. The following topics will be covered: Motivation and applications of robotics with focus on mobile robotics, basics of robot programming with Python and ROS2, robot simulation with Gazebo, applications of mobile robotics in agriculture incl. basic knowledge of corresponding sensors and actuators for environment perception and modification, focus on state-of-the-art image processing with Deep Learning esp. object detection and semantic segmentation, explainable AI, cognitive/KI-based robot control (navigation, path planning), as well as advanced concepts from research, such as evolutionary robotics or swarm robotics.
Literatur	• Heckman, C., Correll, N., Roncone, A., Hayes, B. (2022). Introduction to Autonomous Robots: Mechanisms, Sensors, Actuators, and Algorithms. USA: MIT Press. • Hertzberg, J., Lingemann, K., Nüchter, A. (2012). Mobile Roboter: Eine Einführung aus

	Sicht der Informatik. Deutschland: Springer Berlin Heidelberg. • Cangelosi, A., & Asada, M. (Eds.). (2022). Cognitive robotics. MIT Press.
Anmerkungen	Teilnehmerbegrenzung auf 15 Studierende _____ Maximum number of participants: 15 students

Modul: Inter- and Transdisciplinary Research Approaches in Bioeconomy (4301-420)

Modulverantwortung	Andrea Knierim
Bezug zu anderen Modulen	"Projects in Bioeconomic Research"
Teilnahmevoraussetzung	See admission regulations for the Master Programme Bioeconomy. This module may be attended by other students in MSc programmes at Hohenheim in agreement with the responsible module coordinator.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Bioeconomy (Master) 1. Semester, compulsory
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After completing this module, students have developed an understanding of system concepts and methodological approaches to trans- and interdisciplinary research. They are able to conduct systemic problem and multiple-actor analyses and are familiar with key concepts such as participation, stakeholder involvement, cooperation and networking in social groups and with approaches and methods for integrative project management. They are finally able to apply concepts to a specific case/example. Students acquire group communication and cooperation skills through learning by doing in the seminars. They gain competence in time management, self-reliance, team project planning, group facilitation, implementation and evaluation. Students learn to critically and analytically review scientific papers (on an inter- or transdisciplinary case), while writing essays enhances their scientific articulateness. Finally, they acquire reflection methods during the seminars.
empfohlene Vorkenntnisse	-
Anmerkungen	This module is compulsory for all students of the Bioeconomy Master programme. The two written

	papers to be submitted refer to the identification of a practice-related research question (1) and a review of a paper on transdisciplinary research (2). This module is reserved for students of the Bioeconomy degree program.
Modulprüfung und Gewichtung	individual assignment (40% of the grade) written exam of one hour (60% of the grade)
Studienleistung und Gewichtung	participation in the teamwork training (compulsory participation, not graded)
Inter- and Transdisciplinary Research Approaches in Bioeconomy (4301-421)	
Person(en) verantwortlich	Andrea Knierim
Lehrform	Vorlesung
SWS	3
Inhalt	System concepts and approaches for inter- and transdisciplinary research (hard - soft systems; ecological and social systems; constructivism and positivism etc.) Analysis and understanding of innovative biobased production processes from different disciplinary angles and in an integrative way Inter- and transdisciplinary research - how to conceptualize and organize a problem-oriented research approach in an interdisciplinary team; knowledge types, design of and principles and methods for inter- and transdisciplinary research; research project planning, management, monitoring and evaluation Actor analyses and involvement - how to address, understand and interact with practitioners Concepts and methods for participation, cooperation and networking in multi-actor innovation processes.
Literatur	• Darnhofer et al (2012); • Knierim et al. (2017); • Ison (2008); • Pohl and Hirsch Hadorn (2008)
Anmerkungen	7 units à 4 h (dates to be announced) Non-tiered seminar room with moveable tables
Teamwork in interdisciplinary research groups (Seminar) (4301-422)	
Person(en) verantwortlich	Andrea Knierim
Lehrform	Seminar
SWS	1

Inhalt	Focused team work, systematic project planning, group communication and cooperation, actor/ stakeholder analysis, monitoring and evaluation; feedback and reflection processes.
Literatur	Schulz v. Thun; Will be provided by beginning of module.
Anmerkungen	Several neighbouring rooms are required; students split into groups of max. 8 - 12.

Modul: International Food and Agricultural Trade (4902-420)

Modulverantwortung	Kirsten Boysen-Urban
Bezug zu anderen Modulen	This module is particularly important for students who see their career in national and international organizations dealing with agricultural trade. This module builds on introductory economics lectures such as “Basis Micro- and Macroeconomics” (4201-021, 4202-022) and “Economic and Environmental Policy” (4201-440). The modules “International Food and Agricultural Trade” (4902-420) and “Agricultural and Food Policy” (4201-410) are complement to each other. In addition, the module “Microeconomics” (4202-451) supports the understanding of international trade theory. Module (4902-420) teaches knowledge that is the basis for more advanced agricultural policy modeling such as introduced in the module “Advanced Policy Analysis Modeling” (4201-420).
Teilnahmevoraussetzung	Students must have a solid background in microeconomics and some macroeconomics is required as well. Successfully completed courses in both of these subjects at the undergraduate level are essential and assumed. If these requirements are not met, any undergraduate textbook in microeconomics can be consulted as a preparation for this module and / or the participation in the module “Economics and Environmental Policy” (4201-440) is recommended.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 semester
Studiengänge	Organic Agriculture and Food Systems (Master) 2. Semester, elective Agribusiness (Master) 2. Semester, elective Bioeconomy (Master) 2. Semester, elective (profile: Bioeconomy Policy Analysis) Agricultural Sciences - Agricultural Economics (Master) 2. Semester, semi-elective
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180

Lern- und Qualifikationsziele	After successfully completing this module students should be able to perform the following: Students… • explain, differentiate between and qualify the key concepts of the theory of international economics with focus on international trade theory. • apply core models of international trade to determine the patterns of trade, interpret the effects, generalize the results and thus understand standard theorems using graphical representations and/ or equation systems. • discuss and reason why countries engage in international trade of goods and services and comment on actual trade pattern. • describe and classify the effects of trade policy instruments and apply methods to assess and evaluate their effects. • exemplify linkages of international trade with macroeconomic theory using key concepts of international economics · characterize the development of international trade negotiations and explain their contribution to the development of world trade. • discuss and evaluate topics currently on the trade agenda. During the module, students learn to work self-reliantly through preparation for and recapitulation of the lectures as well as for the exam and participating in the group work. They regularly solve and submit homework exercises, write group work assignments and/or prepare presentations within given time periods thereby improving their time management skills. Within the group work, students develop a common work approach, distribute individual tasks, as well as discuss and present the results of their group work improving their ability to work in teams. Students read and understand scientific articles and use online databases. In so doing, they improve in identifying and extracting relevant information. Regularly students understand, analyze and interpret models' results thereby training their analytical thinking skills. Based on analysis results, they practice deriving economically reasoned conclusions. Through presentations of results students practice preparing clear figures and tables that support their argumentation and precisely communicate crucial

	information. This way they improve their presentation skills.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written exam (75 %)
Studienleistung und Gewichtung	Presentation in groups (25%)
International Food and Agricultural Trade (4902-421)	
Person(en) verantwortlich	Kirsten Boysen-Urban
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	Aim of this module is to introduce students into economic theory of international trade. Students will become acquainted with the theoretical concepts and understand why countries trade with each other. They will be able to use this framework for analyzing patterns of trade and addressing policy-oriented questions in the agricultural and food sectors. After successfully attending this module, students are expected to be able to comprehend details of current trade negotiations, including new topics on the trade agenda, and to be familiar with the analytical tools to assess the wider implications of international trade and trade policy reforms for different groups of countries and population segments. Course outline: • Introduction: World Trade - an Overview • Labor Productivity and Comparative Advantage: The Ricardian Model • Specific Factors and Income Distribution • Resources and Trade: The Heckscher–Ohlin Model • The Standard Trade Model • Economies of Scale and Imperfect Competition • Firms in the global economy • The Instruments of Trade Policy • The Political Economy of Trade Policy • Trade negotiations • Regional Trade Agreements • Trade Policy in Developing Countries • National Income Accounting and the Balance of Payments • Exchange Rates and the Foreign Exchange Market: An Asset Approach • Money, Interest Rates, and Exchange Rates

	Group work/ case study Exercises
Literatur	• º Krugman, P., Obstfeld, M. and M.J. Melitz (2014), International Economics. Theory and Policy. 11th Edition Pearson Publisher. (or back editions) º Feenstra, R.C. and Taylor, A.M. (2021). International Economics. Worth Palgrave Macmillian. International Edition. Fifth Edition. New York. (or back editions) • º Chiang, A.C. and Wainwright, K. (2005), Fundamental Methods of Mathematical Economics, 4th Edition, McGraw-Hill, New York. (or back editions) • º Snyder, C. and Nicholson, W. (2017), Microeconomic Theory, Basic Principles and Extension. 12th Edition, Cengage Learning. (or back editions) • º Brockmeier, M. (2001), A Graphical Exposition of the GTAP Model. GTAP Technical Paper No. 08. available at https://www.gtap.agecon.purdue.edu/resources/tech_papers.asp
Anmerkungen	Lecture with exercises; Group work (case study, database use, trade policies, specific tasks, preparation of handouts/ presentations, oral presentation of results by students and plenary discussion). Willingness to participate in group work and exercises determine the extent to which students can acquire and deepen knowledge and other skills. Power Point slides and additional course material will be uploaded during the course to ILIAS;

Modul: International Innovation Management 1 (5706-440)

Modulverantwortung	Bernd Ebersberger
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	keine
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	International Business and Economics (Master), PO vom 21.11.2018 , 1. Semester, Wahl
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	123
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Die Studierenden haben tiefgehendes Wissen und Verständnis der Schlüsselprinzipien, der zugrunde liegenden Theorien und der grundlegenden Konzepte des Innovationsmanagements und seiner Probleme, inbesondere in Hinblick auf den Innovationsprozess und auf die Rolle von Innovation in innovativen Organisationen. Studierende können Innovation und Innovationsmanagement in den Kontext von internationalen Geschäftsprozessen stellen. Sie haben einen umfassenden Überblick über die Werkzeuge und Methoden des Innovationsmanagements. Die Studierenden kennen und können kritisch die Literatur des Innovationsmanagements diskutieren. Sie können diskutieren, wie sich die in wissenschaftlichen Arbeiten kommunizierten Erkenntnisse auf die Herausforderungen des Innovationsmanagements beziehen. Sie können die Anwendbarkeit von Instrumenten des Innovationsmanagements bewerten. Die Studierenden können ihre eigene Meinung und Erfahrungen in Diskussionen über Innovation und Innovationsmanagement einbringen.
empfohlene Vorkenntnisse	-
Anmerkungen	Für weitere Informationen besuchen Sie bitte innovation.uni-hohenheim.de
Modulprüfung und Gewichtung	Hausarbeit

Studienleistung und Gewichtung	-
International Innovation Management 1 (5706-441)	
Person(en) verantwortlich	Bernd Ebersberger
Lehrform	Vorlesung
SWS	2
Inhalt	• Technologie, Innovation und Wissen in internationalen Geschäftsprozessen • Innovation - Definitionen • Innovation als Kerngeschäftsprozess • Aufbau einer innovativen Organisation • Entwicklung einer Innovationsstrategie • Quellen von Innovation
Literatur	Dodgson, M., Gann, D. M., & Salter, A. J (2008. The management of technological innovation. Oxford: Oxford Univ Press. Johnson, G., Whittington, R., Scholes, K., Angwin, D., Regnér, P., & Edition, E. (2017). Exploring strategy: Text and cases (11th ed.). Harlow: Pearson Morschett, D., Schramm-Klein, H., & Zentes, j. (2015). Strategis International management. Wiesbaden: Springer Gabler Tidd, J., & Bessant, J. (2018). Managing innovation: Integrating technological, market and organizational change (6th ed.). Wiley Mehrere Paper von Journalen, wie R&D Management, Research Policy, Strategic Management Journal, Journal of International Business Studies, World Development etc. Diese Paper werden in der Vorlesung kommuniziert.
Anmerkungen	Für weitere Informationen besuchen Sie bitte innovation.uni-hohenheim.de
International Innovation Management 1 (5706-442)	
Person(en) verantwortlich	Bernd Ebersberger
Lehrform	Übung
SWS	2
Inhalt	-
Literatur	-
Anmerkungen	-

Modul: International Innovation Management 2 (5706-550)

Modulverantwortung	Bernd Ebersberger
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	keine
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (ab WS 16/17) (Master, PO vom 01.04.2017) 2. Semester, Wahl Bioeconomy (ab WiSe 2023/2024) (Master, PO vom 01.10.2014) 3. Semester, Wahl (Profil: Innovation and Entrepreneuship in the Bioeconomy) International Business and Economics (Master), PO vom 21.11.2018, 2. Semester, Wahl
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Die Studierenden verfügen über ein fundiertes Wissen und Verständnis über die wichtigsten Prinzipien sowie der grundlegenden Konzepte und Theorien des Innovationsmanagements und seiner Fragestellungen, insbesondere im Hinblick auf die Innovationsquellen, die Innovationszusammenarbeit, die Auswahl von Innovationsprojekten und die Wertschöpfung aus Innovationen. Studierende können Innovation und Innovationsmanagement in den Kontext internationaler Unternehmungen stellen. Sie haben einen umfassenden Überblick über die Methoden und Instrumente des Innovationsmanagements. Die Studierenden kennen die wesentliche Literatur des Innovationsmanagements und können diese kritisch diskutieren. Sie können diskutieren, wie sich die in wissenschaftlichen Arbeiten erzielten Erkenntnisse auf die Herausforderungen des Innovationsmanagements beziehen. Sie können die Anwendbarkeit von Methoden und Instrumenten des Innovationsmanagements bewerten. Die Studierenden können ihre eigenen Meinungen und Erfahrungen in Diskussionen über Innovation und Innovationsmanagement einbringen.

empfohlene Vorkenntnisse	-
Anmerkungen	Für weitere Informationen besuchen Sie bitte innovation.uni-hohenheim.de
Modulprüfung und Gewichtung	Klausur (50%) und Referat (50%)
Studienleistung und Gewichtung	-
International Innovation Management 2 (5706-551)	
Person(en) verantwortlich	Bernd Ebersberger
Lehrform	Vorlesung
SWS	2
Inhalt	Innovationszusammenarbeit, Entscheidungsfindung unter Unsicherheit. Neue Produkte und Dienstleistungen schaffen. Open Innovation und Zusammenarbeit. Entrepreneurship und neue Unternehmungen. Ökonomische Vorteile von Innovation sichern.
Literatur	Dodgson, M., Gann, D. M., & Salter, A. J (2008). The management of technological innovation. Oxford: Oxford Univ Press Tidd, J. & Bessant, J. (2018). Managing innovation: Integrating technological, market and organizational change (6th ed.). Wiley Mehrere Paper aus den Zeitschriften R&D Management, Research Policy, Strategic Management Journal, Journal of International Business Studies, World Development etc. Diese Paper werden im Kurs bekannt gegeben.
Anmerkungen	-
International Innovation Management 2 (5706-552)	
Person(en) verantwortlich	
Lehrform	Übung
SWS	2
Inhalt	-
Literatur	-
Anmerkungen	-

Modul: Introduction to Machine Learning in Python (4407-480)

Modulverantwortung	Christian Krupitzer Anthony Stein
Bezug zu anderen Modulen	The module provides basic knowledge on machine learning that well prepare the students for participation in subsequent AI modules, i.e., 4407-440 "Einführung in die Künstliche Intelligenz", 4407-470 "Artificial Intelligence for Agriculture", 4407-490 "Bildanalyse mit Deep Learning" or 4407-810 "Machine Learning Reading Club".
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	Agrarwissenschaften - Agrartechnik (Master), 2. Semester, semi-elective All Master's programs of the Faculty of Agricultural and Natural Sciences, 2. semester, elective Information Systems (Master), elective Bioeconomy (Master), 2. Semester, elective (Profil: Data Science and Artificial Intelligence)
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	0
Selbststudium (in Stunden)	225
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	After completing this module, students are able to critically assess the performance of different machine learning approaches and to choose the best approach for a specific use case. Therefore, this module will provide essential theoretical knowledge of the foundations of programming in Python and machine learning algorithms and approaches.Further, students acquire practically-applicable knowledge how to apply machine learning to solve real world problems. The online format, regular assignments as well as the self-study character of the module supports the students' organizational skills and trains their ability to work independently. Further, the module supports analytical thinking, i.e., how to structure a problem and find appropriate solutions to it by means

	of machine learning. Since the course materials and the teaching language are completely in English, the students further train their foreign language skills.
empfohlene Vorkenntnisse	Module 4407-480 is a Master's program module, but can already be taken as an elective in Bachelor's degree programs in agricultural sciences. No prior programming skills are assumed. The necessary basic concepts of Python programming are taught in the first third of the course. In order to prepare for later AI modules in the Master's programs, it is recommended to take this course already during the specialization phase in the Bachelor's programs.
Anmerkungen	The maximum number of participants is limited to a semester-specific amount. In case the threshold is exceeded, a waiting list will be maintained.
Modulprüfung und Gewichtung	Computer-based online exam (50%)
Studienleistung und Gewichtung	Integrated online quizzes and programming assignments to be solved individually by the students (50%)
Introduction to Machine Learning in Python (4407-481)	
Person(en) verantwortlich	Anthony Stein Christian Krupitzer
Lehrform	E-Learning
SWS	5
Inhalt	-
Literatur	-
Anmerkungen	-

Modul: Knowledge and Innovation Management (4301-410)

Modulverantwortung	Andrea Knierim
Bezug zu anderen Modulen	Good completion to the modules "Rural Communication and Extension" or "Beratungslehre"
Teilnahmevoraussetzung	none
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Organic Agriculture and Food Systems (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (Profile: Innovation and Entrepreneuship in the Bioeconomy) Agricultural Sciences - Agricultural Economics (Master) 1. Semester, semi-elective Communication Management and Analysis (Master) 3. Semester, semi-elective
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After completing this module, students are able to explain the process of knowledge creation, and the role of innovations in knowledge systems; they can explain the key terms (e.g. implicit, explicit knowledge, knowledge cycle, as well as innovation and different types and categories of innovations). Students deepen their understanding about the instruments and tools for knowledge and innovation management. They can distinguish between adoption and diffusion of innovation and can explain the underlying concepts (perception, behavior and behavior change, diffusion and adoption), and they are able to apply the concepts on concrete cases. Finally, students know the different types of intellectual property rights and understand its utility in the context of knowledge and innovation management. During lectures, students are able to critically view the role of science in knowledge creation, see different types of knowledge and innovations in a broader context. During preparation for the exam, while preparing and following up on lectures and

	during the seminar, students practice self-reliance, time management, interpersonal communication and cooperation. By preparing the presentation, students enhance their capability of exploring a scientific issue and (as in the group discussions) further practice their oral communication skills.
empfohlene Vorkenntnisse	-
Anmerkungen	Students contributing the voluntary presentation (see above) get a shorter written exam (less questions and 60 minutes instead of 120).
Modulprüfung und Gewichtung	Written exam (100% or 70% respectively)
Studienleistung und Gewichtung	30% of the final score can be earned with a presentation
Knowledge and Innovation Management (4301-411)	
Person(en) verantwortlich	Andrea Knierim Maria Gerster-Bentaya
Lehrform	Vorlesung mit Seminar
SWS	4
Inhalt	types of knowledge (explicit, implicit, tacit) and generation of knowledge; role of science and farmers in knowledge production; knowledge cycle; types / classification of innovations, theories related to adoption and diffusion of innovation, (agricultural) knowledge and information / innovation systems, information systems vs knowledge systems and data banks, "pyramid of knowledge" and expertise; protection of knowledge / intellectual property rights, (political) frame conditions for knowledge / innovation production, diffusion and adoption.
Literatur	Module reader available at the ASTA or at the ILIAS platform.
Anmerkungen	Lecture with exercises, homework assignments, open to external participants.

Modul: Land Use Economics (4904-430)

Modulverantwortung	Thomas Berger
Bezug zu anderen Modulen	This module advances the knowledge in land-use economics and the essential steps required in the modeling process (conceptual modeling, model selection, parameterization and validation). Hands-on computer exercises address various aspects of agricultural land-use systems with emphasis on designing and analyzing simulation experiments for uncertainty and sensitivity assessments.
Teilnahmevoraussetzung	Basic knowledge of Mathematical Programming (Textbook: Ragsdale, C.T., 2004. Spreadsheet Modeling & Decision Analysis, Ch. 1-4)
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1. half of semester
Studiengänge	Earth System Science (Master) 3. Semester, compulsory Bioeconomy (Master) 3. Semester, elective (profile: Bioeconomy Policy Analysis and profile Sustainability Assessement) Earth and Climate System Science (Master) 3. Semester, elective Agricultural Sciences - Agricultural Economics (Master) 3. Semester, semi-elective
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students understand fundamental concepts of land use economics. They can model land use decision problems at various spatial scales. They have gained insights into advanced techniques such as bio-economic modeling and multi-agent systems. By developing their own simulation models, students apply analytical thinking and aquire various scientific skills (e.g., data handling, processing and analysis, oral presentation).
empfohlene Vorkenntnisse	Contents of Farm-System Modeling (4904-460)
Anmerkungen	Laptop required for computer exercises in class
Modulprüfung und Gewichtung	Written exam (100%)
Studienleistung und Gewichtung	-

Land Use Economics (4904-431)	
Person(en) verantwortlich	Thomas Berger
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	• Land-use economics: basic concepts and research questions • Land-use modeling: model classes and cases of application • Irrigation as a special land-use problem • Land-use modeling at watershed level (case study) • Land-use modeling with CA and MAS
Literatur	-
Anmerkungen	-

Modul: Life-Cycle Sustainability Assessment (LCSA) of Biobased Value Chains (3403-490)

Modulverantwortung	Iris Lewandowski
Bezug zu anderen Modulen	none
Teilnahmevoraussetzung	none
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 semester
Studiengänge	Bioeconomy (Master) 2. Semester, elective (profile: Sustainability Assessment) Biobased Products and Bioenergy (Master) 2. Semester, elective
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	The students can apply methods of life cycle assessment, social life cycle assessment and life cycle costing to biobased value chains from the fields of biobased materials and bio-chemicals, bioenergy and foodstuffs. They are able to describe and analyse these value chains in terms of their material and energy flows, environmental impact as well as life cycle costs and social indicators. They use the results of the analyses to develop recommendations for sustainable optimization. The students develop their teamwork and communication skills through the exercises and the group preparation of the report. They learn to work independently and train their organizational skills through the performance of the group's own life-cycle sustainability analysis. In preparing the report and discussing the results, students learn and practice critical, analytical thinking through the consideration of the various dimensions of sustainability analysis. Written skills are learned and practiced through the report-writing and verbal communication skills through the presentation of the results.
empfohlene Vorkenntnisse	-

Anmerkungen	The contents of the individual tutorials are provided in ILIAS; please see Nachwachsende Rohstoffe in der Bioökonomie (340b) and module number.
Modulprüfung und Gewichtung	Written report (50%) and presentation of results (50%) (A pass mark must be achieved for each examinable component separately within the same semester.)
Studienleistung und Gewichtung	Written assignment (group work) with presentation
Life-Cycle Sustainability Assessment of Biobased Value Chains (3403-491)	
Person(en) verantwortlich	Iris Lewandowski
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	The module provides fundamental knowledge on and practical skills for the sustainability assessment of biobased value chains. The theory part includes: - ISO norms related to sustainability management (ISO 14 000 series) - Environmental product declarations (EPD) and product category rules (PCR) - The methodical approaches of: Life Cycle Assessment (LCA), Life Cycle Costing (LCC) and Social Life Cycle Assessment (S-LCA) - LCA software (openLCA) and inventory databases (ecoinvent) - Sustainability aspects specific to biobased value chainsl The practical part (in groups) includes: - Drafting of a biobased value chain to be used as a case study for the exercises - Application of Life Cycle Assessment (LCA), including ‘Goal and Scope’ definition, ‘Life Cycle Inventory’ modelling, ‘Life Cycle Impact Assessment’, and ‘Interpretation’ of the results. - Basic application of Life Cycle Costing (LCC) and Social Life Cycle Assessment (S-LCA)

Literatur	-
Anmerkungen	-

Modul: Livestock Production Systems and Development (4908-440)

Modulverantwortung	Mizeck Chagunda
Bezug zu anderen Modulen	Compulsory for the master course Agricultural Sciences in the Tropics and Subtropics. Provides basic understanding of livestock production in tropical countries through a system-approach. Introductory for further modules of section 480a.
Teilnahmevoraussetzung	Accessible for students from different disciplines related to rural development in the tropics and subtropics and/or animal science.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Agricultural Sciences in the Tropics and Subtropics (Master) 1. Semester, compulsory Bioeconomy (Master) 3. Semester, elective (profile: Sustainable biomass production systems) Environmental Protection and Agricultural Food Production (Master) 1. Semester. semi-elective
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After completion of the module, students are familiarized with livestock production in developing countries in the tropics and subtropics, they understand the differences between intensive and extensive production systems and have knowledge on options for livestock development. They have an overview of basic disciplines of animal science and have a deeper technical background about animal husbandry, feeding, health and breeding. Technical and system related factors are considered when deriving development options for selected cases in the frame of students\' seminars and enable the students to assess potentials and limitations of applicable technologies. Thereby students enhance their methodological and presentation skills. The structure of the module promotes the ability of students to work independently. At the same time, the ability of students to work in a team as

	well as their communication and cooperation ability is promoted by the group seminars. Critical and analytical thinking is actively supported by interactive elements in the lectures and is demanded in the final examination.
empfohlene Vorkenntnisse	-
Anmerkungen	The module is also accessible for third year BSc students.
Modulprüfung und Gewichtung	Written exam (70%)
Studienleistung und Gewichtung	Written paper with presentation (30%)
Livestock Production Systems and Development (4908-441)	
Person(en) verantwortlich	Christoph Reiber Mizeck Chagunda
Lehrform	Vorlesung mit Seminar
SWS	4
Inhalt	In the first part of the module, a framework for the understanding of livestock production is provided, beginning with the analysis of the state of livestock production in tropical and subtropical countries and classification of livestock production systems. Reproductive and productive characteristics of livestock species and their socio-cultural and socio-economic roles and functions in different production systems are discussed. In the second part, a multi-disciplinary approach addressing different fields of animal science, including an introduction to husbandry, feeding (forage husbandry and conservation), animal health, and breeding (breeds and performances, breeding methods, organization of breeding programs), is presented. Options and perspectives for practical application of technologies in different production systems (pastoral, urban/peri-urban, smallholder crop-livestock) are discussed. Students are encouraged to deepen their knowledge through background reading, exercises, and seminar contributions that are prepared using selected scientific literature under guidance from members of staff.
Literatur	• Greiner, C. (2013). Guns, land, and votes: Cattle rustling and the politics of boundary (re) making in Northern Kenya. African Affairs, 112(447), 216-237.

	• Harris, M., Bose, N. K., Klass, M., Mencher, J. P., Oberg, K., Opler, M. K., ... & Vayda, A. P. (1966). The cultural ecology of India's sacred cattle [and comments and replies]. Current Anthropology, 7(1), 51-66. • Slingenbergh, J. (2013). World Livestock 2013: changing disease landscapes. Food and Agriculture Organization of the United Nations (FAO). • Smith, J., Sones, K., Grace, D., MacMillan, S., Tarawali, S., & Herrero, M. (2013). Beyond milk, meat, and eggs: Role of livestock in food and nutrition security. Animal Frontiers, 3(1), 6-13. • Smith, J., Tarawali, S., Grace, D., & Sones, K. (2013). Feeding the World in 2050: Trade-offs, synergies and tough choices for the livestock sector. Tropical Grasslands-Forrajes Tropicales, 1(2), 125-136. • Waters-Bayer, A., & Bayer, W. (1992). The role of livestock in the rural economy. Nomadic Peoples, 3-18. • Waters-Bayer, A. (2000). Living with livestock in town. Urban Agriculture Magazine, 1, 5pp.
Anmerkungen	This module is also suitable for third year BSc students.

Modul: Introduction to Applied Data Science (5107-410)

Modulverantwortung	Thomas Dimpfl
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	International Business and Economics, Master (PO vom 21.11.18), 1. Semester, Pflicht Agrarwissenschaften - Agricultural Economics, Master (PO vom 12.02.2019), 1. Semester, Wahl Bioeconomy, Master (Studienbeginn ab WS23/24), 3. Semester, Wahl (Profil: Data Science and Artificial Intelligence)
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	122,5
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Die Studierenden haben vertiefte Kenntnisse in der Datenanalyse. Die Studierenden können Datenanalysen kritisch beurteilen und sind in der Lage, eigenständige Datenanalysen vorzunehmen.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	2 Hausarbeiten (je 20%) und Klausur (60%)
Studienleistung und Gewichtung	-

Introduction to Applied Data Science (5107-411)

Person(en) verantwortlich	Thomas Dimpfl
Lehrform	Vorlesung
SWS	2
Inhalt	Einführung in Daten (Datentypen, Datengewinnung, Aufarbeitung, Darstellung; Aspekte von Querschnitts-, Zeitreihen- und Textdaten); Grundprinzipien des Programmierens; Ethik in Statistik und Datenwissenschaften; Ausgewählte Methoden und Evaluation
Literatur	-
Anmerkungen	-

Introduction to Applied Data Science (5107-412)	
Person(en) verantwortlich	Thomas Dimpfl
Lehrform	Übung
SWS	2
Inhalt	Praktische Anwendung der Vorlesungsinhalte auf Problemstellungen der Datenwissenschaften, Einführung in die Programmiersprache R
Literatur	-
Anmerkungen	-

Modul: Master's Thesis (3000-430)

Modulverantwortung	Iris Lewandowski
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Student of the Master's program in Bioeconomy.
Lehrsprache	englisch
ECTS	30
Angebotshäufigkeit	jedes Semester
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (Master, PO vom 01.10.2014) 4. Semester, Pflicht Bioeconomy (ab WS 16/17) (Master, PO vom 01.04.2017) 4. Semester, Pflicht
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	900
Lern- und Qualifikationsziele	For the Master's thesis students work on a narrowly defined problem from the subject area in which the thesis was written within a given period of time, under guidance and using scientific methods. Furthermore, students need to reflect (preferably in a separate chapter of the thesis) the impact of their topic on different aspects along the biobased value chain. Depending on the topic, the Master's thesis may consist of laboratory work, bioinformatic analyses, field investigations or case studies. After successful completion of the Master's thesis, students have acquired detailed knowledge and in-depth skills in the subject area of their Master's thesis and are able to describe the relevance of the thesis results for the bioeconomy. After successful completion of the Master's thesis, students are able to carry out independent scientific work. They have proven that they can think critically and analytically, can write a scientific paper and are able to present the obtained results.
empfohlene Vorkenntnisse	-

Anmerkungen	Please read the information on writing your Master’s thesis on the webpage of the Examinations Office at uhoh.de/mastersthesisbioeconomy.
Modulprüfung und Gewichtung	Master's thesis and defense (optional)
Studienleistung und Gewichtung	-

Modul: Methods in Interdisciplinary Collaboration (4903-460)

Modulverantwortung	Regina Birner
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Agricultural Sciences in the Tropics and Subtropics (Master) 1. Semester, compulsory Bioeconomy (Master) 3. Semester, elective (Profile: Innovation and Entrepreneurship)
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Professionals in the field of agricultural development have to be able to collaborate with colleagues trained in different disciplines, including both natural and social sciences. The goal of this module is to provide the participants with knowledge and skills that will increase their effectiveness and professional success in such an interdisciplinary environment. The module will provide the knowledge and expertise needed to: - interact with professionals trained in different disciplines, - work in an intercultural environment, - plan and manage interdisciplinary research and development projects, - attract funding for interdisciplinary work, - manage staff, even in challenging institutional environments, -interact with political decision-makers and stakeholders,

	- negotiate in organizational and business settings, and - communicate to a wide range of audiences.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written seminar paper based on interdisciplinary group work (60%); assignments and presentations during the module (40%)
Studienleistung und Gewichtung	-
Methods in Interdisciplinary Collaboration (4903-461)	
Person(en) verantwortlich	Regina Birner
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	This module aims to develop knowledge and skills required to manage interdisciplinary research and development projects. The module includes several assignments. Details will be provided in class.
Literatur	-
Anmerkungen	-

Modul: Microbiological Safety within the Feed and Food Production Chain (4605-430)

Modulverantwortung	Ludwig Hölzle
Bezug zu anderen Modulen	The knowledge gained by this basic module may be completed in several other more specific modules, especially 4602-430 "Project in advanced Environmental- and Animal Hygiene", 4602-440 "Laboratory Course in Advanced Environmental- and Animal Hygiene".
Teilnahmevoraussetzung	Students shall have basic knowledge in the biochemistry of carbohydrates, fats and proteins as well as in biology and genetics. For better preparation of the students, an introductory lecture is given for those participants who like to fresh up their knowledge before the module starts.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Environmental Protection and Agricultural Food Production (Master) 1. Semester, compulsory Earth and Climate System Science (Master) 3. Semester, elective Landscape Ecology (Master) 3. Semester, elective Environmental Science - Soil, Water, and Biodiversity (Master) 1. or 3. Semester, elective Agricultural Sciences - Animal Sciences (Master) 3. Semester, elective Agricultural Sciences in the Tropics and Subtropics (Master) 3. Semester, elective Bioeconomy (Master), 3. Semester, elective (Profil: Transforming Food Systems within the Bioeconomy)
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students are able to understand and analyse the complex ecologic and microbial systems in soil, air and water as potential epidemiological niches for plant and animal pathogens and zoonotic agents. In addition, students are enabled to perform hygienic risk assessment during microbiocidal biotechnical processes, i.e. composting, anaerobic treatment and

	waste water treatment. In the group with international students they experience the cultural differences in risk assessment and can develop their intercultural competence in this module. Based on these skills and knowledge absolvents are capable to play an important role as advisors in international consultant teams regarding the hygiene of biotechnical processes. critical, analytical thinking , (foreign) language skills
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	oral exam (100 %)
Studienleistung und Gewichtung	-
Microbiological Safety within the Feed and Food Production Chain (4605-431)	
Person(en) verantwortlich	Wolfgang Beyer Ludwig Hölzle
Lehrform	Vorlesung
SWS	4
Inhalt	Principles of microbial morphology and physiology (bacteria, fungi, viruses), life cycles of parasites, microbiology and parasitology of vertebrates, plants, soils, water, and air; survival and inactivation of organisms; techniques for isolation and identification of organisms from soil, water and air. A set of questions will help in exam preparation.
Literatur	• Brock : Biology of Microorganisms, Pearson Education International, Upper Saddle River,NJ07458 • Hurst, Crawford, Knudsen, McInerney, Stetzenbach: Manual of Environmental Microbiology, ASM Press, Washington, DC • Bush, Fernandez, Esch, Seed: Parasitism, Cambridge University Press, Cambridge
Anmerkungen	-

Modul: Monitoring and Evaluation of Rural Development Projects (4901-480)

Modulverantwortung	Manfred Zeller
Bezug zu anderen Modulen	This module complements the "Poverty and Development Strategies" module with respect to the methodology of evaluation and monitoring of development projects and policies.
Teilnahmevoraussetzung	none
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 semester
Studiengänge	Agricultural Economics (Master), 2. semester, semi-elective
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	This module will enable students to apply different valuation methods for the financial and economic appraisal of development projects. The students will be able to assess the suitability of alternative indicators for monitoring and evaluation, and make well-founded choices on how to design and implement a monitoring system for a development project. They will appreciate the pros and cons as well as cost implications for alternative evaluation designs involving the collection of quantitative as well as qualitative data. Students will learn from practical examples of rural development projects. Examples will be drawn mainly from the International Fund for Agricultural Development (IFAD). Theoretical concepts as well as methods used in development practice for the financial and economic appraisal, students have an insight into the current critical discourse of participatory research. They are familiar with concepts and methods of participatory research with particular emphasis on applications in the field of agricultural and resource economics and in the social sciences. Students are able to assess in which research contexts participatory methods have their particular strengths and how they can be combined with conventional research methods. They are

	skilled in a range of qualitative methods for both data collection and analysis and have practiced them in the field and with the computer. During preparation for the exam, while preparing and following up on lectures and during the seminar and practicals, students practice self-reliance, cooperation and time management. They learn and practice both critical and analytical thinking and reading of scientific literature. In the lecture, seminar and practicals, students are acquainted with different approaches of qualitative data collection and analysis, they know how to use computer software for content analysis and are ultimately able to plan a qualitative research project. Students will work as members of a group which has to review an existing monitoring and evaluation plan for a project implemented by IFAD. In group meetings, students will learn to make plans for division of work, and cooperate with others to reach jointly set goals. Students practice critical thinking, and learn how to defend their viewpoints in the seminar. They further learn how to set up a monitoring and evaluation system and how to apply pertinent methods in monitoring and evaluation.
empfohlene Vorkenntnisse	-
Anmerkungen	The size of the class is limited to 30 master students. The group work will consist of five to six students. Each group works on a larger development project over the course of the semester such as a rice irrigation project, a public works program building water boreholes, and a micro-finance project funding rural small-scale enterprises. In the group work, students apply the concepts and methods covered in the lecture for the critical review of the underlying theory of change of the chosen case study project, and the proposed evaluation designs and monitoring methods. Each group finally presents and defends their findings in the classroom. This presentation is graded based on individual and group performances and corresponds to the 40% of the final grade.
Modulprüfung und Gewichtung	Written exam (60 %)
Studienleistung und Gewichtung	Presentation in groups (40 %)
Monitoring and Evaluation of Rural Development Projects (4901-481)	
Person(en) verantwortlich	Manfred Zeller

Lehrform	Vorlesung mit Übung und Seminar
SWS	4
Inhalt	The module consists of lectures as well as guided group work using case studies from recent projects implemented by international organizations such as the International Fund for Agricultural Development (IFAD). The lecture covers important methods used in the design, monitoring and evaluation of development projects. It begins with the so-called theory of change that helps to map the logical chain of how project inputs achieve changes in outcomes. It then covers the various evaluation designs and methods used in practice and differentiates methods for data collection and monitoring by multiple stakeholders of development projects. Students are introduced to the rationale behind doing financial and economic appraisal of development projects. Furthermore, students will review existing rural development projects, implemented by IFAD and other organizations in a group work exercise.
Literatur	-
Anmerkungen	Baker, J. (2000). Evaluating the Impact of Development Projects on Poverty. A Handbook for Practitioners. The World Bank, Washington, D.C.

Modul: Nachhaltigkeit und Produktionsökologie von rohstofffliefernden Pflanzen (3403-460)

Modulverantwortung	Iris Lewandowski
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Grundlegendes Wissen über pflanzenbauliche Maßnahmen wie Bodenbearbeitung, Saatbettbereitung, Düngung und Pflanzenschutz sollten vorhanden sein, ebenso grundlegende Kenntnisse über Pflanzenphysiologie und prinzipielle Verfahren zur Energiegewinnung aus Biomasse und nachwachsenden Rohstoffen.
Lehrsprache	deutsch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Nachwachsende Rohstoffe und Bioenergie (Master) 1. Semester, Pflicht Landscape Ecology (Master) 3. Semester, Wahl Bioeconomy (Master) 3. Semester, Wahl (Profil: Sustainability Assessment)
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Nach erfolgreicher Teilnahme an diesem Modul können die Studierenden die Aspekte der Nachhaltigkeit in der Produktion von nachwachsenden Rohstoffen und Bioenergiepflanzen benennen und die Zusammenhänge zwischen Pflanzenbauforschung, Ökologie, Ökonomie und sozialen Aspekten beschreiben. Die Studierenden können die ökologischen Aspekte und Potentiale des Anbaus von nachwachsenden Rohstoffen und Energiepflanzen aufzeigen und definieren. Sie haben die Fähigkeit, daraus die Möglichkeit zur Gestaltung nachhaltiger Biomasseproduktionssysteme abzuleiten und kennen die Voraussetzungen zur Zertifizierung von biobasierten Produkten. Die Studierenden können die Ressourcennutzungseffizienz einschätzen, Biomasseproduktions- sowie -versorgungssysteme bewerten und Nährstoffbilanzen erstellen. Sie können die Auswirkungen von Biomasseproduktionssystemen auf die

	Landschaftsnutzungsänderung und Biodiversität beurteilen. Weiterhin können sie das nachhaltige Biomasseproduktionspotential erklären und in Ansätzen ermitteln und Sie verstehen die Grundlagen von Ökobilanzen bzw. des Life-Cycle Sustainability Assessments. Durch die praktischen Übungen in Gruppenarbeit lernen und trainieren die Studierenden Teamfähigkeit und Kommunikationsfähigkeit. Selbständiges und problemorientiertes Arbeiten erlernen und üben die Studierenden bei der Erstellung von ökologischen Bewertungen biogener Wertschöpfungsketten und Biomasse-Bereitstellungskonzepten in den praktischen Übungen. Durch die praktische Anwendung der erlernten Methoden auf konkrete Fallbeispiele, die Vorlesungsvor- und -nachbereitung, die Prüfungsvorbereitung, die abwägende Betrachtung ökologischer Vor- und Nachteile von Biomasse-Bereitstellungskonzepten und die Betrachtung unterschiedlicher Dimensionen der Nachhaltigkeitsanalyse erlernen die Studierenden kritisches und analytisches Denken.
empfohlene Vorkenntnisse	-
Anmerkungen	(Vorgängermodul: 3403-410 Produktionsökologie von Energiepflanzen und nachwachsenden Rohstoffen)
Modulprüfung und Gewichtung	schriftliche Klausur (70 %), Präsentation einer Fallstudie (30 %)
Studienleistung und Gewichtung	-

Nachhaltigkeit und Produktionsökologie von rohstofffliefernden Pflanzen (3403-461)

Person(en) verantwortlich	Iris Lewandowski
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	Das Modul behandelt die vielfältigen Themengebiete der sozialen, ökologischen und ökonomischen Nachhaltigkeit sowie Methoden und Herangehensweisen zur Nachhaltigkeitsbewertung. Die Veranstaltung gliedert sich in einführende Beiträge der Dozenten, Gruppenübungen und Diskussionen sowie der eigenständigen Übertragung der Vorlesungsinhalte auf ein konkretes Biomasseproduktionssystem als Fallbeispiel. Folgende Aspekte der Nachhaltigkeit und Bewertungsmethoden werden behandelt:

	• Ökologische Aspekte, u.a. Ressourcennutzungseffizienz, Landnutzung, Biodiversität • Soziale Aspekte, u.a. Social Impact Assessment, Social Life-Cycle Assessment • Ökonomische Aspekte, u.a. Ökosystemdienstleitungen und Monetarisierung • Life-Cycle Sustainability Assessment • Nachhaltige Biomasseproduktion: Indikatoren & Zertifizierung, nachhaltige Intensivierung, Biomassepotentiale
Literatur	-
Anmerkungen	-

Modul: Natural Resource Use and Conservation in the Tropics and Subtropics (4907-410)

Modulverantwortung	Folkard Asch
Bezug zu anderen Modulen	This module is directly linked to all other compulsory modules in AgriTropics.
Teilnahmevoraussetzung	.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Agricultural Sciences in the Tropics and Subtropics (Master) 1. Semester, compulsory Bioeconomy (Master) 3. Semester, elective (profile: Sustainable biomass production systems) Earth and Climate System Science (Master) 3. Semester, elective Environmental Protection and Agricultural Food Production (Master) 3. Semester, semi-elective
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students acquire basic knowledge on resource use, requirements, and conservation as linked to tropical agricultural production. They learn to define and evaluate the different abiotic and biotic resources and their relevance for sustainable agricultural production systems. The are able to recognize and define disciplinary and systemic interactions of resource use and conservation and can apply this knowledge in concepts of sustainable agricultural production.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written exam (100 %)
Studienleistung und Gewichtung	-

Natural Resource Use and Conservation in the Tropics and Subtropics (4907-411)

Person(en) verantwortlich	Folkard Asch Uta Dickhöfer Bettina Haussmann
Lehrform	Vorlesung
SWS	4

Inhalt	1) Introduction - module requirements - module links within the compulsory moduls - Ilias - exam mode and requirements - expectations 2) Systems thinking - multidisciplinary approaches - Resources - functions - links between resources - concepts of use and conservation 3) Weather - Climate - global circulation - wind systems - ocean currents - global energy distribution - precipitation patterns - agro-ecolgical zoning - agri-ecological zones -examples 4) Precipitation patterns - agro-ecological zoning - agri-ecological zones -definitions- Length of growing period - Köppen-Geiger-vegetation zones -examples 5) Global water cycle - precipitation - evaporation - transpiration - run-off - surface pools - kondesation - movement - immobilisation - water table recharge - drainage - percolation 6) Water as a resource - global water issues- virtual water - Green -Blue -Grey - Water Concepts - rain water harvesting - field water management - water and soil -soil degradation and withering -tropical soils = problem soils 7) General definitions, soil functions and global soil degradation 8) Soil description and systematics 9) Soil diversity at variable scales 10) Problem soils and their management 11) Exercise: Calculation of site characteristics 12) Soil management in Sahelian subsistence farming systems 13) Major land usetypes of the tropics and subtropics and ecosystems services 14) Crop production systems, crop management and resource use in the tropics and subtopics: Potentials and constriants 15) Land use change, LUC assessement: tools and approaches 16) Matter flows in landscapes, interconnectivity of landscapes 17) Land degradation: types, extent, human impact, consequences and mitigation options at landscape level 18) Global diversity of vascular plants, Role of the tropics and subtopics: origin of most food crops, Agricultural threats to biodiversity 19) Natural resource use in tropical livestock systems: - System classifications - Resource use by livestock - efficiency of nutrient and water conversion - examples

	20) Tropical feed resources: - Feed evaluation systems - Nutritional value of tropical feed resources 21) Tropical feed resources: - Nutritional value of tropical feed resources (cont.) - Feed management and conservation - examples of livestock feeding in different production systems 22) Grassland-based livestock production: - Grassland ecotypes - Spatio-temporal availability in resource availability - Pastoral livestock systems 23) Grassland-based livestock production: - Grassland degradation processes - 24) Grassland-based livestock production: Rangeland concepts - Management strategies 25) Plant Genetic Resources (PGR), Roles and functions of crop and varietal diversity in the production system (including linkage with nutrition), PGR conservation (ex situ, in situ - farmer management of diversity), Use of PGR : legal framework (CBD, ITPGRFA, SMTA, benefit sharing) 26) Use of PGR and crop improvement targeting sustainable production systems and sustainable use of natural resources (P, N efficiency) 27) Use of PGR and crop improvement to cope with climate variability and change 28) Use and breeding of minor crops
Literatur	-
Anmerkungen	-

Modul: Natural Science Concepts (1507-400)

Modulverantwortung	Christian Krupitzer
Bezug zu anderen Modulen	This module provides the basic knowledge on natural science concepts that is needed to accomplish the Master Program in Bioeconomy.rnrnIt is a prerequisite for the Module „Sustainable Industrial Processes“rn
Teilnahmevoraussetzung	See admission regulations for the Master Programme Bioeconomy.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (Master, PO vom 01.10.2014) 1. Semester, Wahlpflicht Bioeconomy (ab WS 16/17) (Master, PO vom 01.04.2017) 1. Semester, Wahlpflicht
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After completion of the module, students are able to understand fundamental natural science concepts and have the ability to apply these concepts to Bioeconomy-related challenges. The students are able to define and explain key elements of natural sciences and to communicate their findings to colleagues and professionals from other disciplines. Students improve their communicative skills in scientific discourses and are able to understand and transfer fundamental natural science concepts.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 45
Modulprüfung und Gewichtung	Written exam (100%)
Studienleistung und Gewichtung	-

Natural Science Concepts (1507-401)

Person(en) verantwortlich	Mario Jekle Walter Vetter Herbert Schmidt Jochen Weiss Lutz Fischer

	Jörg Hinrichs Reinhard Kohlus Christian Krupitzer
Lehrform	Vorlesung
SWS	4
Inhalt	The module introduces fundamental concepts of “Natural Sciences” and aims to deliver basic knowledge in Chemistry, Microbiology, Biotechnology, (Food) Engineering, and Material Science. A case study, for instance on ‘Time Temperature Indicators”, fosters knowledge transfer and enables the students to apply the different concepts to one concrete example of application. Lecture-accompanying experiments and guided tours through the laboratories and pilot plants of the Institute of Food Science and Biotechnology are part of the course schedule. Moreover, 2 industry – hosted lectures further highlight the importance of natural Sciences as one of the key disciplines in Bioeconomy.
Literatur	-
Anmerkungen	-

Modul: Online Dairy Science and Technology (1505-450)

Modulverantwortung	Jörg Hinrichs
Bezug zu anderen Modulen	The module complements analytically or process-engineering oriented modules with the background of processing of milk to sophisticated milk products, e.g. milk concentrates and their application up to powders
Teilnahmevoraussetzung	Scientific background and basics in food microbiology, chemistry, engineering, and soft matter science. Participation at Online Dairy Science and Technology is only possible if 1505-440 has not been accomplished.
Lehrsprache	englisch
ECTS	5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	M.Sc. Food Science and Engineering, 2. Semester, Wahl M.Sc. Food Biotechnology, 2. Semester, Wahl M.Sc. Food Systems, 2. Semester, Wahl M.Sc. Lebensmittelchemie, 2. Semester, Wahl M.Sc. Bioeconomy, 2. Semester, Wahl (Profil: Transforming Food Systems) Promotionsstudiengang Naturwissenschaften; 1./2. Semester, Wahl
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	94
Arbeitsaufwand (in Stunden)	150
Lern- und Qualifikationsziele	The students learn to understand the sophisticated processing of milk in relation to the physical, chemical and microbiological properties of the raw material and the final product properties. Thereby analytical tools to characterize composition and structure of milk products are studied in order to understand material-process-function relationships. It also teaches the concept of mass and energy balance, the estimation of microbiological risk of milk products and the hazard associated with the various processing steps

	Theoretical knowledge is deepened in composition, analytics, hygiene and aseptic of membrane filtration/ fractionation, evaporation, powder processing. Finally, trouble shooting on practical issue will be done in groups and an outlook will be given to running research projects addressed on future developments and innovations
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 10 (first-in)
Modulprüfung und Gewichtung	Oral exam (20 minutes) or written exam
Studienleistung und Gewichtung	protocol
Online Science and Engineering of milk processing (1505-451)	
Person(en) verantwortlich	Jörg Hinrichs
Lehrform	Vorlesung
SWS	2
Inhalt	The topics are: 1) Physcis, chemistry milk components 2) Chemical and physical analytics 3) Hygiene and Aseptic processing 4) Vacuum evaporation and milk concentrates 5) Membrane materials and processing 6) Drying basics 7) Milk drying 8) Trouble shooting methods 9) Research innovations and outlook
Literatur	Scientific literature, doctoral theses, publications from the department, textbooks in the departmental library. Kessler H.G.: Food & Bio-Process Engineering – Dairy Technology. Verlag A. Kessler, München 2011 Belitz H.D., Grosch W., Schieberle P. Food Chemistry. Springer Verlag

	Lecture handouts
Anmerkungen	-
Online Seminar in advanced milk processing (1505-452)	
Person(en) verantwortlich	Jörg Hinrichs
Lehrform	Seminar
SWS	2
Inhalt	Rework lecture and questions, evaluation, discussion and deepening knowledge of the lecture.
Literatur	Scientific literature, doctoral theses, publications from the department, textbooks in the departmental library. Lecture handout
Anmerkungen	-

Modul: Online – Soft Matter Science I – Food Rheology and Structure (1505-510)

Modulverantwortung	Jörg Hinrichs
Bezug zu anderen Modulen	The module complements analytically or process-engineering oriented modules with the analysis of macrostructural properties, e.g. flow behavior and texture propertise of food
Teilnahmevoraussetzung	The module Online - Soft Matter Science I (1505-510) can only be chosen, if Soft Matter Science I (1505-500) is not already completed or about to be completed.
Lehrsprache	englisch
ECTS	5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 3)
Studiengänge	M.Sc. Bioeconomy; 3. Semester, Wahl (Profil: Transforming Food Systems) M.Sc. Food Biotechnology; 1./3. Semester, Wahl M.Sc. Lebensmittelchemie; 3. Semester, Wahl M.Sc. Molekulare Ernährungswissenschaft; 3. Semester, Wahl M.Sc. Ernährungsmedizin; 3. Semester, Wahl M.S. Food Systems; 1./3. Semester, Wahl Promotionsstudiengang Naturwissenschaften; 1./2. Semester, Wahl
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	94
Arbeitsaufwand (in Stunden)	150
Lern- und Qualifikationsziele	The students learn the basic principles of food structure and rheology. They gain an awareness of the various measurement technologies used to define the structure of complex food matrices. They learn about process modelling. They become familiar with the evaluation of scientific literature regarding food structure and learn to present their work through oral presentations.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 10 (first-in, first-served) Registration via ILIAS is necessary

Modulprüfung und Gewichtung	Exam (80 % of total), Online Presentation via Zoom (20 % of total)
Studienleistung und Gewichtung	-
Online Food Systems: Looking Beyond Rheology and Structure (1505-511)	
Person(en) verantwortlich	Mario Jekle Jörg Hinrichs
Lehrform	Vorlesung
SWS	2
Inhalt	Principles of structural, mechanical, and dynamic characteristics of food systems. Basic information and fundamental terms in rheology, measurement techniques for different food matrices, mechanical strain, dynamic rheology. Measuring systems and principles, methods in structure analysis, analysis of measurement data and modelling.
Literatur	Scientific literature, doctoral theses, publications from the department, textbooks in the departmental library. Metzger T.G. Angewandte Rheologie, Anton Paar ISBN 978-3-200-03652-9 Lecture handout
Anmerkungen	Online version of the course 1505-501 within the module 1505-500
Online Literatur Seminar: Structural Models for Food Systems (1505-512)	
Person(en) verantwortlich	Jörg Hinrichs
Lehrform	Seminar
SWS	2
Inhalt	- Evaluation of publications and research contributions - Analysing scientific literature, presenting and discussing one topic
Literatur	Scientific literature, doctoral theses, publications from the department, textbooks in the departmental library.
Anmerkungen	Online version of the course 1505-502 within the module 1505-500

Modul: Organic Farming in the Tropics and Subtropics (3090-410)

Modulverantwortung	Sabine Zikeli
Bezug zu anderen Modulen	Having studied this module in combination with several other modules for organic farming the student will have a good basis for a profession in international marketing and consulting for organic farming, in certification or extension services for organic agriculture.
Teilnahmevoraussetzung	This module requires basic knowledge in plant and animal production on the level of a Bachelor-degree in agriculture.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Agricultural Sciences in the Tropics and Subtropics (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Sustainable biomass production systems) Organic Agriculture and Food Systems (Master) 3. Semester, elective
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After completing this module, students understand the basic principles of Organic Farming and they are familiar with the specific challenges of its application in tropical and subtropical countries. The students comprehend the role of certification in organic farming and the specific systems that areimplemented for smallholders in developing countries. In addition, the students are understand the interdisciplinary and transdisciplinary approaches of organic farming systems, the interactions between animal husbandry and crop production, in particular for smallholder farms. During preparation for the exam and while preparing and following up on lectures, students practice time management and self-reliance. They learn

	and practice critical and analytical thinking, while writing the seminar paper enhances their scientific articulateness. Through the compilation and interpretation of information from stakeholder interviews during the excursions, students practice and improve their capability of exploring settings from agricultural practice and food processing and their link to science.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written exam (70 %)
Studienleistung und Gewichtung	Seminar paper (30%)
Organic Farming in the Tropics and Subtropics (3090-411)	
Person(en) verantwortlich	Sabine Zikeli
Lehrform	Vorlesung mit Seminar und Exkursion
SWS	4
Inhalt	Introduction to organic farming worldwide, organic farming as a farming system, organic plant production systems in the tropics and subtropics, plant protection and livestock husbandry in organic farming in the tropics and subtropics, certification in developing countries (lecture given by Dr. Neuendorff, CEO of the Gesellschaft für Ressourcenschutz, a certification body that is active worldwide). In addition to the lecture, two workshops (each virtual and on-site) will take place on the topics “Long-term trials in the tropics and subtropics” and ”Organic farming and food security”. Student tasks in the module: Seminars. Teaching: Lectures, group work in the workshops, seminars on different topics and written exam
Literatur	Selected journal contributions will be distributed during the lecture. Further study materials are available in ILIAS.
Anmerkungen	If you want to participate in the module, it is essential that you have access to the E-learning platform ILIAS. Please be aware that the module comprises group work and student seminars which are graded or ungraded requirements for the exam that have to be submitted during the semester.

Modul: Organic Food Systems and Concepts (3090-440)

Modulverantwortung	Sabine Zikeli
Bezug zu anderen Modulen	The module gives an introduction into Organic Farming. It serves as a basis for the more specific the modules on different aspects of organic farming in the M.Sc. Programme Organic Agriculture and Food Systems. The excursions give a real-life impression of organic agriculture and organic food chains.
Teilnahmevoraussetzung	This module requires a basic understanding of agricultural and environmental sciences.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (Master) 3. Semester, elective (profile: Sustainable biomass production systems | Transforming Food Systems within the Bioeconomy) Organic Agriculture and Food Systems (Master) 1. Semester, compulsory
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After completing this module, students understand the background, the basic principles and the history of Organic Farming. They are therefore able to assess the current situation and future changes in the organic sector. Moreover, students comprehend the relationship between Organic Farming and society as well as between Organic Farming and the environment. During preparation for the exam and while preparing and following up on lectures, students practice time management and self-reliance. They learn and practice both critical and analytical thinking and reading of scientific literature, while compiling the padlet enhances their scientific articulateness. Through the compilation and interpretation of information from stakeholder interviews during the excursions, students practice and improve

	their capability to explore settings from agricultural practice and food processing and their link to science.
empfohlene Vorkenntnisse	-
Anmerkungen	This is a compulsory module in the study programme "Organic Agriculture and Food Systems".
Modulprüfung und Gewichtung	Written exam (70%)
Studienleistung und Gewichtung	multimedia elaboration on organic food systems (30%)
Organic Food Systems and Concepts (3090-441)	
Person(en) verantwortlich	Reiner Doluschitz Sabine Zikeli Torsten Müller
Lehrform	Vorlesung mit Seminar und Exkursion
SWS	4
Inhalt	The module consists of four parts to introduce students to organic farming and to give them basic ideas on supply chain management. The module creates a common basis for all students on which the following modules in the M.Sc. programme "Organic Agriculture and Food Systems" will build up. • Part 1: Introduction to organic farming including the basic principles and the history of organic farming • Part 2: Organic Farming Systems: In the this part, you will be introduced to different organic farming systems worldwide • Part 3: Certification: As certification is a major issue in organic farming, it is important to know how to deal with regulations and guidelines. Therefore, students learn how to handle the legal framework of organic farming (e.g. EU regulation 2092 on organic farming) by lectures and exercises provided from lecturer from a certification body • Part 4: Organic farming and resource protection. As resource protection is a basic aim of organic farming, the lecture provides a thorough insight in the benefits and the areas of conflict of organic farming and resource protection. Teaching: Lecture, group works on organic farming in different countries, virtual excursions and discussions with farmers, seminars/essays, written exam
Literatur	• Conford, Philip (2001): The Origins of the Organic Movement. Floris Books, Glasgow, p. 287

	• El-Hage Scialabala, Nadia and Caroline Hattam (2002): Organic agriculture, environment and food security. Environment and Natural Resources Service Sustainable Development Department, FAO, Rome, p. 252 • Lampkin, Nicolas (1999): Organic farming. Farming Press • Stolze, Matthias, et al. (2000): The environmental impacts of organic farming in Europe. Organic Farming in Europe: Economics and Policy. Volume 6. Stuttgart-Hohenheim, p. 125 Up-to-date web pages (e.g. IFOAM, FAO, EU) and journal articles will be given during the modul
Anmerkungen	If you want to participate in the module, it is essential that you have access to the E-learning platform ILIAS. Please be aware that the module comprises group work, student seminars and video tasks assignments which are graded or ungraded requirements for the exam that have to be submitted during the semester.

Modul: Organic Livestock Farming and Products (4908-450)

Modulverantwortung	Mizeck Chagunda
Bezug zu anderen Modulen	Having studied this module in combination with several other modules for organic farming the student will have a good basis for a profession in international marketing and consulting for organic farming, in certification or extension services with a focus on organic livestock farming and products.
Teilnahmevoraussetzung	Basic knowledge in livestock breeding and husbandry and organic agriculture on BSc level
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Agricultural Sciences in the Tropics and Subtropics (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Sustainable biomass production systems) Organic Agriculture and Food Systems (Master) 1. Semester, compulsory
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After completing this module, students understand ethical concepts (man-animal relationship in different cultural contexts) and the role of livestock as a system component in organic farming. They are proficient in international regulations of organic livestock farming and the principles of husbandry, breeding, nutrition and health in organic livestock farming for different species. Students are able to apply these principles in solving problems drawn from concrete examples in temperate, tropical and subtropical countries. During active participation in lectures, preparation for the exam, while preparing and following up on lectures and while preparing the group seminar, students practice self-reliance, time management and team work. They learn and practice both critical and analytical thinking and reading of scientific

	literature in the seminar and through interactive elements in the lectures, while generally improving their ability to explore a scientific issue. Through the seminar presentation, students improve their oral articulateness and their ability to discuss scientific matters.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written exam (70 %)
Studienleistung und Gewichtung	Presentation in groups (20 %) with discussion (5 %) and handout (5%)
Organic Livestock Farming and Products (4908-451)	
Person(en) verantwortlich	Christoph Reiber Mizeck Chagunda
Lehrform	Vorlesung mit Seminar
SWS	4
Inhalt	1) Biological, geopolitical reasons behind principles and international regulations of husbandry, breeding, nutrition and health management in organic livestock farming with examples from different livestock species 2) Examination of animal health and welfare concepts and implications for organic livestock farming 3) Ethical issues of animal-man relationship 4) Measurable and non-measurable traits, factors influencing quality of (organic) livestock products, differences between conventional and organic products, matching specific consumer attitudes towards products from organic livestock farming, environmental footprints of organic vs. conventional products. 5) Potential, constraints and examples of organic livestock production and marketing of organic products in subtropical and tropical countries 6) Livestock as a system component in organic farming: contributions and constraints in different farming systems 7) Environmental and socio-economic sustainability of organic vs. non-organic livestock production. This module goes beyond the basic principles and elements of organic livestock production and organic livestock products. It is aimed to examine and discuss the biological, geo-political and structural reasons behind the principles and regulations of husbandry, breeding, nutrition and health management in organic livestock farming. Further, the module deals with issues of sustainability,

	ethics and interdisciplinarity in different organic livestock production systems. Scheduled lectures with incorporation of internationally renowned guest lecturers transmit basic and advanced knowledge. Interaction with the lecturers from the institute is encouraged during the whole module period. Seminar presentations and development of policy briefs by the scholars on specific topics reinforce the learning process through a combination of preparatory reading selected literature, active presentation of acquired knowledge and enhanced discussions. A digital excursion will demonstrate various organic farming systems and may include organic farms with milk and meat processing, farmers' organisation promoting local breeds with slaughter house and selling point, organic egg production, integrated and social farms with own selling points.
Literatur	• Chander M., Subrahmanyeswari B., Mukherjee R., Kumar S. (2011): Organic livestock production: an emerging opportunity with new challenges for producers in tropical countries. Revue Scientifique et Technique-Office International des Epizooties 30 (3): 969-983. • Escribano A.J. (2015) Organic livestock Farming — Challenges, Perspectives, and Strategies to Increase Its Contribution to the Agrifood System's Sustainability — A Review. INTECH open science. • Van Wagenberg, C., De Haas, Y., Hogeveen, H., Van Krimpen, M., Meuwissen, M., Van Middelaar, C., & Rodenburg, T. (2017). Animal Board Invited Review: Comparing conventional and organic livestock production systems on different aspects of sustainability. Animal, 11(10), 1839-1851. • Vaarst M. and Alrøe H. F. (2012) Concepts of Animal Health and Welfare in Organic Livestock Systems. Journal of Agricultural and Environmental Ethics 25, 333–347 • Vaarst M. (2015) Role of animals for eco-functional intensification of

	organic agriculture. Sustainable Agriculture Research 4 (3).
Anmerkungen	-

Modul: Plant and Crop Modeling (3103-410)

Modulverantwortung	Thilo Streck
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Basic knowledge of mathematics will be helpful (esp. calculus; ordinary differential equations).
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Agricultural Sciences - Soil Science (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Sustainable biomass production systems) Crop Sciences - Plant Nutrition and Protection (Master) 3. Semester, elective Earth and Climate System Science (Master) 3. Semester, elective Environmental Science - Soil, Water, and Biodiversity (Master) 3. Semester, semi-elective Environmental Protection and Agricultural Food Production (Master) 3. Semester, semi-elective in Specialization "Soil Resources and Land Use"
Prüfungsdauer (in Minuten)	30
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After successfully completing the module, students understand the important role of models of plant and crop growth in many disciplines (e.g. agricultural sciences, agricultural economics, bioeconomics, hydrology, earth system science, environmental physics and meteorology). They can specify the general concepts currently used in modelling the processes determining plant and crop growth. Students have a good understanding of the concepts and modelling approaches required for the development of crop growth models appropriate for various environmental situations from the local to the regional scale. They are finally able to work with and further develop basic plant growth models which integrate knowledge from different disciplines at the interface between biogeophysics, plant physiology and agricultural sciences, in particular models of phenological development, biological switches,

	light transmission in canopies, leaf gas exchange, photosynthesis, growth and respiration, transport processes and assimilate partitioning in plants and water and nutrient uptake by plants. Students are ultimately proficient in respective biochemical approaches and plant morphology. Students enhance their organizational skills, self-reliance, time management and team work abilities while preparing and following up on lectures and during the exercises and while preparing for the exam. They learn and practice critical and analytical thinking in the lectures and the exercises, improve their ability of integrating knowledge from different disciplines, and gain experience in approaching complex scientific subjects.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Oral exam (100 %)
Studienleistung und Gewichtung	-
Plant and Crop Modeling (3103-411)	
Person(en) verantwortlich	Thilo Streck
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	.
Literatur	-
Anmerkungen	-

Modul: Policy Processes in Agriculture and Natural Resource Management (4903-500)

Modulverantwortung	Regina Birner
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	none
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Organic Agriculture and Food Systems (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Bioeconomy Policy Analysis) Agricultural Sciences in the Tropics and Subtropics (Master) 3. Semester, elective Agricultural Sciences - Agricultural Economics (Master) 3. Semester, semi-elective Environmental Protection and Agricultural Food Production (Master) 1. Semester, semi-elective
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After successfully completing this module, students are able to understand and analyze the politics of policy processes in agriculture and natural resource management. They are familiar with theoretical and analytical concepts developed for this purpose in different disciplines (Advocacy Coalition Framework, policy cycle models, theory of the neo-patrimonial state, public choice models, discourse analysis, social mobilization theories). They can apply such concepts to topics that are relevant for policy management and development cooperation, such as participatory and evidence-based policy-making, research-policy linkages, the politics and management of agricultural policy reforms, such as trade liberalization and agricultural subsidy policies, ownership in policy reform, and role of donors and donor coordination.

	During preparation for the exam and while preparing and following up on lectures, students practice time management and self-reliance. They learn and practice critical and analytical thinking, while writing essays enhances their capability of exploring a scientific issue and their scientific articulateness. With the presentation, students improve their oral expression and communication skills.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Oral exam (70 %)
Studienleistung und Gewichtung	Presentation with discussion (30 %)
Policy Processes in Agriculture and Natural Resource Management (4903-501)	
Person(en) verantwortlich	Regina Birner
Lehrform	Vorlesung
SWS	4
Inhalt	• Politics of policy processes in agriculture and natural resource management • Advocacy Coalition Framework, policy cycle models, theory of the neo-patrimonial state, public choice models, discourse analysis, social mobilization theories
Literatur	-
Anmerkungen	-

Modul: Poverty and Development Strategies (4901-420)

Modulverantwortung	Manfred Zeller
Bezug zu anderen Modulen	Is complemented by module 4901-430 "Rural Development Policies and Institutions".
Teilnahmevoraussetzung	none
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	2. Semesterhälfte
Studiengänge	Agribusiness (Master) 3. Semester, elective Agricultural Sciences in the Tropics and Subtropics (Master) 3. Semester, elective Earth and Climate System Science (Master) 3. Semester, elective Agricultural Sciences - Agricultural Economics (Master) 1. Semester, semi-elective Environmental Science - Soil, Water, and Biodiversity (Master) 3. Semester, semi-elective Bioeconomy (Master) 3. Semester, elective (profile: Bioeconomy Policy Analysis)
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	The students can describe issues and objectives of agricultural and rural development. They can provide an overview of the history of development strategies and theories, current approaches and their problems with special emphasis on economic distribution, poverty reduction and growth and their interdependencies. Independent work, critical and analytical thought, written and oral concise expression, team ability.
empfohlene Vorkenntnisse	-
Anmerkungen	Once not offered in WS 19/20. Please register online via ILIAS.
Modulprüfung und Gewichtung	written exam (100 %)
Studienleistung und Gewichtung	-
Poverty and Development Strategies (4901-421)	

Person(en) verantwortlich	Manfred Zeller
Lehrform	Vorlesung
SWS	4
Inhalt	Students learn methods/indicators to measure development, with a specific focus on agriculture, economic growth, poverty, equality, and food security. This includes indicators of development, such as the Human Development Index, and development objectives and their relationships as well as conflicts between them. Data (mainly from World Bank and UN system) are presented on selected development indicators for all developing regions. This is followed by a review of development theories (classical, balanced/unbalanced growth models, modernization theory, basic needs approach, role of transaction costs and rural institutions) and related development strategies and by a discussion of the underlying factors of development (as derived by the development theories), such as the endowment with natural resources and land, labor and population growth, and human, financial and social capital. The contributions of agriculture for overall development are presented. Students learn also about the institutional setting of development aid. This concerns national and international development institutions including non-governmental organizations (NGOs) with their structures, roles and development approaches. Finally, students are introduced to several rural and agricultural development policies, with an emphasis on the role of the state for agricultural and rural development and sectoral policy instruments related to agricultural and food markets, land and rural finance, agricultural extension, and social safety net / public works policies.
Literatur	Major literature references for the module are: • TODARO, M.P. and S.C.Smith 2003. Economic Development. Harlow, UK: Pearson Education Ltd. • Chenery, H. and T.N. Srinivasan (eds.). 1989. Handbook of development economics. Amsterdam, NL: Elsevier Publishers. • World Bank. Annual issues of the World Development Report. New York, NY,

	• USA: Oxford University Press.- especially Attacking Poverty. World Development Report 2000/2001. • Eicher, C.K., and J.M. Staatz (eds.). 1998. International agricultural development. London, UK: Johns Hopkins University Press (especially articles 6, 7, 10, 11, 15, 17, 19, 20, 24, and 27) • UNDP. Annual issues of the Human Development Report. New York, NY, USA: United Nations Development Program (UNDP).
Anmerkungen	Lecture with discussion, work in small groups, study of literature, reader/script. The reader and powerpoint slides are available in the ASTA-Skriptenbüro.

Tutorial Poverty and Development Strategies (freiwillig) (not offered anymore) (4901-422)	
Person(en) verantwortlich	Manfred Zeller
Lehrform	Tutorium
SWS	1
Inhalt	The exercise will offer students to rehearse selected topics covered in the lecture for which students demand additional opportunity for learning and rehearsal. These topics include: • methods for measuring development in various dimensions (for example gross national product, income inequality, income poverty, purchasing power parity, human development index, food security, global hunger index); • analytical concepts used in various development theories; and exercises regarding price/market analysis and investments in agricultural research (e.g. total factor productivity analysis).
Literatur	-
Anmerkungen	-

Modul: Practical Introduction to Programming with Python (1511-500)

Modulverantwortung	Christian Krupitzer
Bezug zu anderen Modulen	Python knowledge, e.g. from 1511-201, 1511-400, 4407-481, AIDAHO Tools, ILIAS self-study module "Python in a Nutshell".
Teilnahmevoraussetzung	This course is intended for students with a foundational understanding of Python programming. Prior to the third week of the semester (06.11.2023), we expect all participants to possess basic knowledge of programming with Python (variables, boolean algebra, data structures, control structures, functions and modules, working with jupyter notebooks). To ensure a common baseline, we offer a "Python in a Nutshell" refresher course, which covers essential Python concepts. Follow this link to access the materials: Python in a Nutshell
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	M.Sc. Wirtschaftsinformatik, 1. Semester, Wahlpflicht M.Sc. Bioeconomy, 3. Semester, Wahl (Profil: Transforming Food Systems within the Bioeconomy | Data Science and Artificial Intelligence) M.Sc. Earth and Climate System Science, 3. Semester, Wahl
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	42
Selbststudium (in Stunden)	138
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	The students will learn the fundamental elements of programming using the Python programming language, as well as relevant tools for development such as ChatGPT, Github Copilot, and CodeX. They will learn how to effectively utilize these tools to support their programming tasks and enhance productivity. Furthermore, the students will be introduced to the basics of computer networks. They will understand how computers communicate and deepen their knowledge through two case studies: the Internet and Industry 4.0. Another focus will be on web development with Python. They will acquire fundamental knowledge about web application

	architecture and be capable of creating rudimentary web applications. Additionally, the students will be introduced to API programming. Lastly, the topic of data analysis will be covered. They will learn how to analyze and visualize data using Python libraries such as NumPy, Pandas, and Matplotlib. Through practical exercises and projects, the students will further develop their skills in Python programming.
empfohlene Vorkenntnisse	-
Anmerkungen	The course will be conducted in a project-based format. In addition to delivering theoretical lecture content, these concepts will be practically applied in projects, with students receiving guidance from tutors
Modulprüfung und Gewichtung	50% written Exam, 50% Assignments (group work permitted)
Studienleistung und Gewichtung	-
Practical Introduction to Programming with Python (1511-501)	
Person(en) verantwortlich	Christian Krupitzer
Lehrform	Vorlesung mit Übung
SWS	-
Inhalt	Programming with Python AI Coding-Tools (e.g. ChatGPT, Github Copilot, ...) Computer Networks Web development with Python API Programming Data Analytics
Literatur	A. Downey: Think Python - How to Think Like a Computer Scientist, Green Tea Press, 2nd edition, 2015. A. Tanenbaum, N. Feamster, and D. Wetherall: Computer Networks, Pearson, 6th edition, 2021.
Anmerkungen	The course will be conducted in a project-based format. In addition to delivering theoretical lecture content, these concepts will be practically applied in projects, with students receiving guidance from tutors.

Modul: Precision Farming (4404-520)

Modulverantwortung	Stefan Böttinger
Bezug zu anderen Modulen	This module shows links to other agricultural disciplins and improves the career perspectives in agricultural engineering.
Teilnahmevoraussetzung	Basic knowledge in English, basic knowledge in process engineering in plant production or practical experience in this field is required.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (Master) 2. Semester, elective (profile: Sustainable biomass production systems) Agricultural Sciences - Major: Crop Production Systems (Master) 2. Semester, elective Food Systems (Master) 2. Semester, elective Agricultural Sciences - Agricultural Engineering (Master) 2. Semester, semi-elective
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students will be able to highlight fundamentals, including - background, potential and perspectives of Precision Farming - data base management and decision support systems (farm management information systems) - function and application of different technical solutions. Students can - apply and appraise precision farming technology and equipment - optimize plant production by understanding and applying sophisticated crop models and software. Critical and analytical thinking as well as language skills and communication and cooperation skills will

	be gained during presenting scientific paper related to Precision Farming in group work.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	written (computer aided; 100 %)
Studienleistung und Gewichtung	-
Precision Farming (4404-521)	
Person(en) verantwortlich	Stefan Böttinger
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	Fundamental precision farming principles and description of spatial heterogeneity of soils and plants; data base structures, geographic information systems (GIS), global navigation satellite systems (GNSS) and variable rate technology (VRT) for the main operations in crop production, especially tillage, sowing, fertilisation and harvesting; decision support and economic evaluation
Literatur	Heege, H.J. (2013): Precision in Crop Farming - Site-specific Concepts and Sensing Methods. Springer Dordrecht Heidelberg New York London
Anmerkungen	Lectures, demonstrations and practical exercises. Each student needs to contribute in a group of students to read, present and discuss a scientific paper as an exam prerequisit. The module is conducted in cooperation with teaching staff from other departments, international scientists and experts from different companies. Lecture handouts and other materials will be provided.

Modul: Processing and Quality of Organic Food (3090-430)

Modulverantwortung	Sabine Zikeli
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Understanding of nature sciences like chemistry and biology.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Organic Agriculture and Food Systems (Master) 1. Semester, compulsory Bioeconomy (Master) 3. Semester, elective (profile: Transforming Food Systems within the Bioeconomy)
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After completing this course, students are proficient in the basic principles of organic food processing and organic food quality based on the organic farming standards and guidelines and their differences to conventional food processing and quality. They understand the most important features related to the quality of processed organic products of plant and animal origin and are able to discuss the differences in food quality between organic and conventional products based on the production methods. Students are familiar with the current challenges in organic food production and processing and have knowledge about sensory testing and food quality assessement. During preparation for the exam and while preparing and following up on lectures, students practice time management and self-reliance. They learn and practice both critical and analytical thinking and reading of scientific literature, while writing essays improves their capability of exploring a scientific issue and enhances their scientific articulateness. Through the compilation and interpretation of information from stakeholder interviews during the excursions, students practice and improve

	their capability to explore settings from agricultural practice and food processing and their link to science.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written exam (100 %)
Studienleistung und Gewichtung	-
Processing and Quality of Organic Food (3090-431)	
Person(en) verantwortlich	Sabine Zikeli Christian Zörb
Lehrform	Vorlesung mit Exkursion
SWS	4
Inhalt	The module gives an overview on organic food processing and quality and covers the following topics: 1) Introduction in the basic principles of food chemistry and food technology 2) Organic Food Processing including the conversion to organic food processing, regulations of organic food processing; processing of certain products: milk, meat, eggs, cereals, vegetables, wine production 3) Introduction to sensory analysis 4) Introduction to specific methods that are specific to organic food quality assessment. The different topics will be covered by different lecturers of the University of Hohenheim and other institutions. During the module three excursions will take place that cover different organic food chains: Meat (visit of a small slaughterhouse), eggs (visit of an organic egg producer) and cereals (visit of an organic mill).
Literatur	will be provided by the different lecturers
Anmerkungen	Please register for the module online in ILIAS. If you have any questions regarding the module, please ask Dr. Zikeli (sabine.zikeli@uni-hohenheim.de)

Modul: Projects in Bioeconomic Research - Applied Project (1505-430)

Modulverantwortung	Jörg Hinrichs
Bezug zu anderen Modulen	The module complements natural science or process-engineering oriented modules, and the module Projects in Bioeconomic Research
Teilnahmevoraussetzung	Interest and basics in natural science and experimental work in the laboratory and/or the pilot plant.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (ab WS 16/17) (Master, PO vom 01.04.2017) 3. Semester, Wahl (Profil: Data Science and Artificial Intelligence)
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	This module serves to introduce students to doing a research project independently, which also prepares them for working on their Master's thesis. The topic is chosen with the supervisor on the basis of the contents of a compulsory or elective module of the programme. The supervisor (postgraduate) is assigned by the department. There are two options for completing this module. Option A: Literature-based project work - Writing a synopsis of the research topic using relevant scientific literature on the topic (10-15 pages). This paper is handed in and discussed with the supervisor.

	- Experimental reproduction of selected relevant data found in the literature (maximum of 3-5 laboratory days; in consultation with the supervisor). Writing a protocol (5-10 pages). The report is handed in and discussed with the supervisor. Option B: Experimental project work - Writing a report (15-25 pages) outlining the experimental task, the materials used as well as methods and results of the experiments (approximately 15 laboratory days). - Analysis of the data in writing.
empfohlene Vorkenntnisse	-
Anmerkungen	Registration on an individual basis in consultation with the supervisor. Please refer to the professor in charge of the module most closely related to your desired research topic. This module does not count towards the final grade.
Modulprüfung und Gewichtung	Report
Studienleistung und Gewichtung	Protocol/Synopsis
Projects in Bioeconomic Research - Applied Project (1505-431)	
Person(en) verantwortlich	Jörg Hinrichs
Lehrform	Projekt/Projektarbeit
SWS	2
Inhalt	This module serves to introduce students to doing a research project independently, which also prepares them for working on their Master's thesis.
Literatur	-
Anmerkungen	-

Modul: Projects in Bioeconomic Research - Group Project (1505-410)

Modulverantwortung	Regina Birner Jörg Hinrichs Christian Krupitzer
Bezug zu anderen Modulen	All compulsory modules of the Master's programme in Bioeconomy.
Teilnahmevoraussetzung	Student of the Master's programme in Bioeconomy.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (ab WS 16/17) (Master, PO vom 01.04.2017) 2. Semester, Pflicht
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	In this module students have the opportunity to apply the methods and skills learned in the compulsory modules. They perform a system analysis of a whole biogenic value chain from an inter- and transdisciplinary perspective. They gain practical knowledge and skills by applying the methods of value stream mapping, life-cycle and impact assessment as well as continuous improvement techniques. This enables students to identify gaps and lacks of knowledge to be addressed in various disciplines of (bioeconomic) research and development.This allows managing projects independently. Students acquire inter- and transdisciplinary skills to analyze biogenic value chains from interrelated agricultural, natural science, engineering as well as social and economical perspectives. Key competencies developed range from independent working and analytical thinking to teamwork, communication and cooperation skills.
empfohlene Vorkenntnisse	-
Anmerkungen	-

Modulprüfung und Gewichtung	Exposé (70%) and presentation (30%)
Studienleistung und Gewichtung	-
Projects in Bioeconomic Research - Group Project (1505-411)	
Person(en) verantwortlich	Dirk Hachmeister Jörg Hinrichs Regina Birner Christian Krupitzer
Lehrform	Projekt/Projektarbeit
SWS	4
Inhalt	In this module a set of tools and skills are provided to identify, describe, evaluate, and improve the sustainability of the value chain of a (new) biobased product. The students analyze a whole biogenic value chain currently on the agenda of the bioeconomy transformation process to develop a deeper understanding of biobased industrial and commercial activities. With support from supervisors and in communication with partners from industry, students first identify a value chain related to food, feed, fibre or fuel production. They then describe, analyse and identify gaps in the value chain from biomass production to conversion and market introduction of the product. The following methods and tools can be used for the system analysis: • “energy and mass flows”, and “thermodynamic considerations” • supply chain management based on “value stream mapping” and “continuous improvement techniques”. • “life-cycle assessment”, • “environmental and social impact assessment”. These methods and tools are introduced to demonstrate how to carry out an internet-based case study using a step-by-step approach. Particular emphasis is placed on the selection of green materials, the design of factory operations and the management of market introduction of (new) bio-based products. Environmental and social impacts of the value chain will be assessed and approaches for

	waste reduction and energy saving will be elaborated in order to optimize production. Finally, based on their analysis, students develop a concept to improve an existing biogenic value chain or scientific and engineering pre-studies can be carried out to fill identified gaps or create new products. The results as well as the pros and cons of the applied methods are presented and discussed in class.
Literatur	Linton, J./Klassen, R./Jayaraman, V.: „Sustainable supply chains: An introduction", in: Journal of Operations Mangement, 25. Jahrgang (2007), Heft 6, S. 1075 – 1085. Guinée, Jeroen (Ed.) (2002): Handbook on Life Cycle Assessment - Operational Guide to the ISO Standards Series: Eco-Efficiency in Industry and Science, Vol. 7, Kluwer Academic Publishers, New York. Tallaksen, Joel (2011): Guidelines for Developing a Sustainable Biomass Supply Chain Biomass in: Biomass Gasification: A Comprehensive Demonstration of a Community Scale Biomass Energy System Final Report: 2011 USDA, West Central Research and Outreach Center, University of Minnesota.
Anmerkungen	-

Modul: Properties of Biobased Resources and Products (3405-430)

Modulverantwortung	Christian Zörb
Bezug zu anderen Modulen	“Sustainable industrial processes”
Teilnahmevoraussetzung	See admission regulations for the Master Programme Bioeconomy. This module may be attended by other students in MSc programmes at Hohenheim in agreement with the responsible module coordinator.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (Master) 1. Semester, compulsory Biobased Products and Bioenergy (Master) 3. Semester, elective
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students are able to describe the diversity of biobased resources and decide which are best suited for different uses (material or chemical) in the context of food, feed, fuel and fibre. They are familiar with the properties of biobased resources and intermediate products. Students learn to develop concepts for quality optimization of biobased resources in the biomass production and supply phase (up to the factory gate). This module is related to “Sustainable industrial processes” and deals with the composition and properties of raw biomass. In addition it addresses pre-treatment and primary conversion to intermediate products such as sugar, starch and fibre for further processing to biobased products. Students acquire the multidisciplinary skills and concepts necessary to determine the complex factors influencing biomass properties, composition and quality. Critical, analytical thinking as well as creativity are encouraged in the identification of innovative ways of utilizing biobased resources.

empfohlene Vorkenntnisse	-
Anmerkungen	A mandatory registration for the module is required within the first two weeks per ILIAS. In the introductory session a password is distributed. This module is compulsory for all students of the Bioeconomy Master programme.
Modulprüfung und Gewichtung	Written exam
Studienleistung und Gewichtung	All students prepare and hold a presentation.
Properties of Biobased Resources and Products (3405-431)	
Person(en) verantwortlich	Iris Lewandowski Jan Frank Christian Zörb Florian Fricke
Lehrform	Vorlesung
SWS	4
Inhalt	Students gain knowledge of properties and characteristics of biobased resources and their intermediate products, learn to characterize the quality specifications for different uses (food, feed, fuel, fibre) for the bioeconomy and to become acquainted with technical methods for the optimization of resource quality. The module contents include: 1) Characteristics of biobased resources Composition and properties of biobased resources including biomass from crops, animals, algae, yeasts, organic wastes and residues Characterization of intermediate biobased products occurring in the supply chain Methods for qualitative analysis 2) Quality demands of different use options for biobased resources Description of use options for biobased resources (food, feed, fibre, fuel) Quality and hygiene demands of food and feed products Chemical and mechanical properties required for material, chemical and energetic uses of biomass Competition for biobased resources 3) Optimization of the properties of biobased resources Measures that can be applied during the production of biobased resources, for example in crop production, to support the optimization of biomass properties for different uses. Measures that can be applied in the biomass supply chain to support the optimization of biomass qualities for different uses. Agricultural processes of pre-treatment and conversion, such as ensiling and fermentation in biogas plants, and their influences on biomass properties.
Literatur	to be announced

Anmerkungen	to be announced

Modul: Qualitative Methods in Business Research (5706-450)

Modulverantwortung	Bernd Ebersberger
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	keine
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	International Business and Economics (Master, PO vom 21.11.2018), 1.Semester, Pflicht Bioeconomy (vor WiSe 2020/2021) (Master, PO vom 01.10.2014) 1. Semester, Wahl Bioeconomy (ab WiSe 2020/2021) (Master, PO vom 01.10.2014) 1. Semester, Wahl Bioeconomy (ab WiSe 2021/2022) (Master, PO vom 01.10.2014) 1. Semester, Wahl Bioeconomy (ab WiSe 2023/2024) (Master, PO vom 01.10.2014) 3. Semester, Wahl (Profil: Innovation and Entrepreneuship in the Bioeconomy)
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	180 Stunden: 42 Stunden Präsenzstudium 138 Stunden Selbststudium, Vor- und Nachbereitung
Lern- und Qualifikationsziele	1. Fachkompetenz: Die Studierenden kennen die theoretisch-methodologischen Grundlagen qualitativer Forschung und ihre Bedeutung in der betriebswirtschaftlichen Forschung. Sie kennen Prozess und Design wissenschaftlichen Forschens und Erkennens aus der Perspektive verschiedener interpretativer Ansätze. Sie entwickeln eine differenzierte Sicht auf Möglichkeiten und Grenzen qualitativ- empirischer Methoden und darauf aufbauender Resultate. Sie können die Qualität bestehender Forschung beurteilen, kritisieren und diese diskutieren.

	2. Methodenkompetenz: Die Studierenden kennen verschiedene Methoden der qualitativen Datenerhebung und -auswertung und können diese auf Fragestellungen der Betriebswirtschaftslehre anwenden. Sie können qualitative Forschungs-Designs entwickeln, Daten erheben, diese auswerten, die Ergebnisse berichten und diese interpretieren. Die Studierenden können dem Fachdiskurs folgen und ihre methodischen Entscheidungen gegen Kritik verteidigen. 3. Sozial- und Selbstkompetenz: Die Studierenden entwickeln Selbstständigkeit, Fähigkeit zur Selbstreflexion; diskursive Kompetenz und sachbezogene Dialogfähigkeit; sie erwerben die Fähigkeit, sich neues Wissen anzueignen und in Gruppen zu arbeiten.
empfohlene Vorkenntnisse	-
Anmerkungen	Für weitere Informationen besuchen Sie bitte innovation.uni-hohenheim.de
Modulprüfung und Gewichtung	Hausarbeit
Studienleistung und Gewichtung	-
Qualitative Methods in Business Research (5706-451)	
Person(en) verantwortlich	Bernd Ebersberger
Lehrform	Vorlesung mit Übung
SWS	3
Inhalt	Dieser Kurs behandelt Qualitative Forschungsmethoden in der betriebswirtschaftlichen Forschung * Grundlagen der qualitativen Forschung * Qualitatives Forschungsdesign * Daten • Text Daten • Nicht-textliche Daten * Qualitative Datenanalyse

	* Schreiben qualitativer Forschung
Literatur	Der Kurs baut auf einem Standardlehrbuch für qualitative Forschung auf (wie beispielsweise Flick (2018))und wird durch Forschungsarbeiten ergänzt, die zumeist in referierten Zeitschriften veröffentlicht sind. Eine Literaturliste wird im Kurs zur Verfügung gestellt.
Anmerkungen	Für weitere Informationen besuchen Sie bitte innovation.uni-hohenheim.de

Modul: Qualitäts- und Umweltmanagement in der Agrar- und Ernährungswirtschaft (4202-410)

Modulverantwortung	Sebastian Hess
Bezug zu anderen Modulen	Für Studierende, die später mit Qualität der Produkte zu tun haben werden.
Teilnahmevoraussetzung	Keine
Lehrsprache	deutsch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	Agribusiness (bis Studienbeginn 2018) (Master, PO vom 01.10.2014) 2. Semester, Pflicht Agribusiness (ab Studienbeginn SS 2019) (Master, PO vom 01.04.2019) 2. Semester, Pflicht Bioeconomy (Master) 2. Semester, Wahl (Profil: Transforming Food Systems within the Bioeconomy)
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Die Studierenden haben die theoretischen Grundlagen des Qualitätsmanagements. Sie können verschiedene Betrachtungsweisen und damit Definitionen von Qualität werden verstehen. Sie können die geschichtliche Entwicklung des Qualitätsmanagements nachvollziehen. Die Studierenden haben praktisch anwendbares Handlungswissen um ein Qualitätsmanagement in einem Unternehmen einzuführen. Dabei haben die Studierenden, sowohl für Qualitätsmanagement im Bereich der pflanzlichen Produkte als auch im Bereich der tierischen Produkte, die naturwissenschaftlichen Grundlagen an. Die Studierenden können durch Kenntnis verschiedener Lösungskonzepte, den unterschiedlichen Interessen einzelner Abteilungen in einem Unternehmen gerecht werden. Mögliche Konflikte zum Beispiel zwischen der Marketingabteilung und der Entwicklungsabteilung können sie so erkennen und lösen. Die Studierenden kennen und verstehen die rechtlichen Anforderungen und Konsequenzen von Qualitätsmanagementsystemen.

	Durch die Vorlesungsvor- und Nachbereitung sowie durch die Prüfungsvorbereitung erlernen und trainieren die Studierenden selbstständiges Arbeiten und kritisches, analytisches Denken. Die Studierenden lernen durch die Vorlesungen und durch die Gruppenarbeit und den Vortrag den kompetenten Umgang mit fachlichem Wissen. Durch die Gruppenarbeit bauen die Studierenden ihre Teamfähigkeit und ihre Kommunikationsfähigkeit, sowie ihre Selbst- und Fremdorganisation aus. Bei der Vorbereitung des Vortrags erlernen und trainieren die Studierenden die Informationsbeschaffung, das Strukturieren von Wissen und Informationen und die Visualisierung von Ergebnissen. Durch den Vortrag bauen die Studierenden ihre mündliche Ausdrucksfähigkeit aus und sie erlernen den Wissenstransfer.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Schriftliche Prüfung (100% falls keine Studienleistung erbracht wird; 90% falls Gruppenarbeit und Kurzvortrag gemacht werden)
Studienleistung und Gewichtung	in LV 4202-412 Betriebliches Umweltmanagement in der Agrar- und Ernährungswirtschaft: Gruppenarbeit mit Kurzvortrag + Präsentation (10%) Die Teilnahme ist freiwillig. Die Studierenden können sich Zusatzpunkte erarbeiten, die als Prüfungsleistung angerechnet werden.

Qualitätsmanagement in der Agrar- und Ernährungswirtschaft und in der Pflanzen- und Tierproduktion (4202-411)

Person(en) verantwortlich	Sebastian Hess
Lehrform	Vorlesung
SWS	2
Inhalt	Die Vorlesung beginnt mit der Definition des Begriffs Qualität. Die Theorie des Qualitätsangebots und der Qualitätsnachfrage werden ebenso behandelt, wie die Märkte für Produktqualität. Anschließend wird auf die Qualitätspolitik und das Qualitätsmanagement in Europa eingegangen. Das Qualitätsmanagement nach ISO 9000 ff. und das HACCP-Konzept werden vertieft behandelt. In der Veranstaltung wird auf das Qualitätsmanagement in der tierischen Produktion speziell eingegangen. Die tierärztliche Lebensmittelüberwachung, die Qualitätssicherung bei der Verarbeitung von Rest- und Abfallstoffen aus der landwirtschaftlichen Erzeugung, der Fischerei und Teichwirtschaft, sowie bei der Abwasserbehandlung werden vertieft behandelt.

	Darüber hinaus wird auch auf gesetzliche Vorgaben, Produktionsabläufe und Qualitätssicherung in der Futtermittelproduktion eingegangen. In einem zweiten Teil wird auf das Qualitätsmanagement in der pflanzlichen Produktion eingegangen. Dabei wird auf einige gesetzliche Vorschriften und EU-Normen eingegangen, ebenso wie auf Verfahren zur mehrdimensionalen Qualitätscharakterisierung. Des Weiteren werden Qualitätssicherungsverfahren für die Produktion, Qualitätsmanagement in Betrieben sowie Lagerverfahren bei Obst und Gemüse behandelt.
Literatur	• Literaturliste wird in der Vorlesung herausgegeben • Vorlesungsfolien in ILIAS
Anmerkungen	-

Betriebliches Umweltmanagement in der Agrar- und Ernährungswirtschaft (4202-412)

Person(en) verantwortlich	Reiner Doluschitz
Lehrform	Vorlesung
SWS	2
Inhalt	Nachhaltige Entwicklung, Betriebsbewertungssysteme zur Nachhaltigkeitsmessung, DIN EN ISO 14.001 und EMAS/Agrar-Öko-Audit, Betriebliches Umweltmanagement in der Praxis, Umweltcontrolling sowie Nachhaltigkeitskennzahlen- und Nachhaltigkeitskennzahlensysteme, Ökobilanzen Umweltkostenrechnung und Nachhaltigkeitsmarketingmarketing und Nachhaltigkeitskommunikation. Vorlesung teilweise Selbststudium. Freiwillige Teilnahme an der Gruppenarbeit in 2er Teams mit Kurzvortag und Präsentation zu aktuellen Themen und Fallbeispielen entsprechend der inhaltlichen Schwerpunkte der Lehrveranstaltung. Studierende können sich mit der freiwilligen Gruppenarbeit Zusatzpunkte erarbeiten, die als Prüfungsleistung angerechnet werden.
Literatur	• Baumast, A. und Pape, J. (2013): Betriebliches Nachhaltigkeitsmanagement. Verlag Eugen Ulmer, Stuttgart. • Zapf, R. et al. (2009): Bewertung der Nachhaltigkeit landwirtschaftlicher Betriebe, KTBL Schrift 473. • Baumast, A. und Pape, J. (2009): Betriebliches Umweltmanagement. Verlag Eugen Ulmer, Stuttgart.

Anmerkungen	-

Modul: Quantitative Methods in Biosciences (3402-420)

Modulverantwortung	Hans-Peter Piepho
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	A first course in statistics
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Agricultural Biology (Master), 1. Semester, compulsory Agricultural Sciences in the Tropics and Subtropics (Master) 3. Semester, elective Crop Sciences - Plant Breeding and Seed Science (Master) 1. Semester, elective Crop Sciences - Plant Nutrition and Protection (Master) 1. Semester, elective Environmental Science - Soil, Water, and Biodiversity (Master) 1. Semester, compulsory Organic Agriculture and Food Systems (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Data Science and Artificial Intelligence)
Prüfungsdauer (in Minuten)	120 minutes (60 minutes for EnvEuro students)
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	56 h presence + 124 h preparation at home = 180 h workload (90 h for EnvEuro students)
Lern- und Qualifikationsziele	After successfully completing the first part of this module (Basic Statistics), participants have a solid knowledge of basic statistical methods and concepts. They can apply these methods as used in either the biosciences or in economy. Participants taking also the second part of the module (Biometrics) can master the principles of design of experiments and are able to fit complex linear models to data arising from designed experiments. They are able to make informed use of up-to-date computing tools.

	During preparation for the exam, while preparing and following up on lectures and while participating in the laboratory, participants practice self-reliance and time management. The successful participant is able to identify and apply suitable basic statistical methods for his or her own survey and experiment. Key concepts are understood so that the participant is well equipped to professionally communicate with a statistician about his/her planned experiment or survey both at the design stage and the analysis stage.
empfohlene Vorkenntnisse	-
Anmerkungen	It is necessary to register per ILIAS for the participation in this module. EnvEuro students receive 3 credits after they have successfully completed the first part of this module (Basic Statistics). All other students have to complete both parts to receive 6 credits.
Modulprüfung und Gewichtung	Written exam (100 %)
Studienleistung und Gewichtung	-

Quantitative Methods in Biosciences (3402-421)

Person(en) verantwortlich	Hans-Peter Piepho
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	Descriptive statistics, survey sampling, simple tests, Type I and Type II errors, confidence intervals, linear regression and correlation, residuals, analysis of variance, c2-tests, factorial analysis of variance, multiple linear regression, polynomial regression, nonlinear regression. Lecture. Lab work will be done using a pocket calculator and the SAS statistical package.
Literatur	• Lecture notes. • Mead, R., Curnow, R. N., Hasted. A. M. 1993. Statistical methods in agriculture and experimental biology. 2nd edition. Chapman & Hall, London. • Rees, D.G. 1985. Essential statistics. Chapman and Hall, London.
Anmerkungen	-

Modul: Quantitative Methods in Economics (4901-470)

Modulverantwortung	Manfred Zeller
Bezug zu anderen Modulen	This module is considered as basic for all other modules offered to students in the Major of "Rural Development Economics" in the M.Sc. Agritropics.
Teilnahmevoraussetzung	Successfully completed courses in statistics at undergraduate level are assumed.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	2. Semesterhälfte
Studiengänge	Organic Agriculture and Food Systems (Master) 3. Semester, elective Agricultural Sciences in the Tropics and Subtropics (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Sustainable biomass production systems) Earth and Climate System Science (Master) 3. Semester, elective Agricultural Sciences - Agricultural Economics (Master) 3. Semester, semi-elective
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After completing this module, students: • Know the steps of preparing a field research project • Comprehend the different methods of sampling commonly used in rural areas of developing countries • Are able to utilize about best practices in questionnaire design • Are proficient in various statistical tools to address research questions and to test research hypotheses • Can apply these tools using Stata, a comprehensive statistics software package During preparation for the exam, while preparing and following up on lectures and during the exercises, students practice self-reliance and time management. They learn and practice critical and

	analytical thinking when challenged with statistical analysis. In the exercises, students further practice team work by working in small groups. Skills in professional statistical software such as STATA are indispensable for further scientific work. The skills and competences gained in the course facilitate students to successfully conduct fieldwork activities in rural areas with the highest scientific standard.
empfohlene Vorkenntnisse	-
Anmerkungen	This module targets students from all master programs with a strong interest in empirical quantitative social science research. It is highly recommended to students in their 3rd semester who plan to conduct such research for their master thesis. A certain degree of overlap with module 4902-810 "Applied Econometrics" (compulsory for AgEcon students in their 1st semester) regarding linear regression is unavoidable because the module also targets students from other master programs who may not have chosen "Applied Econometrics" in their 1st semester. However, due to its much broader range of topics, "Quantitative Methods in Economics" is a highly recommended module also and especially for AgEcon students. Please register online via ILIAS. We only accept a maximum of 25 students.
Modulprüfung und Gewichtung	Written exam (100 %)
Studienleistung und Gewichtung	-
Quantitative Methods in Economics (4901-471)	
Person(en) verantwortlich	Manfred Zeller
Lehrform	Vorlesung mit Übung
SWS	3
Inhalt	This module consists of lectures and exercises in the computer lab. Its emphasis is on the design and execution of socio-economic research that investigates issues of rural or agricultural development in developing countries. The course mainly covers quantitative research methods that are used in development economics and in applied socio-economic research in developing countries. The particular contents of the module are as follows: 1) Quantitative research designs in the social sciences 2) The sampling process (constructing sampling frames, sampling procedures, sample size)

	3) The measurement of variables and questionnaire design (with group assignment) 4) Data entry and data cleaning (with computer exercises) 5) Overview of statistical instruments 6) Parametric and non-parametric tests (with computer exercises) 7) Principal component analysis (with computer exercises) 8) Linear regression (with computer exercises) 9) Binary response models (with computer exercises) 10) Matching methods
Literatur	• Black, Thomas R. (1999) Doing quantitative research in the social sciences. An Integrated approach to research design, measurement and statistics. Sage Publications, London. • Field, Andy (2005) Discovering statistics using SPSS. Second Edition. Sage Publications, London. • Hill, R. Carter, Griffiths, William E., and Judge, George G. (2001) Undergraduate econometrics. Second Edition. John Wiley & Sons, New York.
Anmerkungen	-
Exercises to Quantitative Methods in Economics (4901-472)	
Person(en) verantwortlich	Manfred Zeller
Lehrform	Übung
SWS	1
Inhalt	Computer exercises to quantitative methods in economics used in socio-economic research to issues of rural or agricultural development in developing countries.
Literatur	-
Anmerkungen	-

Modul: Schwerpunkt-Seminar Economics of Innovation (5209-610)

Modulverantwortung	Andreas Pyka
Bezug zu anderen Modulen	Innovation Economics 1 und 2
Teilnahmevoraussetzung	Keine
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes Semester
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (vor WiSe 2020/2021) (Master, PO vom 01.10.2014) 1. Semester, Wahl Bioeconomy (ab WiSe 2020/2021) (Master, PO vom 01.10.2014) 1. Semester, Wahl Bioeconomy (ab WiSe 2021/2022) (Master, PO vom 01.10.2014) 1. Semester, Wahl Bioeconomy (ab WiSe 2023/2024) (Master, PO vom 01.10.2014) 3. Semester, Wahl (Profil: Innovation and Entrepreneuship in the Bioeconomy)
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	180 Stunden 28 Stunden Präsenzstudium 152 Stunden Selbststudium
Lern- und Qualifikationsziele	Die Studierenden haben vertiefte Kenntnisse im Bereich der theoretischen und empirischen Innovationsökonomik und der dort Anwendung findenden Methoden erworben. Sie verfügen über Kenntnisse in der Netzwerkforschung, der numerischen Modellanalyse sowie in den statistischen Verfahren zur Auswertung von Patenten. Ein zentraler Bestandteil der innovationsökonomischen Ausbildung ist die problemorientierte Anwendung der erworbenen Kenntnisse und Fertigkeiten auf aktuelle Fragestellungen. Ziel der Seminarveranstaltung ist die Vertiefung der selbständigen Anwendung des Wissens sowie die Vermittlung der auf Basis des Wissens abgeleiteten Erkenntnisse und Schlussfolgerungen. Sie sind in der Lage, selbständig Fragestellungen mit dem aktuellen innovationsökonomischem Instrumentarium zu bearbeiten.
empfohlene Vorkenntnisse	-

Anmerkungen	-
Modulprüfung und Gewichtung	Seminararbeit und Vortrag (15 Min)
Studienleistung und Gewichtung	-
Schwerpunkt-Seminar Economics of Innovation (5209-611)	
Person(en) verantwortlich	Andreas Pyka
Lehrform	Seminar
SWS	2
Inhalt	-
Literatur	-
Anmerkungen	-

Modul: Seminar Bioeconomy Policies (5213-410)

Modulverantwortung	Franziska Schünemann
Bezug zu anderen Modulen	Das Modul passt inhaltlich zum Modul Economic Policy Analysis of the Bioeconomy, beide Module können parallel belegt werden, sind aber keine Voraussetzung fu#reinander.
Teilnahmevoraussetzung	keine
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (ab WS 16/17) (Master, PO vom 01.04.2017) 2. Semester, Wahl (profile: Bioeconomy Policy Analysis)
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	28
Selbststudium (in Stunden)	152
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Die Studierenden sind nach erfolgreichem Abschluss in der Lage, eigenständig wissenschaftlich zu arbeiten und die komplexen Zusammenhänge und Auswirkungen von Bioökonomiepolitiken auf Wirtschaft, Gesellschaft und Umwelt zu verstehen und kritisch zu hinterfragen. Sie können Ihre Arbeit vor Publikum vorstellen, erklären und verteidigen
empfohlene Vorkenntnisse	-
Anmerkungen	Anmeldung u#ber Ilias, auf ca. 20 Teilnehmer/innen begrenzt, first come first serve Prinzip.
Modulprüfung und Gewichtung	Seminararbeit 70% und Vortrag 30%
Studienleistung und Gewichtung	-

Seminar Bioeconomy Policies (5213-411)

Person(en) verantwortlich	Franziska Schünemann
Lehrform	Seminar
SWS	2
Inhalt	Das Seminar bietet einen vertiefenden Einblick in die komplexen Zusammenhänge und Auswirkungen von Bioökonomiepolitiken auf Wirtschaft, Gesellschaft und Umwelt. Die Studierenden fertigen eine Seminararbeit u#ber eine aktuelle Politikmaßnahme in der Bioökonomie an und stellen Ihre Arbeit in einem Vortrag vor. Die Studierenden erweitern

	Ihre Kompetenzen in Bezug auf eigenständiges wissenschaftliches Arbeiten und die Vorstellung Ihrer Forschungsergebnisse. Dabei lernen Sie, aktuelle Politikmaßnahmen in der Bioökonomie an der Schnittstelle der Agrar-, Klima- und Energiepolitik wie z.B. Nachhaltigkeitskriterien, Biokraftstoffquoten oder den Emissionshandel kritisch zu hinterfragen.
Literatur	Wird im Seminar bekannt gegeben.
Anmerkungen	Anmeldung u#ber Ilias, auf ca. 20 Teilnehmer/innen begrenzt, first come first serve Prinzip.

Modul: Soft Matter Science II - Food Physics (1507-510)

Modulverantwortung	Jochen Weiss
Bezug zu anderen Modulen	Second part to Soft Matter I - Food Rheology and Structure
Teilnahmevoraussetzung	Admission to a Master's program. Basic knowledge in physical chemistry and mathematics.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 1)
Studiengänge	Food Science and Engineering (Master, PO vom 01.10.2013) 2. Semester, Pflicht Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 2. Semester, Wahl Bioeconomy (Master, PO vom 01.10.2014) 2. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl Bioeconomy (ab WS 16/17) (Master, PO vom 01.04.2017) 2. Semester, Wahl (Profil: Transforming Food Systems) Food Systems (Master, PO vom 01.10.2019) 2. Semester, Wahl
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Upon completion of this online module, students are expected to have gained knowledge of physical phenomena that play a role in food systems. The students are able to demonstrate an understanding of (i) molecular material science approach to food systems, and (ii) structure-function relationships in matrices composed of proteins, lipids, and carbohydrates, and (iii) the operating principles of advanced physical analytical techniques as well as their use in the analysis of complex food structures. The students are able to apply principles of molecular mass transport,

	solution thermodynamics, phase transitions, and molecular interactions to solve problem-oriented case studies in foods. Furthermore, the students are able to explain, evaluate, and communicate concepts and results. Furthermore, students are able to develop stronger communication skills and develop their skills of applying digital tools by completing assignments and designing clear and well-organized presentatations, posters and flash talks. The students are expected to apply critical and analytical thinking to solve food physics-related challenges. Students are able to improve their written and oral English skills.
empfohlene Vorkenntnisse	-
Anmerkungen	Sign-up for module: in ILIAS Maximum number of participants: 50 Some lectures of this course might be held online.
Modulprüfung und Gewichtung	Written exam (75%) Oral or online exam optional. Three-minute-talk (10%) Poster and its presentation (15%)
Studienleistung und Gewichtung	Laboratory work, Laboratory presentation, Peer review
Soft Matter Science II - Food Physics (1507-511)	
Person(en) verantwortlich	Jochen Weiss
Lehrform	Vorlesung mit Übung und Praktikum
SWS	4
Inhalt	This module reviews fundamental concepts of food physics, and aims to deliver knowledge of principles of physical phenomena (e.g., mass transport, solution thermodynamics, molecular and particle interactions, and phase transitions) in complex food matrices. Case studies highlight the connection between the theory and practical relevance. Student assignments aim to promote knowledge transfer and enable the students to apply the scientific concepts and scientific literature. These assignments involve calculation exercises, virtual lab projects, and generating individual flash talks and poster

	presentations based on current papers in the area of food physics.
Literatur	Principles of Colloid and Surface Chemistry, CRC Press,1997, ISBN: 978-0824793975 Polymer Chemistry, CRC Press, 2007, ISBN: 978-1574447798 Phase Transitions in Foods (1. Ed), Academic Press,1995, ISBN: 978-0125953405 Phase Transitions in Foods (2. Ed) Academic Press, 2016, ISBN: 978-0124080867 Biophysics: An introduction, Springer, 2012, ISBN: 978-3-642-25211-2 Biophysics, Springer, 2002, ISBN: 978-1-4020-0218-2
Anmerkungen	The module is taught online. Online live sessions are designed to answer student questions about the teaching material, and present student assignments in a mini-conference.

Modul: Spatial Data Analysis with GIS (3103-450)

Modulverantwortung	Thilo Streck
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	REGISTRATION FOR THIS MODULE THROUGH THE ILIAS SYSTEM IS MANDATORY. Basic knowledge of descriptive statistics will be helpful. Basic computer skills are required. Students who want to prepare for the module may take the ESRI self-study course. Please contact Dr. Joachim Ingwersen (jingwer@uni-hohenheim.de) for details and a password.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 1)
Studiengänge	Environmental Protection and Agricultural Food Production (Master) 2. Semester, compulsory Environmental Science - Soil, Water, and Biodiversity (Master) | Specialization “Environmental Management”. 2. Semester, compulsory Environmental Science - Soil, Water, and Biodiversity (Master) | Specialization “Soil Resources and Land Use”. 2. Semester, compulsory Landscape Ecology (Master) 2. Semester, semi-elective Agricultural Sciences - Soil Science (Master) 2. Semester, semi-elective Bioeconomy (Master) 2. Semester, elective (profile: Sustainability Assessment)
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	70
Selbststudium (in Stunden)	155
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Students will be able to analyse, process and illustrate spatial data by means of the Geographical Information System ArcGIS and geostatistical computer programs.
empfohlene Vorkenntnisse	-
Anmerkungen	PARTICIPATION IN THE COMPUTER EXERCISES IS MANDATORY. You will not be allowed to take the exam if not having participated regularly in the computer exercises.

Modulprüfung und Gewichtung	Written exam (70%)
Studienleistung und Gewichtung	Electronic exam as a GIS project work (30%). Taking the electronic exam is a precondition for sitting the written exam.
Spatial Data Analysis with GIS (3103-451)	
Person(en) verantwortlich	Thilo Streck
Lehrform	Vorlesung mit Übung
SWS	5
Inhalt	Lecture: This class provides an overview of Geographical Information Systems (GIS) and explains types and sources of spatial data and how data are handled by GIS. Special subjects include map projection, remote sensing, digital terrain analysis, and landcover mapping. Further, we present statistical and geostatistical methods to analyze spatial data (histograms, probability plots, variograms) and to produce maps (inverse distance methods, kriging, cokriging). Computer exercices: The computer exercises introduce participants to the Geographical Information System ArcGIS. The course covers fundamental GIS concepts as well as how to create, edit, and work with georeferenced spatial data. It will be demostrated how to manipulate tabular data, query a GIS database, and present data clearly and efficiently using maps. Moreover, students will be exposed to a variety of techniques for interpolating surfaces from point data such as inverse distance method and kriging. Computer exercises. Basic computer skills are required.
Literatur	• Burrough, P.A. McDonnell, R.A. (1998). Principles of Geographical Information Systems. Oxford University Press, Oxford, UK. • Lillesand, T.M., Kiefer, R.W., Chipman, J.W. (2004). Remote sensing and image interpretation. Wiley, NY, USA. • Chang, K.-T. (2008). Introduction to geographic information systems. McGraw-Hill, Boston, MA, USA.

	• ESRI. 1999. Understanding GIS. Wiley, N.Y., USA. • Isaaks, H.I., Srivastava, R.M. (1989). Applied geostatistics. Oxford University Press, NY, USA.
Anmerkungen	-

Modul: Statistical Learning (5200-510)

Modulverantwortung	Robert Jung Aderonke Osikominu
Bezug zu anderen Modulen	Nachfolgemodul für "5200-410 - Introduction to Statistical Learning ". Eine Belegung beider Module ist nicht möglich.
Teilnahmevoraussetzung	Nur für Studierende, die das Modul "5200-410 - Introduction to Statistical Learning" noch NICHT belegt haben.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	International Business and Economics, Master (PO vom 21.11.2018), 2. Semester, Wahl Economics, Master (PO vom 21.11.2018), 2. Semester, Wahl Management, Master (PO vom 21.11.2018), 2. Semester, Wahl Wirtschaftspädagogik, Master (PO vom 21.11.2018), 2. Semester, Wahl Agrarwissenschaften - Agricultural Economics, Master (PO vom 12.02.2019), 2. Semester, Wahl Bioeconomy (Master) 3. Semester, Wahl (Profil: Sustainability Assessment | Data Science and Artificial Intelligence)
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	122,5
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Die Studierenden haben spezifische Kenntnisse in der Anwendung ausgewählter Methoden des Maschinellen Lernens in der statistischen Datenanalyse. Sie können empirische Analysen aus dem Bereich der Wirtschaftswissenschaften, die auf diesen Methoden basieren, kritisch beurteilen und sind in der Lage eigenständige Analysen vorzunehmen.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	-
Studienleistung und Gewichtung	Klausur
Statistical Learning (5200-511)	

Person(en) verantwortlich	Robert Jung Aderonke Osikominu
Lehrform	Vorlesung
SWS	2
Inhalt	Die Vorlesung bietet einen einführenden Überblick über moderne Methoden des Statistical Learning. Sie soll die Studierenden insb. in die Lage versetzen, vertiefende Module des Schwerpunktbereichs "Data Analytics" belegen zu können.
Literatur	Wird zur Beginn der Vorlesung zur Verfügung gestellt.
Anmerkungen	-
Statistical Learning (5200-512)	
Person(en) verantwortlich	Robert Jung Aderonke Osikominu
Lehrform	Übung
SWS	2
Inhalt	Die Übung vertieft die Methoden und Modelle, die in der Vorlesung vorgestellt werden und wendet diese auf bereitgestellte Datensätze mit Hilfe geeigneter Statistik-Software an.
Literatur	-
Anmerkungen	-

Modul: Sustainability Marketing & Marketing Consulting (4203-460)

Modulverantwortung	Ramona Weinrich
Bezug zu anderen Modulen	This module is a good basis for studying the module 4202-420 Microeconomics and 4902-420 International Food and Agricultural Trade.
Teilnahmevoraussetzung	Basic knowledge in economics and marketing on BSc level, e. g. 4202-010 Grundlagen der Agrarpolitik und Marktlehre (fundamentals of agricultural policy and markets) or on MSc level 4101-430 Socioeconomics of Organic Farming
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 semester
Studiengänge	Organic Agriculture and Food Systems (Master) 2. semester, compulsory Nachwachsende Rohstoffe und Bioenergie (Master) 2. semester, elective Bioeconomy (Master) 2. semester, elective (profile: Transforming Food Systems within the Bioeconomy)
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After successfully completing this module, students understand the specifics of several quality food markets, both within the EU as well as within a global context. They are hereby especially competent in organic, geographical indication, sustainability and functional food. Students are further skilled in marketing methods for food and also have empirical knowledge of markets and international trade of quality foods. While preparing and following up on lectures and while working on their case study (written paper), students practice time management and self-reliance. They learn and practice critical and analytical reading of (preparatory) scientific literature, thereby also reinforcing their learning process. Discussions and writing enhance their scientific articulateness, while presenting the case study

	further improves their oral communication skills. Finally, students are able to actually apply marketing theory in their case studies i.e. real world problems.
empfohlene Vorkenntnisse	-
Anmerkungen	The number of participants is limited to 60 due to the fixed number of case studies.
Modulprüfung und Gewichtung	Written paper in groups (60 %). The written paper (case study) must be passed and cannot be compensated by the oral presentation performance. If the written paper is not passed, the entire module must be repeated.
Studienleistung und Gewichtung	Presentation in groups (40 %); compulsory attendance at guest lecture and the seminar
Sustainability Marketing & Marketing Consulting (4203-461)	
Person(en) verantwortlich	Ramona Weinrich
Lehrform	Vorlesung mit Seminar
SWS	4
Inhalt	1) Scientific writing & presenting 2) Project management 3) Marketing basics 4) Start-ups and business plans 5) Sustainable marketing: social responsibility & ethics 6) Food law requirements 7) Food Labelling & certification 8) Case study (group work, 60 %) and presentation in seminars (40 %) The scheduled lectures contain: • Principles of marketing and its concept. • Understanding consumer demand and behaviour and using information in marketing management. • Examples from selected marketing concepts and international markets highlight the characteristics of trade and regulations of sustainable food and food products. A practice partner (Food Start-Up) will be enforcing practical experience in business creation, sustainablity marketing and marketing consulting. Obligation to attend the guest lecture. The learning process will be reinforced by participation of the students through preparatory reading of selected literature using creativity techniques and discussing in working groups and presenting ideas and results.

	A case study will allow the students to practically apply methods acquired and gained. Compulsory attendance at the case study seminar.
Literatur	• Gary Armstrong, Philip Kotler (2017): Marketing: An Introduction, 13. ed., Prentice Hall, Upper Saddle River/NJ, 2017, 656 p. • Paul Tiffany, Steven Peterson and Colin Barrow (2012): Businss Plans for Dummies, 3. ed. Willey, 2012,375p. • Additional reading material will be given in lecture
Anmerkungen	The number of participants is limited to 60 due to the fixed number of case studies.

Modul: Sustainable Industrial Processes (1510-410)

Modulverantwortung	Rudolf Hausmann
Bezug zu anderen Modulen	“Properties of biobased Resources and Products”
Teilnahmevoraussetzung	See admission regulations for the Master Programme Bioeconomy.rnrnThis module may be attended by other students in MSc programmes at Hohenheim in agreement with the responsible module coordinator.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	Bioeconomy (Master, PO vom 01.10.2014) 2. Semester, Pflicht Bioeconomy (ab WS 16/17) (Master, PO vom 01.04.2017) 2. Semester, Pflicht
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	After successful completion of the course, participants should be able to: • identify thermochemical and biotechnological routes for the conversion of renewable resources. • identify the relevant properties of renewable resources and discuss the differences in comparison to petrochemical-based resources. • name examples and list categories of processed products derived from the conversion of primary agricultural products. • name the required process steps and the specific unit operations utilized for the conversion. • reflect qualitatively on the thermochemical and biochemical steps used in the conversion of renewable resources. • explain the concept of industrial conversion of renewable resources with examples of products, both for thermochemical and biochemical conversion.

	• assess which products are best produced by thermochemical or biochemical conversion. • develop an independent bioeconomic business plan and to apply their oral and written communication skills in scientific discourses. • to critically reflect arguments.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written exam (75%) + oral presentation (25%)
Studienleistung und Gewichtung	Active participation
Biochemical Conversion of Renewable Resources (1510-411)	
Person(en) verantwortlich	Rudolf Hausmann
Lehrform	Vorlesung mit Seminar
SWS	2
Inhalt	The module focuses on the manufacture of products of industrial biotechnology which are currently the most important. Emphasis will be placed on aspects of biorefinery concepts relevant to biotechnology. In addition possibilities of knowledge-based biotechnology for the production of new biobased products will be discussed. This module deals with further processing steps of intermediate biobased products such as sugars and starch. (The initial conversion steps are covered in the module “Properties of biobased resources and products”). During the seminar, participants independently develop a bioeconomic business plan, which is presented in an oral group presentation. Each participant presents his or her individual contribution.
Literatur	-
Anmerkungen	-
Thermochemical Conversion of Renewable Resources (1510-412)	
Person(en) verantwortlich	Andrea Kruse
Lehrform	Vorlesung mit Seminar
SWS	2
Inhalt	The focus is on chemical and thermochemical and conversion of biomass. The module introduces the pretreatment of biomass and the production of sugars as precursors for biochemical processes. In addition it presents the production of chemical energy

	carriers / fuels as well as the production of platform chemicals. This will cover state-of-the-art techniques as well as processes currently under development. The concepts of biorefineries and the role of the different processes involved will also be discussed. During the seminar, participants independently develop a bioeconomic business plan, which is presented in an oral group presentation. Each participant presents his or her individual contribution.
Literatur	-
Anmerkungen	-

Modul: Technologie pflanzlicher Lebensmittel II (1504-430)

Modulverantwortung	Mario Jekle
Bezug zu anderen Modulen	Einführung in Modul "Technologie pflanzlicher Lebensmittel I"
Teilnahmevoraussetzung	-
Lehrsprache	deutsch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 3)
Studiengänge	M.Sc. Food Science and Engineering, 2. Semester, Wahl M.Sc. Food Biotechnology, 2. Semester, Wahl M.Sc. Bioeconomy, 2. Semester, Wahl (Profil: Transforming Food Systems)
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Die Studierenden - führen im Rahmen des Praktikums im Technikum des Lehrstuhls unter industrienahen Bedingungen Versuche zur Verarbeitung pflanzlicher Lebensmittel durch - lernen den Umgang mit den hierfür notwendigen Maschinen und Apparaten kennen - bearbeiten in Kleingruppen komplette Prozesse vom Einsatz der Rohware bis zum fertig verpackten Produkt einschließlich prozessbegleitender Analysen - erwerben in der Vorlesung vertiefte Kenntnisse über alkaloidhaltige Rohwaren (Kaffee, Tee, Kakao und andere), deren Aufbereitung in den Ursprungsländern und Weiterverarbeitung in den Verbraucherländern
empfohlene Vorkenntnisse	-
Anmerkungen	Anzahl Teilnehmerplätze: 30 Anmeldung zur Teilnahme am Modul: Ab Mitte des Wintersemesters bis zu Beginn der Vorlesungszeit

	im Sommersemester durch Aushang am Schwarzen Brett des Fachgebietes.
Modulprüfung und Gewichtung	2-stündige schriftliche Prüfung, Kolloquium (20 Minuten)
Studienleistung und Gewichtung	-
Technologie pflanzlicher Lebensmittel II: Alkaloidhaltige Lebensmittel (1504-431)	
Person(en) verantwortlich	Mario Jekle
Lehrform	Vorlesung mit Seminar
SWS	3
Inhalt	- Kaffee - Tee - Kakao - Weitere alkaloidhaltige Lebensmittel (Guaraná, Maté usw.)
Literatur	Skripte mit speziellen Literaturempfehlungen für die einzelnen Themengebiete
Anmerkungen	-
Technologie pflanzlicher Lebensmittel II: Technologisches Praktikum (1504-432)	
Person(en) verantwortlich	Mario Jekle
Lehrform	Praktikum
SWS	2
Inhalt	- Haltbarmachung durch Erhitzen (Pasteurisation, Sterilisation) und Gefrieren (Nasskonserven, Tiefkühlprodukte) - Alkoholfreie Getränke (Fruchtsaft, -nektar) - Speiseöl - Gelierprodukte (Konfitüre, Fruchtzubereitung) - Lebensmittel-3D-Druck
Literatur	Skripte mit speziellen Literaturempfehlungen für die einzelnen Themengebiete
Anmerkungen	-

Modul: Time Series Econometrics (5211-740)

Modulverantwortung	Robert Jung
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	keine
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	alle 2 Jahre
Dauer des Moduls	1 Semester
Studiengänge	Economics (Erstzulassung WS 17/18) (Master, PO vom 01.10.2016) 4. Semester, Wahl International Business and Economics (Erstzulassung WS 17/18) (Master, PO vom 01.10.2016) 4. Semester, Wahl Management (Erstzulassung WS 17/18) (Master, PO vom 01.10.2016) 4. Semester, Wahl International Business and Economics (Erstzulassung WS 17/18) (Master, PO vom 01.10.2016) 4. Semester, Wahlpflicht Management (Erstzulassung WS 17/18) (Master, PO vom 01.10.2016) 4. Semester, Wahlpflicht Master für das wirtschaftswissenschaftliche Lehramt (Master, PO vom 01.10.2016) 4. Semester, Wahlpflicht Bioeconomy, Master (Studienbeginn ab WS23/24), 3. Semester, Wahl (Profil: Data Science and Artificial Intelligence)
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	122,5
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Die Studierenden haben vertiefte Kenntnisse in der ökonometrischen Analyse von Zeitreihendaten. Aufbauend auf Fähigkeiten aus Einführung in die Ökonometrie können die Studierenden empirische Analysen insbesondere aus dem Bereich der Makroökonomie und der Finanzmarktökonomie kritisch beurteilen und sind in der Lage eigenständige Analysen vorzunehmen.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Klausur
Studienleistung und Gewichtung	-

Time Series Econometrics (5211-741)	
Person(en) verantwortlich	Robert Jung
Lehrform	Vorlesung
SWS	2
Inhalt	Aufbauend auf den Inhalten der Veranstaltung Financial Econometrics I wird die ökonometrische Analyse insbesondere von nichtstationären Prozessen betrachtet. Dazu werden Testverfahren zur Entdeckung stochastischer Trends in Zeitreihen und geeignete Trendbereinigungsverfahren vorgestellt. Die Darstellung des Konzepts der Kointegration sowie die Modellierung und Schätzung der Volatilität in Zeitreihendaten runden die Veranstaltung ab.
Literatur	Martin, Hurn and Harris (2013) Econometric Modelling with Time Series. Cambridge UP Weitere Literatur wird in der Veranstaltung angegeben
Anmerkungen	-
Time Series Econometrics (5211-742)	
Person(en) verantwortlich	Robert Jung
Lehrform	Übung
SWS	2
Inhalt	In der Übung werden die Vorlesungsinhalte vertieft und mit Hilfe einschlägiger Softwarepakte (Stata und R) selbständig Datensätze analysiert
Literatur	Siehe Literaturangabe für die Lectures in Financial Econometrics
Anmerkungen	-

Modul: Waste Management and Waste Techniques (4406-410)

Modulverantwortung	Gerold Hafner
Bezug zu anderen Modulen	This module is a good basis for the environmental part of the M.Sc. programs EnviroFood, AgriTropics and Agricultural Engineering.
Teilnahmevoraussetzung	Basic knowledge in natural sciences is helpful to understand the lectures.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester
Studiengänge	Agricultural Sciences - Agricultural Engineering (Master) 3. Semester, elective Bioeconomy (Master) 3. Semester, elective (profile: Sustainability Assessment) Environmental Science - Soil, Water, and Biodiversity (Master) 3. Semester, semi-elective in Specialization "Environmental Impacts" Environmental Science - Soil, Water, and Biodiversity (Master) 3. Semester, semi-elective in Specialization "Environmental Management" Environmental Protection and Agricultural Food Production (Master) 3. Semester, semi-elective
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students can illustrate the topic "waste" in the municipal, commercial and industrial sectors. They can derive the actual situation of waste management in Germany and abroad from the historical development of industry and society, and illustrate the evolution of waste techniques by the legal framework with a main focus on techniques for waste treatment and their environmental impacts. Students can show opportunities and limitations of waste prevention and waste utilisation by examples. The lecture is illustrated by field trips to e.g. waste treatment plants with composting, sorting, incineration, waste water treatment processes.

	The students will aquire skills like critical and analytical thinking.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	written
Studienleistung und Gewichtung	-
Waste Management and Waste Techniques (4406-411)	
Person(en) verantwortlich	Gerold Hafner
Lehrform	Vorlesung
SWS	4
Inhalt	Characterisation of hazarduous compounds in wastes. The problematic of contaminated sites as a key to understand the goals of modern waste management. The legislative power as initiator for progessive waste management and waste technologies. Techniques to collect and transport wastes. Waste techniques: on ground and underground landfills, waste incineration, pyrolysis, gasification, composting, anaerobic treatment, treatment of municipal and industrial slurries, special treatment processes, waste reduction and waste prevention, opportunities and limitations with examples. Waste utilisation, opportunities and limitations, waste sampling and analytics. Lectures with discussions, use of powerpoint-presentation, overheads, slides and script.
Literatur	-
Anmerkungen	-