Georg-August-Universität
Göttingen

Modulverzeichnis

zu der Prüfungs- und Studienordnung für den konsekutiven Master-Studiengang "Sustainable International Agriculture" (Amtliche Mitteilungen I 6/2011, zuletzt geaendert durch Amtliche Mitteilungen I Nr. 16/2025 S. 284)

Module

Übersicht nach Modulgruppen

I. MSc Sustainable International Agriculture (English)

At least 120 C must be succesfully completed within the following regulations.

1. Specialisations

At least 90 C must be succesfully completed within a specialisation.

a. International Agribusiness and Rural Development Economics

aa. Compulsory modules

The following four compulsory modules must be completed:

bb. Elective compulsory modules

From the following modules five mandatory modules (of which at least one module is on learning work methods with code M) must be completed:

cc. Elective modules

From the following modules (or the so far not chosen mandatory modules of the degree programme) six elective modules must be completed. Language courses at level B1 or B2 of the Common European Framework of Reference for Languages (CEFR) or comparable totaling 6 C may be considered once as electives, provided that the course is not English or the student's native language.

b. International Organic Agriculture

aa. Compulsory modules

The following bridging module (P07) and four compulsory modules comprising 30 C must be successfully completed.

bb. Elective compulsory modules

From the following modules four mandatory modules (of which at least one module is on learning work methods with Code M and one economics module with Code E) must be completed:

cc. Elective modules

From the following modules six elective modules must be completed. It is also possible to choose the mandatory modules of the degree programme so far not chosen. Language courses at level B1 or B2 of the Common European Framework of Reference for Languages (CEFR) or comparable totaling 6 C may be considered once as electives, provided that the course is not English or the student's native language.

c. Tropical Agricultural and Agroecosystems Sciences

aa. Compulsory modules

The following bridging module (P07) and four compulsory modules must be completed.

bb. Elective compulsory modules

From the following modules four mandatory modules (of which at least one module is on learning work methods with Code M) must be completed:

cc. Elective modules

From the following modules, six electives must be completed. It is also possible to choose the mandatory modules of the degree programme that have not already been chosen. Language courses at level B1 or B2 of the Common European Framework of Reference for Languages (CEFR) or comparable totaling 6 C may be considered once as electives, provided that the course is not English or the student's native language.

2. Master's thesis and Colloquium

Successful completion of the Master's thesis and of the colloquium for the Master's thesis is worth 30 Credits.

II. Ergänzende Modulübersicht für Studierende des Double-Degree-Programms mit der Universität Talca

1. Studium an den Universitäten Kassel und Göttingen im 1. und 2. Semester

a. Studium an den Universitäten Kassel und Göttingen

aa. Pflichtmodule (24 C)

Es sind folgende vier Module im Umfang von insgesamt 24 C erfolgreich zu absolvieren:

bb. Wahlpflichtmodule (18 C)

cc. Wahlmodule (18 C)

bb. Wahlpflichtmodule (6 C)

cc. Wahlmodule (6 C)

b. Studium an der Universität Talca

aa. Pflichtmodule (6 C)

bb. Wahlpflichtmodule (24 C)

cc. Wahlmodule (30 C)

3. Studium an den Universitäten Kassel und Göttingen im 3. und 4. Semester

Studierende, die im Rahmen des Double-Degree-Programms mit der Universität Talca studieren, absolvieren während der ersten zwei Studiensemester an der Universität Talca nachfolgendes Studienprogramm.

a. Studium an der Universität Talca

aa. Pflichtmodule (6 C)

bb. Wahlpflichtmodule (24 C)

cc. Wahlmodule (30 C)

b. Studium an den Universitäten Kassel und Göttingen

aa. Pflichtmodule (18 C)

bb. Wahlpflichtmodule (6 C)

cc. Wahlmodule (6 C)

Georg-August-Universität Göttingen **Module M.Agr.0009: Biological Control and Biodiversity**	6 C 6 WLH

Learning outcome, core skills: Gain an understanding of what biological control is and how it can be used effectivelyas part of an IPM system and how biodiversity contributes to control of pest populations and other ecosystem services.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Biological Control and Biodiversity (Lecture, Exercise, Seminar) *Contents*: • Theoretical foundations of biological control • Natural enemy behaviour and biological control success • Biodiversity and ecosystem services in agroecosystems • Practical examples of biological control projects • Plant-herbivore-predator-interactionsPrinciples of population dynamics • Biological weed control	6 WLH
Examination: Written exam (70%; 45 minutes) and presentation (30%; approx. 20 minutes) **Examination prerequisites:** Regular attendance at seminar and exercise and presentation of a seminar talk **Examination requirements:** Basic knowledge of the mechanisms of biological control of herbivorous insects; methodological approaches based on case examples; role of biodiversity for ecosystem processes and the population dynamic of herbivorous insects, multitrophic interactions between plants, herbivorous insects and their natural enemies; biodiversity and services of ecosystems.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Michael Georg Rostás
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Georg-August-Universität Göttingen **Modul M.Agr.0056: Plant breeding methodology and genetic resources** *English title: Plant Breeding Methodology and Genetic Resources*	6 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden lernen, klassische und molekulare Methoden und Techniken bei der Lösung pflanzenzüchterischer Problemen zu integrieren. Sie lernen, eigene Schlussfolgerungen aus klassischen und neuesten Veröffentlichungen zu ziehen und diese Wissenschaftlern und Studierenden verständlich, knapp und klar zu vermitteln.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Plant breeding methodology and genetic resources (Vorlesung) *Inhalte*: Grundlagen der Zuchtmethodik: Populationsgenetik, Zuchtmethoden in der Klon-, Linien-, Hybrid- und Populationszüchtung, Marker-gestützte Selektion für monogene und polygene Merkmale. Nutzung pflanzengenetischer Ressourcen: Wildarten, ex-situ und in-situ-Erhaltung, on-farm-Management. Züchtung für marginale Standorte mit Beispielen aus gemäßigten und tropischen Breiten. Dieses Modul und das Modul "Genetic Principles of Plant Breeding" ergänzen sich wechselseitig.	4 SWS
Prüfung: Klausur (Gewicht: 80%, Dauer: 90 Minuten) und Präsentation, Referat oder Korreferat (Gewicht: 20%, Dauer: ca. 20 Minuten) **Prüfungsanforderungen:** Grundlagen zu: Populationsgenetik, Einsatz von Markern in der Pflanzenzüchtung, Konzepte zur Nutzung Pflanzengenetischen Ressourcen. Gute Kenntnisse: 'Pre-Breeding', Kategorien und Methoden der Pflanzenzüchtung.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** apl. Prof. Dr. Wolfgang Link
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 25	

Georg-August-Universität Göttingen **Modul M.Agr.0086: Weltagrarmärkte** *English title: World Agriculture Markets and Trade*	6 C 6 SWS

Lernziele/Kompetenzen: Die Studierenden kennen die wichtigsten Modelle zur Erklärung internationalen Handels von Agrarprodukten. Sie sind in der Lage, populistische Argumente gegen den Freihandel als solche zu entlarven. Sie können beurteilen, ob es Gründe dafür gibt, bei Agrarprodukten vom Postulat des Freihandels abzuweichen, z.B. um die positiven externen Effekte der Landwirtschaft zu honorieren, die Versorgung mit Nahrungsmitteln sicherzustellen, Öko- und Sozialdumping abzuwehren oder verzerrte Weltmarktpreise für Agrarprodukte zu korrigieren.	**Arbeitsaufwand:** Präsenzzeit: 84 Stunden Selbststudium: 96 Stunden

Lehrveranstaltung: Weltagrarmärkte (Vorlesung, Übung) *Inhalte*: Das Modul befasst sich mit der Situation an den Weltagrarmärkten und den Eingriffen der Agrar- und Handelspolitik in diese Märkte, basierend auf einer Einführung in die Theorie des internationalen Handels.	6 SWS
Prüfung: Mündlich (ca. 30 Minuten) **Prüfungsanforderungen:** Handelstheoretische Grundlagen: Ricardo, Heckscher-Ohlin-Vanek, Viner; Empirische Tests von Handelstheorien; unvollkommener Wettbewerb auf internationalen Märkten; Grundlagen von Gravitätsgleichungen; Institutionen und Organisationen auf Weltagrarmärkten; Agrarhandelsliberalisierung auf multilateraler (WTO) und bilateraler Ebene; spezielle Politikmaßnahmen im internationalen Agrarhandel	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch, Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Bernhard Brümmer
Angebotshäufigkeit: jedes Sommersemester; Göttingen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 90	

Bemerkungen: Es finden parallel zwei Übungen statt (dt/engl).

Georg-August-Universität Göttingen **Modul M.Agr.0106: China Economic Development: From an agricultural economy to an emerging economy** *English title: China Economic Development: From an Agricultural Economy to an Emerging Economy*	6 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden erfahren Einzelheiten über die ökonomische Wandlung Chinas und lernen grundlegende ökonomische Konzepte kennen.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: China Economic Development: From an agricultural economy to an emerging economy (Vorlesung, Seminar) *Inhalte*: Der Kurs ist konzipiert für Masterstudenten der Universität Göttingen. Es werden die Erfahrungen und Lehren aus der ökonomischen Entwicklung Chinas behandelt, indem die Ursachen für die Wandlung von der landwirtschaftlich geprägten zur aufstrebenden Volkswirtschaft erklärt werden.	4 SWS
Prüfung: Präsentation, Referat oder Korreferat (ca. 25 Minuten, Gewichtung 50%) und Hausarbeit (max 15 Seiten, Gewichtung 50%) **Prüfungsanforderungen:** Darstellung und kritische Diskussion eines wissenschaftlichen Aspekts des ökonomischen Wandels in China.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Xiaohua Yu
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 25	

Georg-August-Universität Göttingen **Module M.Agr.0118: Applied Microeconometrics**	6 C 4 WLH

Learning outcome, core skills: Learn the basic logics behind each econometric model, understand the tests for model specification, and appropriately explain the model outputs in connection to economic theories.	**Workload:** Attendance time: 40 h Self-study time: 140 h

Course: Applied Microeconometrics" (Internship, Lecture, Seminar) *Contents*: This course mainly teaches how to correctly apply basic econometric models to studying specific research questions for master level students in agricultural economics, agribusiness, and related programs at the University of Goettingen. The main software package used in this course will be STATA.	4 WLH
Examination: Written examination (120 minutes, 70%) and term paper (max. 12 pages, 30%) **Examination requirements:** 1. Understand the econometric models taught in the class 2. Use Stata skillfully	6 C

Admission requirements: Ökonometrie I / Econometrics I	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Xiaohua Yu
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Georg-August-Universität Göttingen **Module M.Agr.0148: Policy Analysis of International Agri-environmental Schemes**	6 C 4 WLH

Learning outcome, core skills: Students gain essential knowledge on the analysis of policy instruments in agri-environmental systems and are capable to apply selected methods and criteria for policy analysis.	**Workload:** Attendance time: 40 h Self-study time: 140 h

Course: Policy analysis of international agri-environmental schemes (Seminar) *Contents*: This module is aimed at analyzing public policies in agri-environmental schemes. The module will • Outline the role of agriculture for positive and negative environmental externalities, e.g. biodiversity loss, climate change, multi-functionality of agriculture • Introduce into governance and policy processes of agri-environmental schemes • Give an overview of policy instruments, such as economic incentives and environmental standards and regulation • Present criteria and methodologies to conduct policy analysis Students will subsequently conduct a small policy analysis of their own interest in the field of agri-environmental policy and incentive instruments (national, EU-level or international level), e.g. EU-CAP, PES schemes, carbon markets in agriculture, sustainability standards, environmental financing, or land-use planning.	4 WLH
Examination: Presentation (approx. 25 min; 30%) and term paper (max. 20 pages; 70%) **Examination requirements:** Students write a seminar paper on the analysis of specific agri-environmental policy measures applying selected evaluation criteria and methods. Subsequently, they present and discuss their findings in class.	6 C

Admission requirements: none	**Recommended previous knowledge:** M.Agr.0124: Environmental Economics and Policy
Language: English	**Person responsible for module:** Prof. Dr. Meike Wollni
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 2 - 3
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module M.Agr.0151: Data Analysis with R in Agricultural Economics**	6 C

Learning outcome, core skills: Students learn • the basic functionality of the statistical software package R • how to retrieve, manage and analyze datasets • an independent and autonomous usage of online resources (e.g. packages, support, R-literature) with regard to topics in agricultural economics. The course aims at providing a tool-set for the successful completion of final thesis with quantitative focus.	**Workload:** Attendance time: 55 h Self-study time: 125 h

Course: Data Analysis with R in Agricultural Economics (Block course, Exercise) The course is split into two main components: The first one is mainly concerned with R programming while the second part deals with applied analysis of datasets connected to agricultural economics: **1. Programming in R:** Introduction and basic functionalities, data management, data visualization, coding styles, functions and programming, dynamic report generation and maps **2. Applied Data Analysis:** data sources in agricultural economics and related API packages, application of selected econometric techniques	
Examination: Term Paper (max. 15 pages) **Examination requirements:** Students prove that they are capable of • finding relevant data, manage and manipulate datasets • applying an appropriate econometric or statistical method and create a corresponding code which is comprehensive and reproducible • interpreting data and results through the use of graphical tools. The produced code has to be handed in along with the paper and will also be subject to the evaluation.	6 C

Admission requirements: Econometrics I (*M.WIWI-QMW.004*), Introduction to Econometrics (B.WIWI-VWL.0007) or equivalent	**Recommended previous knowledge:** Basic econometric techniques (OLS)
Language: English	**Person responsible for module:** Prof. Dr. Bernhard Brümmer
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Georg-August-Universität Göttingen **Module M.Agr.0156: Microfinance for the Rural Poor: A Business Class**	6 C

Learning outcome, core skills: Students learn concepts of different microfinance instruments, such as microcredit, microsaving, and microinsurance. Students can critically evaluate the potentials and drawbacks of microfinance tools for the rural poor. Designing their own business model, students learn how to properly • work in groups • brainstorm an idea • pitch and argue for their business idea • write a business plan	**Workload:** Attendance time: 66 h Self-study time: 114 h

Course: Microfinance for the Rural Poor: A Business Class (Block course, Lecture) *Contents*: This module provides students with an overview of microfinance instruments. In groups, the students will be given case studies involving rural poor from different regions, facing different problems. The challenge is to apply a microfinance instrument to the respective case study, making it a business model. Being supported, the groups will need to create their own business idea, pitch and argue for it and write a business plan to prove it is a thought through idea.	
Examination: Presentation (approx. 20 minutes, 40%) and term paper (max. 12 pages, 60%) **Examination requirements:** Good knowledge about microfinance instruments (definition, criticism, and examples), Applying business ideas in among low-income population (difficulties and chances); Proper writing of a business plan/ argumentation of an idea).	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Oliver Mußhoff
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module M.Agr.0174: Plant Health Management in Tropical Crops**	6 C 4 WLH

Learning outcome, core skills: Students are able to recognize pests and diseases of tropical crops as treated in this course. They critically evaluate scientific and non-scientific publications on crop protection in the tropics. Students are able to create a scientific presentation according to the standards of international conferences and use interactive teaching material; students know the scope and limits of their knowledge in the treated field, they know where to find relevant, reliable information. Students learn to consider subject-related issues from a variety of different perspectives and to work effectively in international teams.	**Workload:** Attendance time: 36 h Self-study time: 144 h

Course: Plant Health Management in Tropical Crops (Lecture, Excursion, Seminar) *Contents*: Blended learning module; presentation of the most important pests and diseases of the most important tropical crop plants: symptoms, life cycles and plant health management (eg. in rice, maize, cacao, coffee, bananas). Additional crops may be included according to students´ preferences and practical experience. Introduction to relevant international data banks and networks. Use of scientific videos on selected topics of crop protection in the tropics.	4 WLH
Examination: Written exam (45 min, 40%), Student presentation with discussion (ca. 20 min presentation + ca. 10 min discussion 60%) **Examination requirements:** • Written exam: main groups of causal agents, basic botany of the crop plants treated, basic biology of causal agents (life cycles etc.), recognition of symptoms, knowledge of control strategies. • Presentation: appropriate according to the standard of international conferences: relevant and sound content, clear structure, style, language (written and spoken) and pronunciation, citation and use of sources according to good scientific practice.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basics of plant pathology, including basics of integrated pest management
Language: English	**Person responsible for module:** Prof. Dr. Michael Georg Rostás
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 2
Maximum number of students: 30	

Additional notes and regulations:

The module is designed as a blended learning-course with strong emphasis on digital material and student based learning. Contact time is reduced to allow thorough preparation of the presentations.

Georg-August-Universität Göttingen **Module M.Agr.0180: Mineral Nutrition of Crops Under Different Climate and Environmental Conditions**	6 C 4 WLH

Learning outcome, core skills: Students acquire knowledge of characteristic properties and specialities of nutrient cycles of ecosystems of different climate zones and upon different environmental drivers. Participants develop understanding of important processes and interactions between abiotic condition of locations, processes in soils and in particular on their effects on plant nutrient uptake. They know plant adaptation mechanisms. Students also get knowledge of the use of stable isotopes for the study of the above processes.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Mineral nutrition of crops under different climate and environmental conditions (Lecture) *Contents*: Lectures focus on element dynamics in ecosystems starting with element inputs, their internal turnover processes and dynamics and outputs. In the course of the semester they will cover sub-arctic over temperate to tropical zones and key examples. In each zone a key focus will be on adaptation mechanisms that can be found among wild plants and crops. About one third of the module will address stable isotope methods for studying such subjects.	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Knowledge of key characters of nutrient cycles in different climate zones with respect to major problems of soil fertility, plant nutrient supply and other environmental impacts, including anthropogenic management. Second important focus on adaptation mechanisms in plants to cope with nutritional constraints. Basic knowledge in stable isotope tracer methods and natural stable isotope abundance methods for the study of above research subjects.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basics in plant physiology, chemistry and soil science
Language: English	**Person responsible for module:** Prof. Dr. Klaus Dittert
Course frequency: each winter semester	**Duration:**
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 36	

Additional notes and regulations: After successful conclusion of M.Agr.0103 students can not complete M.Agr.0180

Georg-August-Universität Göttingen **Module M.Agr.0200: Machine Learning in Food Economics and Agribusiness**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Machine learning is changing the world from different dimensions, and agricultural and food economics is no exception. In contrast to econometrics of causal analysis, machine learning put more emphasis on prediction and pattern recognition. This course will briefly introduce machine learning algorithms for research of agricultural and food economics. It will help master students to master bask techniques in programing for machine learning with Python and their application in food economics and agribusiness analysis.	Attendance time: 56 h Self-study time: 124 h

Course: Machine Learning in Food Economics and Agribusiness (Lecture, Exercise) *Contents*: This course will introduce basic algorithms in machine learning and apply them to research of agribusiness and food economics. Specifically, we will introduce Python language, and how to use Python to realize plotting, feature engineering, linear regression, logit model, support vector machine, k-nearest neighbor, random forest, k-means clustering, neural network and deep learning (ANN, CNN and RNN). **Course Outline** 1. Introduction to Python and its application of machine learning in agricultural economics 2. Data Plotting and visualization 3. Linear regression and feature engineering 4. Logit model and support vector machine 5. k-nearest neighbor and discrimination analysis 6. Classification and random forest 7. Artificial neural network and deep learning (CNN and RNN) 8. Unsupervised learning: k-means clustering, PAM, Principal Component Analysis, and 9. Machine learning with time series data **Programming Requirement**: 1. Python : https://www.python.org/ 2. Anaconda: https://www.anaconda.com/ 3. VScode: https://code.visualstudio.com/ **Text books:** Swamynathan Manohar.2017.Mastering Machine Learning with Python in Six Steps. APress. Matthes E. , 2022. Python Crash Course, 3rd Edition. No Starch Press, L.A. Raschka Sebastian, Yuxi (Hayden) Liu, Vahid Mirjalili.2022. Machine Learning with PyTorch and Scikit-Learn. Packet Press. 2022.	4 WLH

Reference Papers : Wang H. , X. Yu (2023) “Carbon Dioxide Emission Typology and Policy Implications: Evidence from Machine Learning”. Forthcoming in China Economic Review. Maruejols L., L. Hoeschle, X. Yu (2022) Vietnam between economic growth and ethnic divergence: A LASSO examination of income-mediated energy consumption. Energy Economics. Graskemper V., X. Yu and Jan-Henning Feil (2022) Values of Farmers-Evidence from Germany, Journal of Rural Studies. Vo. 89:13-24. Wang H., L. Maruejols, and X.Yu (2021) Predicting energy poverty with combinations of remote-sensing and socioeconomic survey data in India: Evidence from machine learning. Energy Economics. Vol. 102, 105510. https://doi.org/10.1016/j.eneco.2021.105510 Graskemper V., X. Yu and Jan-Henning Feil (2021). Farmer Typology and Implications for Policy Design – an Unsupervised Machine Learning Approach. Land Use Policy. Volume 103, April 2021, 105328.	
Examination: Written examination (120 minutes, 70%) and homework assignments (30%) **Examination requirements:** Examination requirements: 1. Understand the machine learning models taught in the class 2. Use python skillfully	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Xiaohua Yu
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module M.Agr.0201: Dynamic modelling in land use systems**	6 C 4 WLH

Learning outcome, core skills: System dynamics is an interdisciplinary field of study that combines insights from various disciplines, such as sociology, agronomy, economics, ecology and computer science, to understand the behaviour of complex systems over time. The course on system dynamics aims to equip students with a solid understanding of the principles and methods used in this field. The targets of the course include developing an understanding of complex systems, teaching students how to model and simulate these systems, analysing feedback loops, understanding system behaviour, optimizing systems, and developing effective communication skills.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Dynamic modelling in land use systems (Lecture, Exercise) *Contents*: System dynamics is an interdisciplinary field of study that combines insights from various disciplines, such as sociology, agronomy, economics, ecology and computer science, to understand the behaviour of complex systems over time. The course on system dynamics aims to equip students with a solid understanding of the principles and methods used in this field. 1. Understanding complex systems: The primary target of a course on system dynamics is to help students develop an understanding of complex systems. System dynamics is concerned with the study of systems that are made up of interdependent components that interact with one another in complex ways. These systems can be found in a wide range of fields, such as economics, ecology, healthcare, and engineering. A course on system dynamics provides students with the necessary tools and techniques to analyse and model such systems, and to understand the behaviour of these systems over time. 2. Modelling and simulation: Another important target is to teach students how to develop models of complex systems and simulate their behaviour. System dynamics modelling involves constructing a graphical representation of the system, identifying the key components and their interrelationships, and developing equations that describe the behaviour of the system over time. Simulation involves running these equations to generate predictions of how the system will behave under different conditions. A course on system dynamics helps students develop the skills needed to create and run such models and simulations, and to interpret the results. 3. Analysis of feedback loops: Feedback loops are a central concept in system dynamics, and a course on this topic aims to help students understand their role in complex systems. Feedback loops occur when the output of a system is fed back into the system as input, leading to a cycle of cause and effect. System dynamics courses teach students how to identify different types of feedback loops, such as reinforcing and balancing loops, and how they can impact the behaviour of a system. Students also learn how to analyse the dynamics of feedback loops using mathematical and computational tools.	4 WLH

4. Understanding system behaviour: A course on system dynamics also helps students understand the behaviour of complex systems over time. System dynamics models can be used to generate predictions of how a system will behave under different conditions, and to identify key factors that influence the behaviour of the system. Students learn how to use these models to understand the behaviour of systems in various domains, such as business, healthcare, and the environment. They also learn how to interpret the results of these models and to use them to make informed decisions. 5. System optimization: In addition to understanding system behaviour, a course on system dynamics also teaches students how to optimize complex systems. System optimization involves identifying the goals of the system and developing strategies to achieve them while taking into account various constraints and trade-offs. Students learn how to use system dynamics models to optimize systems in various domains, such as supply chain management, energy systems, and transportation. 6. Communication: Finally, a course on system dynamics aims to develop students' communication skills. Students learn how to communicate complex concepts and models to a wide range of audiences, including policymakers, managers, and other stakeholders. Effective communication is critical in system dynamics, as it helps to ensure that the insights generated by models are understood and acted upon by decision-makers. The targets of the course include developing an understanding of complex systems, teaching students how to model and simulate these systems, analysing feedback loops, understanding system behaviour, optimizing systems, and developing effective communication skills.	
Examination: 4 Home assignments (50%), 1 written paper (50%) **Examination prerequisites:** attendance of 80% of the course sessions	6 C

Admission requirements: none	**Recommended previous knowledge:** Regional Economics, Agroecology, Agr. Sociology, div
Language: English, German	**Person responsible for module:** Dr. sc. agr. Holger Bergmann
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 16	

Georg-August-Universität Göttingen **Module M.FES.321: Ecopedology of the Tropics and Subtropics**	6 C 4 WLH

Learning outcome, core skills: General understanding of the most important aspects of tropical and subtropical soils, their occurrence, genesis, geography, properties and use. Understanding the principles of the international FAO soil profile description and classification.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Ecopedology of the Tropics and Subtropics (Lecture) *Contents*: Part I: General introduction in soils of the tropics and subtropics, their functions, genesis, geography and properties. Objective: general understanding of the most important aspects of tropical soils, their occurrence, genesis, properties and use. The following topics will be discussed: Introduction; Climate, water and vegetation; Weathering and weathering products, clay minerals; Soil organic matter, C and N dynamic; Soil chemical reactions, variable charge; Soil forming processes and development of soils; Water and nutrient cycling of land use systems; Tropical shield areas (example: Amazon basin); Arid shields and platforms (example: West Africa); Tropical mountain areas (example: Andes); Fluvial and coastal areas in the tropics (example: coastal areas in Asia). Part II: Introduction in the description and classification of soils, using in international system (FAO). Objective: understanding the principles of the FAO soil profile description and classification. The course consists of introductory lectures in which the principles of the FAO soil description and classification will be explained. This knowledge will be practiced using examples of soil profiles from different tropical countries. The second part consists of a practical week during which soil profile descriptions and evaluations will be exercised in the field. We will visit three contrasting sites around Göttingen where a site and soil description will be made. The work will be done in small groups. Students discuss their results in a report.	4 WLH
Examination: Term paper (10 pages max.) and written exam (2 hours)	6 C

Examination requirements: Being able to describe, classify and evaluate soils for forestry applications in (sub)tropical regions. Understand most relevant biogeochemical processes and function of (sub)tropical soils. Calculate water and nutrient stocks in soils. Explain differences between soils in different (sub)tropical regions.	

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

Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module M.FES.734: Agroforestry Design Course**	6 C 4 WLH

Learning outcome, core skills: Acquiring knowledge to design an agroforestry system. The gained knowledge will be applied for own design work in groups, in cooperation with real farms that aim to plant agroforestry systems. This course is for students who aim to implement agroforestry in the field as farmers or as agroforestry consultants.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Agroforestry Design Course (Lecture, Excursion, Seminar) *Contents*: Learn about different agroforestry systems, historic developments, design processes, analysis of local conditions, (social) context, complexity, geography and water management, soil and plants, tree spacing and management, economy and marketing and map design. Two short excursions are included.	4 WLH
Examination: Presentation (approx. 10 minutes) with written outline (max. 5 pages)	6 C

Examination requirements: Agroforestry design as a group work of approx. 3 students. Presentation and report to explain and embed the design in scientifically sound contexts, as learned in the course	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge on Agroforestry
Language: German	**Person responsible for module:** Franziska Leonie Gaede
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: cf. examination regulations	**Recommended semester:**
Maximum number of students: 30	

Georg-August-Universität Göttingen **Modul M.Forst.739: Grundlagen und Anwendung Geografischer Informationssysteme in den Lebenswissenschaften** *English title: Basics and application of Geographic Information Systems in life sciences*	6 C 2 SWS

Lernziele/Kompetenzen: Nach erfolgreichem Abschluss des Moduls sind die Studierenden in der Lage selbständig QGIS-Projekte und die zugehörigen Geodaten zu erstellen und zu verwalten, räumliche Analysen für Vektor- und Rasterdaten durchzuführen und wissenschaftliche Kartenlayouts anzufertigen.	**Arbeitsaufwand:** Präsenzzeit: 6 Stunden Selbststudium: 174 Stunden

Lehrveranstaltung: Grundlagen und Anwendung Geografischer Informationssysteme in den Lebenswissenschaften (Übung) *Inhalte*: Die Übung vermittelt grundlegende Kenntnisse zu Geographischen Informationssystemen (GIS; im Kurs QGIS) und wird als ILIAS-Selbstlernmodul angeboten. Das Lernmodul umfasst Hintergrundinformationen, Übungsaufgaben sowie Wissen zur praktischen Durchführung der Übungen in QGIS. Die Wissensvermittlung erfolgt mittels erläuternder Texte sowie kurzer Videosequenzen. Die Studierenden erwerben Kenntnisse und Kompetenzen • zur Anlage und Administration von GIS-Projekten, • zu Datenformaten und -management (Raster-/Vektordaten) • zu Datenquellen und -generierung (Digitalisierung, mobiles GIS, Online-Quellen wie WMS-/WFS-Dienste, etc.), • zum Umgang und der Arbeit mit Vektorattributdaten, • zur räumlichen Analyse von Vektor- und Rasterdaten, • zu Koordinatenbezugssystemen, • zu Symbologie-Optionen von Vektor- und Rasterdaten, sowie • zur Erstellung wissenschaftlicher Karten.	2 SWS
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: Nachweis von Hintergrund- sowie Praxiswissen zu Geografischen Informationssystemen (QGIS): Projekterstellung und -verwaltung, Datenformate, -quellen und -generierung, *Handling* von Vektorattributdaten, räumliche Analysen von Vektor- und Rasterdaten, Koordinatenbezugssysteme, *Layout*-Optionen	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Dr. Inga Schmiedel
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: gemäß Prüfungs- und Studienordnung	**Empfohlenes Fachsemester:**

Maximale Studierendenzahl: 40	

Bemerkungen:

Dieses Modul kann nicht von Studierenden des Schwerpunktes "Waldnaturschutz" belegt werden.

Sobald das Modul M.Forst.739 erfolgreich absolviert wurde, kann das Modul M.Forst.221 nicht mehr belegt werden.

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

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

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

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

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

Additional notes and regulations: Literature: Lecture based materials.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A03M: International and tropical food microbiology and hygiene**	6 C 4 WLH

Learning outcome, core skills: Auf der Basis eines wissenschaftlich zeitgemäßen Kenntnisstandes können die Studierenden moderne und effektive Lebensmittelhygiene-Konzepte bewerten und in komplexe Qualitätsmanagementprogramme integrieren. Die Absolventen sind fähig, ihr Fachwissen in multidisziplinären Arbeitsbereichen der Nahrungsmittelmikrobiologie und -hygiene anzuwenden.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: International and tropical food microbiology and hygiene (Lecture, Exercise) *Contents*: Infektiöse Pathogene und Toxine sind weltweit die Verursacher der meisten Lebensmittelkontaminationen mit Einfluss auf die menschliche Gesundheit. Globale Märkte erfordern ein internationales Überwachungssystem sowie standardisierte Lebensmittelhygiene-Regularien. Dieses Modul gibt einen allgemeinen Überblick über aktuelle international relevante Lebensmittel-bedingte Zoonosen, sowie über Lebensmittelhygieneprogramme. Ein spezieller Aspekt ist die Analyse der Voraussetzungen für solche Programme in den Subtropen und Tropen. Ausführlich wird die Biologie der Infektionserreger erklärt (Parasiten, Pilze, Hefen, Bakterien, Viren, Prionen und deren Toxine), die für die Kontamination und Intoxikation von menschlichen Nahrungsmitteln tierischer Herkunft verantwortlich sind. Einige dieser Keime sind die Ursache für schwere Erkrankungen mit einem letalen Potenzial für Menschen oder Menschen bestimmter Altersgruppen. Die Widerstandsfähigkeit spezieller Mikroorganismen in den Matrices Fleisch, Milch und Eiern und in den dazugehörigen Produkten wird anhand des kompletten Produktionsprozesses „from stable to table" erläutert. Ebenso wird der Verderb von Nahrungsmitteln durch Mikroorganismen diskutiert. Gegenwärtig verfügbare diagnostische Methoden für die Entdeckung von kontaminierten oder verdorbenen Nahrungsmitteln und neue biotechnologische Ansätze in Bezug auf zukünftige Test-Formate werden analysiert. Die Adaptierung von praxisnahen Hygieneregeln und standardisierten Qualitätsmanagement-Systemen an die verschiedenen Tierproduktionssysteme (Wiederkäuer, Schweine, Geflügel) bzw. die nachgelagerten Produktionsprozesse werden erklärt. Diese beinhalten Lebensmittelkonservierung, Keimabreicherung und Keimabtötung (Reinigung, Desinfektion, Autoklavierung, Sterilisation). Neben den negativen mikrobiellen Effekten auf die Nahrungsmittelqualität, werden auch positive Einflüsse, vor allem von Bakterien und Pilzen, auf die Lebensmittelproduktion präsentiert. Biotechnologische Aspekte von genetisch veränderten Nahrungsmittelzusätzen oder gezielt veränderten Keimen sollen diskutiert werden. Dieses Modul wird außerdem in einem praktischen Laborkurs über Lebensmittel-Mikrobiologie gut etablierte Techniken für die mikrobiologische und parasitologische	4 WLH

Diagnostik in verschiedenen Lebensmitteln vermitteln. Die Studierenden werden sowohl klassische Methoden als auch moderne biochemische, immunologische, biotechnologische und molekularbiologische Techniken zur Detektion von infektiösen Keimen, Toxinen und schädlichen Substanzen, die in Lebensmitteln enthalten sein können, praktisch üben. Vorlesungsbegleitende Materialien	
Examination: Oral examination (approx. 90 minutes) **Examination requirements:** Kenntnisse der aktuellen international relevanten Lebensmittelbedingte Zoonosen, der Lebensmittelhygieneprogramme und deren Voraussetzungen für die Tropen und Subtropen sowie der Biologie von Infektionserregern. Wissen über die Widerstandsfähigkeit spezieller Mikroorganismen und dem Verderb von Nahrungsmitteln durch diese, über die verfügbaren diagnostischen Methoden zur Entdeckung kontaminierter oder verdorbener Nahrungsmittel und über neue biotechnologische Ansätze in Bezug auf zukünftige Test-Formate. Kenntnisse der praxisnahen Hygieneregeln und standardisierten Qualitätsmanagement-Systemen, der Lebensmittelkonservierung, der Keimabreicherung und Keimabtötung sowie die positven Einflüsse von Bakterien und Pilzen auf die Lebensmittelproduktion.	6 C

Admission requirements: none	**Recommended previous knowledge:** Grundkenntnisse (B.Sc.Niveau) in Boden-, Pflanzen- und Tierwissenschaften
Language: English	**Person responsible for module:** N. N.
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A04: Livestock reproduction physiology**	6 C 4 WLH

Learning outcome, core skills: Acquire in-depth knowledge of the physiology of reproduction of agricultural livestock; Ability to critically consider what has been learned and to independently identify and solve problems of global challenges in the reproduction of farm animals.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Livestock reproduction physiology (Lecture, Excursion, Exercise, Seminar) *Contents*: Anatomical and physiological principles of reproduction in farm animals (endocrinology, growth factors, oogenesis, spermatogenesis, reproductive cycles, reproductive-specific behavior, insemination and fertilization, pregnancy, parturition, lactation and care of offspring); Reproductive Biotechnologies, Assisted Reproductive Technologies (artificial insemination, pregnancy diagnosis, gamete preservation, embryo transfer, in vitro fertilization, sex determination on gametes and fetuses, cloning techniques, creation of transgenes); stem cells; ethics. Hafez B., Hafez, E.S.E. 2000: Reproduction in Farm Animals 7th ed. Lippincott Williams & Wilkins Publishing; Bearden, H.J., Fuquay, J.W., Willard, S.T. 2004: Applied Animal Reproduction, 6th ed. Pearson Prentice Hall Publishing; Squires, E.J. 2003: Applied Animal Endocrinology 1st ed. CABI Publishing; Pineda, M.H., Dooley, M.P. 2003: Mc Donald's Veterinary Endocrinology and Reproduction 5th ed. Blackwell Publishing.	4 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** The exam will ask knowledge and transfer questions related to the lecture content (i.e. endocrinology, physiology of reproduction, genetics, animal husbandry, animal nutrition, animal hygiene and reproductive biotechnologies). Emphasis is placed on being able to assess the interaction of the individual disciplines in reproductive management.	6 C

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

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.A07: Unconventional livestock and wildlife-management, utilization and conservation** *English title: Unconventional livestock and wildlife-management, utilization and conservation*	6 C

Lernziele/Kompetenzen: Die Studierenden kennen den Unterschied zwischen Nutztier und Haustier, die Bedeutung und das Potenzial derzeit wenig genutzter Haustiere und Wildtiere für die ländliche Entwicklung und die Lebens(unterhalts)bedingungen der ländlichen Bevölkerung in verschiedenen Regionen. Studierende haben einen Überblick über die Vielfalt derzeit wenig genutzter Haustiere, deren Anpassungsmerkmale an verschiedene Lebensräume, deren Biologie, Ökologie sowie deren Produkte und die verschiedenen Haltungssysteme. Studierende kennen die Vielfalt nutzbarer Wildtierarten, deren Biologie, Ökologie, Populationsdynamik und das Potenzial ihrer Nutzung. Sie kennen einerseits die wichtigen internationalen Konventionen, die für den Artenschutz von Bedeutung sind und haben andererseits einen Einblick in Art und Umfang von Mensch-Wildtier-Konflikten. Studierende wissen um Kosten und Nutzen des Zusammenlebens von Wildtieren und menschlichen Gesellschaften auf der gleichen Fläche und verstehen das daraus resultierende Dilemma zwischen a) lokalen, nationalen und internationalen Bestrebungen zum Artenschutz, b) Bestrebungen der Landnutzer zur Sicherung von Lebensunterhalt und Einkommen, c) staatliche Bestrebungen zur wirtschaftlichen Entwicklung. Studierende haben einen Überblick über verschiedene terminale und kontinuierliche Formen der Wildnutzung und deren jeweiligen Beitrag zu diesen teilweise gegenläufigen Zielen.	**Arbeitsaufwand:** Präsenzzeit: 60 Stunden Selbststudium: 120 Stunden

Lehrveranstaltung: Unconventtional livestock and wildlife-management, utilization and conservation (Blockveranstaltung, Exkursion, Seminar) *Inhalte*: Geschichte der Domestikation der Haustiere; Unkonventionelle domestizierte Nutztiere in Asien/Ozeanien, Afrika und Lateinamerika: Biologie, Management, Haltungssysteme, subsistenz- und marktorientierte Erzeugung von Produkten anhand verschiedener Beispiele - von Insekten über Schnecken, Reptilien, Nagetiere bis hin zu wenig verbreiteten Huftieren und anderen großen Pflanzenfressern; wirtschaftliches Potenzial und Beitrag zum Lebensunterhalt der Bevölkerung sowohl lokal als auch national/ regional. Wildtiere in Asien, Afrika and Lateinamerika: Biologie, Populationsentwicklung und Modellierung der Populationsdynamik, Mensch - Wildtier - Konflikte, Internationale Konventionen zu (Agrar-)Biodiversität und Artenschutz, Strategien für den Schutz von Wildtierarten durch kontrollierte Nutzung, verschiedene Wildnutzungssysteme in verschiedenen Organisationsformen: Tourismusnutzung, Fleischnutzungssysteme verschiedener Intensitätsstufen (Jagd/Trophäenjagd "Game-Ranching", "Game Farming", "Feedlot" mit beginnender Domestikation), gemeinschaftliche und genossenschaftliche Organisationsformen im kleinbäuerlichen Umfeld. Potenzieller	SWS

Beitrag verschiedener Nutzungssysteme zum Lebensunterhalt der Bevölkerung. Rechtlicher Rahmen, Möglichkeiten und Perspektiven für den Artenschutz. Diamond, J. 1999: Guns, Germs, and Steel: The Fates of Human Societies. W.W.Norton and Company, New York, 480 p.; Board on Science and Technology for International Development 1991: Microlivestock Little-Known Small Animals with a Promising Economic Future. National Academy Press, Washington D.C., 449; Bonner, R.. 1993: At the Hand of Man - Peril and Hope for Africa's Wildlife. Alfred A. Knopf Inc., New York, 322 p.; Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973/1979 at http://www.cites.org/ (incl. appendices)	
Prüfung: Klausur (90 Minuten, Gewicht: 70%) und Präsentation, Referat oder Korreferat (ca. 20 Minuten, Gewicht: 30%) **Prüfungsanforderungen:** Domestikation / Zähmung; unkonventionelle domestizierte Nutztiere: Biologie, Management, Haltungssysteme, wirtschaftliches Potential. Wildtiere: Biologie, Populationsentwicklung, Modellierung der Populationsdynamik; Mensch-Wildtier-Konflikte, Internationale Konventionen zu Biodiversität und Artenschutz. Wildtiernutzungssysteme: Tourismusnutzung, Fleischnutzung, Jagd/Trophäenjagd.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Grundlagenwissen in den Boden-, Pflanzen-, und Tierwissenschaften
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Eva Schlecht
Angebotshäufigkeit: SoSe, jedes 2 Jahr, alternieernd mit dem Modul M.SIA.A08; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.A08: Social-ecology in livestock production systems** *English title: Social-ecology in livestock production systems*	6 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden verstehen Tierhaltungssysteme als sozio-ökologische Systeme und erkennen die Bedeutung der Handlungen der Tierhalter für das Zustandekommen, Aufrechterhalten und die Weiterentwicklung der Produktionssysteme. Diese Handlungssysteme werden durch akteursorientierte Ansätze untersucht, wobei im Modul ein Schwerpunkt auf Methoden zur Analyse und Verbesserung der Managementaktivitäten der Landwirte gelegt wird. Dies dient dazu, zu verstehen "warum Tierhalter tun was sie tun" und "wie sie produzieren". Die Studierenden lernen, wie sie basierend auf dem Wissen der Landwirte Kenntnisse zur Funktionsweise von low-external input Systemen erlangen können. Kooperatives Lernen wird als transdisziplinäre Methode eingeführt. Durch den Dialog zwischen Wissenssystemen wird das gegenseitige Verstehen von Tierhaltern und Wissenschaftlern verbessert. Dies wird durch Methoden, die auf die Verbesserung der Lernprozesse der Tierhalter ausgerichtet sind, ergänzt. Die Studierenden erlangen umfassende Kenntnisse zum Einsatz von Computermodellen als Lernwerkzeuge, mit denen Verbesserungsmaßnahmen in Ex-ante Evaluierungen getestet werden können. In sogenannten "Was-wenn" Analysen wird untersucht welche Auswirkung die Änderungen von Handlungsregeln auf die betrachteten soziö-ökologischen Systeme haben.	**Arbeitsaufwand:** Präsenzzeit: 60 Stunden Selbststudium: 120 Stunden

Lehrveranstaltung: Social-ecology in livestock production systems (Blockveranstaltung, Vorlesung, Seminar) *Inhalte*: Theoretische Hintergründe der sozio-ökologischen Systembetrachtung; Systemtheorie, Kybernetik erster und zweiter Ordnung, Komplex Adaptive Systeme, Menschliche Handlungssysteme. Akteursorientierte Ansätze zur Analyse von *low-external input* Systemen: • Lokales Wissen und situierte Handlungen • Methoden zur Analyse von lokalem Wissen: Beobachtung zweiter Ordnung und Wissensanalyse • Kooperatives Lernen: Dialog zwischen Wissenssystemen, Aktionsforschung, Farmers' experimentation, partizipatives Monitoring und Evaluierung Modellierung von Tierhaltungssystemen als Lernwerkzeug: • Bio-ökonomische Modellierung • Multiagenten Modellierung und Rollenspiele Kaufmann, B.A. 2007: Cybernetic analysis of socio-biological systems: The case of livestock management in resource poor systems. In: Kommunikation und Beratung, Volume 81, Margraf Publishing; McCown, R.L. 2002: Changing systems for supporting farmers' decisions: problems, paradigms and prospects. Agricultural Systems 74:	SWS

179-220; Wiener, N. 1948: Cybernetics or control and communication in the animal and the machine. John Wiley, New York.	
Prüfung: Klausur (90 Minuten, Gewicht: 70%) und Präsentation, Referat oder Korreferat (ca. 20 Minuten, Gewicht: 30%) **Prüfungsanforderungen:** Sozio-ökologische Systembetrachtung, Systemtheorie, Kybernetik, Komplex Adaptive Systeme, Menschliche Handlungssysteme. Lokales Wissen und situierte Handlungen, Analyse von lokalem Wissen, Kooperatives Lernen, Modellierung von Tierhaltungssystemen.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Grundlagenwissen in den Boden-, Pflanzen-, und Tierwissenschaften
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Brigitte Kaufmann
Angebotshäufigkeit: SoSe, jedes 2 Jahr, alternierend mit dem Modul M.SIA.A07; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 30	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A10M: Livestock nutrition and feed evaluation under (sub)tropical conditions**	6 C 4 WLH

Learning outcome, core skills: Students are able to: • describe the function of the major digestive systems and processes of domestic livestock species and their consequences for ration formulation • understand the different feeding strategies and nutritional requirements of the main livestock species • assess the quality of feedstuffs through theoretical concepts and practical feed quality analyses • calculate rations for the main livestock species • understand abiotic and biotic environmental influences on the physiology of different livestock species • discuss opportunities and limitations of feeding strategies for an optimization of livestock production under specific agro-ecological settings	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Livestock nutrition and feed science *Contents*: The lecture explains and discusses the nutritional physiology of the main livestock species. The adaptation of the different livestock species to climatic conditions and to qualitatively and quantitatively variable fodder supply is analysed. Possibilities to reduce the negative impact of environmental factors on animal production through adapted feeding strategies and ration formulation are evaluated.	2,5 WLH
Course: Laboratory analyses of feedstuffs *Contents*: Students are introduced to the main standard methods of feed quality analyses, such as determination of crude protein, macro-minerals, cell wall constituents and *in vitro* digestibility. They apply these methods onto selected tropical feed samples and write an essay on one method, thereby interpreting the quality of their feed samples which they determined with the selected method.	1,5 WLH
Examination: Oral (approx. 20 minutes; 75%) and protocol (max. 6 pages; 25%) **Examination requirements:** Knowledge of basic terms relevant to livestock nutrition and physiology, feed science and feed quality analysis; insights into interdependencies between the discussed fields and livestock performance; ability to explain species-specific implications of nutrition physiology on global feed requirements of livestock systems.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of animal sciences
Language: English	**Person responsible for module:** Prof. Dr. Eva Schlecht

Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Additional notes and regulations:

Literature:

- *Close, W.H., Menke, K.H. (eds.) 1986: Selected topics in animal nutrition. A manual. Deutsche Stiftung für Internationale Entwicklung (DSE), Feldafing, Germany*
- *Payne, W.J.A., Wilson, R.T. 1999: An Introduction to Animal Husbandry in the Tropics. Blackwell Science Ltd., Oxford, UK*
- *Van Soest, P.J. 1994: Nutritional Ecology of the Ruminant. Cornell University Press, Ithaca, US*
- *Selected up-to-date journal articles*

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.A11: Tropical animal husbandry systems** *English title: Tropical animal husbandry systems*	6 C 4 SWS

Lernziele/Kompetenzen: Studierende sind in der Lage • den Einfluss von Umweltfaktoren und sozio-ökonomischen Bedingungen auf die Entstehung und Weiterentwicklung verschiedener Tierhaltungssysteme in den (sub)Tropen zu verstehen. • den Einfluss der genanten Variablen auf die Ausrichtung und Intensität der tierischen Produktion zu erklären • die Kenngrößen zu identifizieren, die bei einer ganzheitlichen Analyse eines Tierhaltungs-systems berücksichtigt werden müssen eigenständig ein spezifisches Tierhaltungssystem vorzustellen und seine Vorzüge und Nachteile in ökologischer und ökonomischer Hinsicht zu diskutieren	**Arbeitsaufwand:** Präsenzzeit: 60 Stunden Selbststudium: 120 Stunden

Lehrveranstaltung: Tropical animal husbandry systems (Vorlesung, Seminar) *Inhalte*: Das Modul vermittelt einen detaillierten Überblick über die in den (sub)Kontinenten Afrika, Asien und Mittel-/Südamerika anzutreffenden Tierhaltungssysteme. Dabei werden traditionelle nomadische Systeme genauso analysiert und diskutiert wie moderne Milch- und Fleischerzegungsbetriebe, wobei der Fokus auf kleinbäuerlichen und mittelständischen Betrieben liegt. Angesprochen werden jeweils die Haltungssysteme an sich sowie deren ökonomische und ökologische Vorzüge und/ oder Probleme. Der Einfluss von kulturellen, sozialen und politischen Faktoren auf die Tierhaltungssysteme wird diskutiert. Delgado, C., Rosegrant, M., Steinfeld, H., Ehui, S., Courbois, C. 1999: Livestock to 2020. The next food revolution. FAO Discussion Paper 28, FAO Rome, Italy; Devendra, C., Thomas, D., Jabbar, M.A. and Zerbini, E., 2000: Improvement of Livestock Production in Crop-Animal Systems in Agro-ecological Zones of South Asia. ILRI, Nairobi, Kenya; Falvey, L., Chantalakhana, C. (eds) 1999: Smallholder Dairying in the Tropics. ILRI, Nairobi, Kenya	4 SWS
Prüfung: Klausur (90 Minuten, Gewicht: 75%) und Präsentation, Referat oder Korreferat (ca. 15 Minuten, Gewicht: 25%) **Prüfungsanforderungen:** Schlecht: abiotische und biotische Rahmenbedingungen für Tierhaltungssysteme in den (Sub-)Tropen; Charakteristika, Vorteile/Probleme agro-pastoraler, industrieller und urbaner Systeme; tierartspezifische Haltungs- und -produktionsformen (Rind, Schaf, Ziege, Yak, Schwein, Huhn). Schiborra: Charakteristika, Vorteile/Probleme pastoraler, silvo-pastoraler und aquatischer Systeme; tierartspezifische Haltungs- und -produktionsformen (Cameliden).	6 C

Zugangsvoraussetzungen:	**Empfohlene Vorkenntnisse:**

keine	Grundlagenwissen (BSc Niveau) in den Boden-, Pflanzen-, und Tierwissenschaften
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Eva Schlecht
Angebotshäufigkeit: jedes Wintersemester; Göttingen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.A13M: Livestock-based sustainable land use** *English title: Livestock-based sustainable land use*	6 C 4 SWS

Lernziele/Kompetenzen: Studierende sind in der Lage • die Interaktionen von Nutztieren mit den natürlichen Ressourcen zu verstehen und daraus standorts- und managementspezifische positive oder negative Umweltwirkungen abzuleiten • Methoden zu benennen, die der qualitativ/quantitativen Erfassung von Tier-Umweltinteraktionen dienen, und deren Einsatzmöglichkeiten und Präzision aus eigener praktischer Erfahrung zu beurteilen • Einfache mathematische Ansätze zur Modellierung von Tier-Umweltinteraktionen zu benennen und die Aussagekraft entsprechender Ergebnisse zu beurteilen	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Livestock-based sustainable land use (Vorlesung, Übung) *Inhalte*: Das Modul analysiert die positiven und negativen Effekte der Tierhaltung auf die natürlichen Ressourcen Luft (gasförmige Emissionen), Boden, Wasser und Vegetation in unterschiedlichen agro-ökologischen Kontexten und auf den Skalenebenen Feld/ Weide bis Wassereinzugsgebiet. Die quantitative und qualitative Erfassung der Interaktionen zwischen Nutztier und Umwelt im Feld mittels erprobter Methoden wird dargestellt und in praktischen Übungen im Feld überprüft. Strategien zur Konsolidierung der Produktionsinteressen von Tierhaltern mit den Notwendigkeiten des Ressourcenschutzes, wie er unter anderem auch in Internationalen Konventionen festgeschrieben ist, werden diskutiert. Der in der Vorlesung vermittelte Stoff wird durch eine Auswahl an wissenschaftlichen Veröffentlichungen ergänzt, welche von den Studierenden im Selbststudium zu analysieren sind. Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M., de Haan, C. 2006: Livestock's long shadow. Fao, Rome, Italy; Specific scientific articles, distributed in the course.	4 SWS
Prüfung: Klausur (90 Minuten) **Prüfungsanforderungen:** Schlecht: Einfluß der Tierhaltung / des Einzeltieres auf die Umwelt: Bodenfruchtbarkeit und - erosion, Weidevegetation, Nährstoffkreisläufe, Treibhausgasemissionen; Tierhaltung und Naturschutz. Schiborra: Methoden der Vegetationsbestimmung und –quantifizierung, Methoden zur Bestimmung des Weideverhaltens und der Futteraufnahme weidender Tiere. Schlecht (4 oder 6 Fragen) Schiborra (2 oder 4 Fragen)	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:**

	Grundkenntnisse (BSc Niveau) in Boden-, Pflanzen- und Tierwissenschaften
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Eva Schlecht
Angebotshäufigkeit: jedes Sommersemester; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

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

Learning outcome, core skills: *Advances in animal nutrition and animal health:* Students get to know scientific tools for quantifying, assessing and evaluating problems within organic livestock production. *Animal welfare :* Students have a basic understanding of animal welfare, familiarize with different organic husbandry systems, practical problems and scientific concepts including how to assess animal welfare both at farm and system level.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Animal nutrition and animal health (Lecture) *Contents*: Principles and regulations of organic livestock farming in Europe; Nutrition in organic cattle, pigs and poultry; Animal health and production diseases; Production diseases in organic cattle, pigs and poultry; Health management in organic livestock farms	1,33 WLH
Course: Animal welfare (Lecture) *Contents*: Principles of animal welfare in relation to organic farming; scientific methods of welfare assessment	1,33 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Knowledge of basic terms relevant to organic livestock systems; insights into aspects of feeding, healthcare, welfare, forage production and forage quality assessment; linkages and interdependencies between the discussed fields. One written exam with all three parts**.**	6 C

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

Additional notes and regulations:

Literature:

Advances in animal nutrition and animal health:

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

Animal welfare:

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

Sustainable forage production systems:

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

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A15M: Scientific writing in natural sciences**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
In the course of their study programme, when compiling their MSc thesis and for their further (academic) career, students have to deliver a variety of scientific texts. Therefore, this module aims at presenting and discussing the main principles of such texts. It provides training in how to write different types of essays, abstracts, grant winning proposals and complex texts (chapters) in preparation and writing of the master thesis research. At successful completion of this module, participants will be able to: • differentiate the structure and format of various types of scientific texts; • search scientific literature, set up and manage an electronic literature database and compile reference lists; • write term papers, grant proposals, conference abstracts, and final thesis (chapters); • compile scientific tables and figures and be able to decide which type of data is best expressed in which format; • apply the rules of good scientific practice; • give and receive constructive feedback on scientific texts.	Attendance time: 56 h Self-study time: 124 h

Course: Scientific writing in natural sciences *Contents*: To provide participants with theoretical basics and practice these, the module will offer a mixture of lecture and exercises. Within the course a variety of facets and techniques of scientific writing will be imparted that graduate SIA students should be able to master. Consequently, participants are introduced to scientific literature search and analysis, good scientific practice and how to avoid plagiarism. Additionally, guidelines for creating concise tables and figures are presented. To be prepared for their master thesis work, students will be taught how to write different scientific text documents such as grant proposals and conference abstracts. By reviewing and discussing a scientific article and peer-reviewing an abstract of a fellow student by using an online tool, module participants will train how to give and receive constructive feedback. Finally, students will choose a topic for their term paper (see below) to further apply the newly acquired knowledge.	
Examination: 3 short written assignments (approx. 4 pages, 50%) are to be handed in during the semester and one major text (term paper, approx. 6 pages 50%) is to be submitted at the end of the semester.	6 C

Admission requirements:	**Recommended previous knowledge:**
none	Basic knowledge of Word (Microsoft or Open Office) and Adobe Acrobat.
Language:	**Person responsible for module:**
English	Prof. Dr. Eva Schlecht

Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 3
Maximum number of students: 30	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A17: Digitalisation in Livestock Systems**	6 C 4 WLH

Learning outcome, core skills: Following a successful completion of this module, students are expected to: • Have an overview of the current trends in digital technology for agricultural development with particular emphasis on livestock husbandry. • Be familiar with key terminologies including Precision Agriculture (PA), Precision Livestock Farming (PLF), Precision Pasture Management (PPM), and Digital Livestock Farming (DLF). They should be able to give relevant examples of a range of technologies currently applied to facilitate individual animal management systems. • Identify the opportunities and challenges of PLF for organic agriculture • Be able to critically assess the benefits of digitalisation vis-à-vis the socioeconomic realities of agricultural transformation, especially in low- and middle-income countries • Develop scientific presentation and reporting skills	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Digitalisation in Livestock Systems (Lecture, Excursion, Seminar) *Contents*: **Course content:** Lectures (16 h), Seminars (plus excursion) 44 h Digitalisation is revolutionising the agricultural sector at an unprecedented pace requiring the building of human resource capacity to conveniently cope with the emerging norms of farming and livestock husbandry practices. In this module, students will be given a broader overview of the changes that have taken place in agricultural development. The concept of digital transformation which is enforcing the adoption of automation, high-tech sensors, cloud computing, decision making algorithms, and the Internet of Things will be introduced, and terminologies such as PA and PLF will be explained. Focusing on PLF, students will be helped to self-study a range of digital tools currently in use for either individual or group intensive and extensive management systems. These may include but not limited to the following: • Use of radio frequency identification (RFID) leveraged in other technologies for monitoring feed intake, weight gain etc. • Behavioural monitoring using on-animal motion and pressure sensors • Thermal and biochemical sensors for monitoring disease state • Autonomous animal location management (virtual fencing) • Pasture management using geographical information system (GIS) The students must have a fair understanding of what these tools/systems are, their mode of operation, associated costs, and the pros and cons of usage.	4 WLH

As part of the learning process, students will be provided with journal article(s) relevant to the trends in application of digitalisation in PLF. Each student would be required to carefully study/review the article provided, and prepare a 25-page (max.) PowerPoint presentation to be presented in a weekly seminar session. Non-presenting students are also required to attend the weekly seminars and learn from their colleagues. de Queiroz DM, Valente DSM, Pinto FAC, Borém A, Schueller JK, eds. 2022: *Digital Agriculture*. Springer	
Examination: Student presentation with discussion (ca. 25 min presentation + ca. 10 min discussion 70%) and written report (30%) **Examination requirements:** transitions in agricultural development; digital transformation and sustainability; role/trends of digital tools, e.g., sensors in livestock husbandry. Written report and PowerPoint presentation according to international conference standards: concise, sound content, clear structure, and very well communicated (orally in case of ppt).	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Sowah Addo
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A18: Grassland-based livestock systems and climate change mitigation**	6 C 4 WLH

Learning outcome, core skills: This course is divided into two sub-modules consisting of 3 credits each. **Sub-module A** has the following objectives: (i) to learn fundamental relationships between livestock management and forage value of grasslands; (ii) to learn about factors affecting animal performance and animal health; (iii) to become familiar with scientific approaches in animal science and grassland-based systems. In **Sub-module B**, you will: (i) understand the basics of greenhouse gas (GHG) emissions and climate change related to livestock; (ii) become familiar with key international climate conventions and agreements; (iii) get acquainted with the methodological approaches used for collecting data and calculating GHG emission from grassland-based livestock systems; (iv) become familiar with policies and mitigation measures for decreasing emissions in these systems.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Grassland-based livestock systems and climate change mitigation (Lecture) *Contents*: **Sub-module A:** Grasslands play a vital role for biodiversity and the climate. Grazing on grasslands has a long tradition in livestock farming and production of high-quality animal products. Today´s generations of livestock farmers face increasing challenges because of climate change, invasive plant species, modern animal genetics with high energy and nutrient requirements, and other factors. This sub-module will focus on these challenges from a farmer and animal perspective, looking at various grassland management practices that promote biodiversity and ensure animal health and the production of high-quality livestock products. Participants will learn to differentiate between feed qualities and recognize their effects on animal performance and product quality. Lectures will provide knowledge about selective plants and plant biodiversity in relation to animal health and product quality. The effects of grazing on forage quality and *vice versa* will be discussed and additional factors such as climate change and plant diversity will be considered. **Sub-module B:** Reducing GHG emissions is paramount to combat climate change globally. Grassland-based livestock systems contribute to climate change but are also affected by it, which means that livestock in these systems can be part of the solution. This sub-module is designed to provide participants with an introduction to the topic of GHG emissions from livestock in grassland-based systems. Key international climate conventions (e.g., the Paris Agreement) and other international commitments envisaged to combat climate change will be discussed. We will explore both qualitative and quantitative aspects needed for understanding, quantifying and mitigating GHG	4 WLH

emissions from grassland-based livestock systems. The sub-module will also present different policies and measures (e.g., carbon credits and tax incentives) that can be considered to support a decrease in GHG emissions from livestock in grassland-based systems. The lectures for each sub-module are given by researchers from FB11 at Uni Kassel and invited speakers. In the seminar part, students give a presentation on a topic from this course. Guest lecturers from international research institutions and the private sector will be invited for both sub-modules. Lecture slides will be provided for each lecture alongside further literature for self-study.	
Examination: Presentation in either sub-module A or B (ca. 20 min) 50 % + an oral exam in the corresponding other sub-module (ca. 15 min) 50 % **Examination requirements:** **Examination prerequisites for both sub-modules:** Regular attendance of lectures and exercises, as well as presentation of a seminar talk.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of plant and animal sciences
Language: English	**Person responsible for module:** Prof. Dr. Fenja Klevenhusen
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 3
Maximum number of students: 20	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A19: Innovative Sustainable Breeding: Shaping the Future of Global Livestock Production**	6 C 4 WLH

Learning outcome, core skills: After taking the course "Sustainable Breeding Innovations: Shaping the Future of Livestock Production" module students • Understand the complex challenges facing global livestock production, including societal expectations, environmental sustainability, and efficient resource management. • Are able to explore and critically evaluate innovative breeding strategies that contribute to sustainable agricultural practices. • Gain practical insights into strategic breeding through interactive learning methods such as lectures, seminars, group discussions, and field trips (if feasible). • Design a sustainable livestock breeding program that addresses real-world issues, demonstrating an ability to integrate economic viability with social acceptability, animal welfare and environmental health. • Contribute meaningfully to policy discussions or practical interventions aimed at promoting sustainability within the livestock sector.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Innovative Sustainable Breeding: Shaping the Future of Global Livestock Production (Lecture, Seminar) *Contents*: Block module (2 weeks after the summer-semester examination period), lecture, student seminars / written assignments *Contents:* In recent years, the paradigm has shifted from prioritizing animal productivity to embracing a more holistic approach in livestock breeding programs that includes animal health, environmental impact, and resource efficiency alongside with economic and production aspects. This course aims to provide students with a comprehensive understanding of these changes and to explore breeding strategies that align with contemporary societal values and international best practices. Students will engage with topics including: 1. Societal expectations and livestock production: Understanding how consumer preferences and societal norms are reshaping livestock breeding objectives. 2. Sustainable breeding practices: Exploring strategies that balance productivity with animal health, environmental sustainability, and resource efficiency.	4 WLH

3. Genetic diversity management: Examining the importance of preserving breed diversity as a cultural heritage and as an investment in future resilience to stresses such as zoonotic disease outbreaks and global warming. 4. Ethical breeding approaches: Investigating ethical considerations in breeding practices that respect animal welfare while meeting farmers' production goals and societal norms. 5. Policy implications: Assessing the role of policy in guiding sustainable breeding practices and protecting genetic diversity. Students will develop skills to critically analyze and synthesize literature related to livestock breeding challenges and opportunities, elaborate exemplary breeding approaches for diverse environmental and societal goals, learn to effectively communicate scientific research findings and propose solutions to stakeholders. Methods: Interactive lectures, student seminars, group discussions, field trips to farms or research institutions (if feasible) **Literature:** Literature will be provided to prepare for the lectures and students' assignments / seminars	
Examination: Written exam (90 minutes, 70%) and individual assignment (30%): either written project report (max. 15 pages) or oral presentation (ca. 20 minutes). **Examination requirements:** Know contemporary challenges of livestock production and societal expectations; ability to evaluate and discuss sustainable and ethical breeding practices; understand the role of genetic diversity management; conclude on policy implications arising from the aforementioned aspects.	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of animal sciences and animal breeding
Language: English	**Person responsible for module:** PD Dr. Regina Rößler
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.E02: Agricultural price theory** *English title: Agricultural price theory*	6 C 4 SWS

Lernziele/Kompetenzen: Bedeutung von Preisen aus individueller und gesamtwirtschaftlicher Sicht; Agrarpreisgefüge; Bedeutung des technischen Fortschritts; vertikale und räumliche Preisbildung; Preisbildung auf dem Bodenmarkt; Preisbildung auf quotierten Märkten; Warenterminmärkte.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Agricultural price theory (Vorlesung) *Inhalte*: Kern des Moduls ist eine umfassende Behandlung der Preisbilder auf landwirtschaftlichen Produkt- und Faktormärkten, bei besonderer Berücksichtigung von Warenterminmärkten. Die Studierenden erwerben ein vertieftes Verständnis für Preisbildungsprozesse, die das Ergebnis auf den Märkten der Agrar- und Ernährungswirtschaft bestimmen, und sind informiert über Besonderheiten der Preisbildung auf Agrarmärkten, insbesondere die Preisbildung für den Produktionsfaktor Boden und die Preisbildung auf quotierten Märkten. Die Studierenden erlernen an Beispielen aus der Praxis, wie zeitliche und räumliche Preisbildungsprozesse ablaufen und wie Preise auf räumlich getrennten Märkten bzw. für Produkte von unterschiedlichem Verarbeitungsgrad zusammenhängen. Sie können die Bedeutung und Nutzung von Warenterminmärkten in der Landwirtschaft sowie in vor- und nachgelagerten Branchen einschätzen. Vorlesungsbegleitende Materialien	4 SWS
Prüfung: Klausur (90 Minuten) **Prüfungsanforderungen:** Wissen der Bedeutung von Preisen aus individueller und gesamtwirtschaftlicher Sicht, des Agrarpreisgefüge, sowie über die Bedeutung des technischen Fortschritts. Kenntnisse der vertikalen und räumlichen Preisbildung, der Preisbildung auf dem Boden- und den quotierten Markt, sowie Kenntnisse der Warenterminmärkte.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Grundlagen der Agrarpolitik und landwirtschaftlichen Marktlehre oder äquivalent
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Bernhard Brümmer
Angebotshäufigkeit: jedes Wintersemester; Göttingen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 60	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E05M: Marketing research**	6 C 4 WLH

Learning outcome, core skills: Students · are able to describe how marketing research relates to the marketing concept · are able to outline the steps in the marketing research process and show how the steps are interrelated · know the factors to consider in defining the marketing problem or opportunity · are able to develop a research design · are able to state the specific advantages of the most important methods of data collection · know fundamentals of sampling theory acquire personal skills for oral and written presentations in teamwork.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Marketing researches (Lecture, Seminar) *Contents*: • Steps and management of marketing research • Development of research design • Methods of data collection • Oral and written presentation of market research topic Aaker, D.A., Kumar, V., Leone, R.P., Day, G.S. (2013): Marketing research. 11th ed., Hoboken: Wiley; Nunan, D., Birks, D.F., Malhotra, N.K. (2020): Marketing research, 6th ed., Harlow: Pearson Education	4 WLH
Examination: Oral examination (approx. 30 min.) 60%, oral and written presentation (approx. 20 min. + max. 5 p.) 40%	6 C

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

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E06: International organic food markets and marketing**	6 C 4 WLH

Learning outcome, core skills: Students · are able to describe international markets for organic food · know about international organic regulations · are able to outline the steps for developing a marketing strategy · know how to develop a marketing concept on international markets · acquire personal skills for oral and written presentations in teamwork.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: International markets and marketing for organic products (Lecture, Seminar) *Contents*: • Analysis of international markets for organic products • Organic regulations • Basics of food marketing for exporters • Oral and written presentation of marketing topic Vahlen, Munich. Armstrong, G, Kotler, K., Opresnik, M.O. 2016: Marketing: An Introduction, 13th ed., Pearson, Harlow, UK. Hollensen, S., Opresnik, M.O. 2015: Marketing: A Relationship Perspective.	4 WLH
Examination: Presentation (ca. 20 minutes) with written outline (max. 5 pages) (40%) and oral exam (approx. 30 minutes) (60%) **Examination requirements:** Knowledge of tasks and approaches in market research as well as knowledge of data survey methods, prognosis methods and analysis methods.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge on marketing
Language: English	**Person responsible for module:** Prof. Dr. Katrin Zander
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 35	

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

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

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

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

Additional notes and regulations: Literature: Text books, research articles and lecture notes.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E12M: Quantitative research methods in rural development economics**	6 C 4 WLH

Learning outcome, core skills: This module will equip students with the skills to plan, develop and implement their own research projects, focusing on key aspects essential for empirical analysis. After successful completion of this course, students should be able to: • Develop relevant research questions • Understand and implement the required steps for primary data collection • Analyse micro data with statistical and econometrics methods • Interpret and communicate empirical findings	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Quantitative research methods in rural development economics (Lecture) *Contents*: The focus of this module is on the design of quantitative research methods in rural development economics, comprising of lectures and practical exercises in the computer lab. The module covers the research process, with specific focus on formulating research questions, collecting primary data and conducting empirical data analysis. One key topic is analysing quantitative data in rural development economics using various statistical and econometric techniques, with a focus on farm and household-level data. The module also covers practical aspects of primary data collection, such as questionnaire development, and implementing household surveys. It also addresses the use of secondary data. Practical application of statistical and econometric methods is reinforced through hands-on exercises in the computer lab, using real-world examples for better understanding.	4 WLH
Examination: Written exam (90 Minutes) (85%) and interim homework assignment (max. 10 pages) (15%) **Examination requirements:** Types of research designs; steps of primary data collection; use and interpretation of descriptive statistics and standard econometric methods; data management.	6 C

Admission requirements: Familiarity with the contents of the module "Socioeconomics of Rural Development and Food Security" is recommended.	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Doris Läpple
Course frequency:	**Duration:**

each summer semester; Göttingen	1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 40	

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

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

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

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

Additional notes and regulations:

Literature:

Text books, research articles and lecture notes.

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

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E14: Evaluation of rural development projects and policies**	6 C 4 WLH

Learning outcome, core skills: Students know the major methods for the evaluation of rural development projects and policies. They apply these methods for concrete project examples and thus are able to design and carry out evaluations independently.	**Workload:** Attendance time: 40 h Self-study time: 140 h

Course: Evaluation of rural development projects and policies (Lecture) *Contents*: This module teaches and trains the standard methods for the evaluation of rural development projects and policies. In particular, this includes impact assessment as well as cost-benefit analysis. These methods are used for concrete project and policy examples.	4 WLH
Examination: Written exam (90 minutes, 70%) and presentation (ca. 25 minutes, 30%) **Examination requirements:** Cost-benefit analysis; development project evaluation; impact assessment; targeting of projects and interventions	6 C

Admission requirements: none	**Recommended previous knowledge:** Knowledge of the content of the module "Socioeconomics of Rural Development and Food Security" is required.
Language: English	**Person responsible for module:** Ph.D. Bethelhem Legesse Debela
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 45	

Additional notes and regulations: Literature: Text books, research articles and lecture notes.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.E17M: Management and management accounting** *English title: Management and management accounting*	6 C 4 SWS

Lernziele/Kompetenzen: (Inter-)Kulturelle Aspekte von Organisationen und Führung kennenlernen, erste Einblicke in Unternehmensführung sowie Präsentationssicherheit.	**Arbeitsaufwand:** Präsenzzeit: 60 Stunden Selbststudium: 120 Stunden

Lehrveranstaltung: Management and management accounting (Vorlesung, Seminar) *Inhalte*: Breiter Überblick über Managementkompetenzen, Personalführung, Mitarbeitermotivation, Organisationskultur, genereller Einblick in Controllingsysteme von Unternehmen, erste finanzielle Kennzahlen. Lussier, R.N. 2006: Management fundamentals – Concepts, Applications, Skill Development, Thomson, London, UK; Robbins, S.P., Coulter, M. 2007: Management, 9th edition, Pearson, Upper Saddle River; Drury, C. 2005: Management Accounting for Business, Thomson, London, UK; Atkinson, A.A., Kaplan, R.S., Young, S.M. 2004: Management Accounting, 4th Edition, Upper Saddle River.	4 SWS
Prüfung: Presentation (ca. 15 minutes, 50%) and written examination (90 minutes, 50%) **Prüfungsanforderungen:** Wissen über Historie des Management und -forschung, Managementsysteme und Führungsstile, Interkulturelle Organisation. Basiswissen über Controllingsysteme, Kosten- und Preisgestaltung.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Bettina König
Angebotshäufigkeit: jedes Wintersemester; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 35	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.E18: Organization of food supply chains** *English title: Organization of food supply chains*	6 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden lernen die theoretischen Grundlagen der organisatorsichen Gestaltung von Food Supply Chains und Unternehmen des Agribusiness kennen. Sie verstehen, wie landwirtschaftliche Betriebe und andere Unternehmen des Agribusiness auf technische und soziale Einflüsse in ihrer internen und externen Umwelt reagieren. Die Studierenden sind in der Lage, Problemstellungen zu erkennen und einzuordnen und unter Rückgriff auf das erlernte theoretische Rüstzeug zu lösen.	**Arbeitsaufwand:** Präsenzzeit: 68 Stunden Selbststudium: 112 Stunden

Lehrveranstaltung: Organization of food supply chains (Seminar) *Inhalte*: Organisation von Food Supply Chains in der Fleischwirtschaft und anderen Teilbranchen des Agribusiness: Transaktionskostentheoretische, strategische und verhaltensorientierte Ansätze sowie empirische Ergebnisse. Transparenz von Food Supply Chains. Stakeholder-Management für landwirtschaftliche Betriebe und andere Unternehmen des Agribusiness. Organisationsstrukturen und Gestaltung von Geschäftsprozessen in Unternehmen des Agribusiness: Entscheidungsorientierte Grundlagen und ihre Anwendung. Vorlesungsbegleitende Materialien	4 SWS
Prüfung: Presentation (ca. 45 minutes, 35%) and homework (max. 15 pages, 65%) **Prüfungsanforderungen:** Kenntnisse der theoretischen Grundlagen der organisatorischen Gestaltung von Food Suppy Chains, sowie der Unternehmen des Agribusiness. Wissen über die Transparenz von Food Supply Chains und Stakeholder-Management für landwirtschaftliche Betriebe sowie über die Organisationsstrukturen und Gestaltung von Geschäftsprozessen in Unternehmen des Agribusiness.Von den Studierenden wird weiterhin die wissenschaftliche Präsentation ausgewählter in der Vorlesung vermittelter Inhalte (inkl. der Erstellung eines 2- bis 5-seitigen Handouts)sowie einer landwirtschaftlichen Wertschöpfungskette erwartet.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Grundlegende Kenntnisse des Supply Chain Management (B.Sc.-Niveau)
Sprache: Englisch	**Modulverantwortliche[r]:** Dr. Christian Schaper
Angebotshäufigkeit: jedes Sommersemester; Göttingen	**Dauer:** 1 Semester
Wiederholbarkeit:	**Empfohlenes Fachsemester:**

zweimalig	
Maximale Studierendenzahl: 21	

Bemerkungen:
Students are not allowed to take the module M.Agr.0053 if they have passed M.SIA.E18.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E19: Market integration and price transmission I**	6 C 4 WLH

Learning outcome, core skills: • Students gain insight into the functioning of the price mechanism on agricultural markets and into the determinants of market integration • Students learn to apply econometric methods to analyse horizontal and vertical prices transmission processes (dynamic models, cointegration, including non-linear and regime-dependent error correction models)	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Market integration and price transmission I (Lecture) *Contents*: 1. Vertical price transmission A simple model of the farm-retail price spread, empirical applications, the effect of market power on vertical price transmission, asymmetric price transmission, the analysis of retail prices 2. Horizontal or spatial price transmission A simple model of spatial equilibrium, empirical applications, accounting for transaction costs in spatial trade, the effects of temporal and spatial data aggregation A list of seminal papers (Gardner, Goodwin and Fackler, Barrett and others) will be provided to students Lecture notes and presentations are made available on StudIP	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** • Students are able to explain the economic theory of vertical and spatial/horizontal price transmission and market integration • Students are able to apply the most important methods that are used in price transmission analysis (estimation of error correction models)	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic/intermediate econometrics
Language: English	**Person responsible for module:** Prof. Dr. Stephan von Cramon-Taubadel
Course frequency: Every second summer semester (Start: 2021)	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 2
Maximum number of students: 40	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.E21: Rural Sociology** *English title: Rural sociology*	6 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden lernen Grundlagen der Soziologie im Allgemeinen und Kernkonzepte sowie Themenbereiche der Umweltsoziologie sowie Land- und Agrarsoziologie im Besonderen kennen. Darüber hinaus werden sie mit relevanten Theorien und Forschungsmethoden vertraut gemacht, um diese Kernkonzepte verstehen und anwenden zu können. Hierbei erwerben und vertiefen Studierende die Kompetenz, wissenschaftliche Ergebnisse aufzubereiten und kritisch zu diskutieren.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Rural Sociology (Vorlesung, Seminar) *Inhalte*: In diesem Modul werden wichtige Konzepte und Themenbereiche der Umweltsoziologie sowie Land- und Agrarsoziologie behandelt. Für jeden Themenbereich werden eine einführende Vorlesung und zwei Seminarsitzungen angeboten, wobei die Seminare der Vertiefung des Inhalts der Vorlesung dienen. Neben allgemeinen Grundlagen der Soziologie werden Themen wie „Natur-Gesellschafts-Beziehungen“, „Sozialstruktur und soziale Probleme in ländlichen Räumen“, „soziale Netzwerke und soziales Kapital in "Communities" und „Umweltgerechtigkeit“ behandelt.	4 SWS
Prüfung: **Prüfungsanforderungen:** Darstellung von und kritische Auseinandersetzung mit Theorien, Konzepten und Methoden im Bereich der Umweltsoziologie sowie Land- und Agrarsoziologie.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Claudia Neu
Angebotshäufigkeit: jedes Sommersemester; not 2014 Göttingen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 25	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.E24: Topics in Rural Development Economics I** *English title: Topics in rural development economics I*	6 C 4 SWS

Lernziele/Kompetenzen: Ziel dieses Kurses ist es, den Masterstudierenden an das Lesen und Verstehen von wissenschaftlichen Artikeln heranzuführen und sie mit aktuellen Themen der ländlichen Entwicklungsökonomie vertraut zu machen. Dabei sollen den Studierenden wissenschaftliche Herangehensweise, Methodenwahl und struktureller Aufbau von wissenschaftlichen Artikeln vermittelt werden. Die Studierenden sollen in die Lage versetzt werden, eigene Forschungsfragen auf dem Gebiet der ländlichen Entwicklungsökonomie zu entwickeln und zu konzeptionalisieren.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Topics in Rural Development Economics I (Vorlesung) *Inhalte*: In diesem Kurs erhalten Masterstudierende einen Überblick über aktuelle Themen der ländlichen Entwicklungsökonomie und über analytische Herangehensweisen zur Bearbeitung relevanter Forschungsfragen. Zu diesem Zweck werden ausgewählte Artikel aus internationalen Fachzeitschriften gelesen, vorgestellt und kritisch diskutiert, sowohl im Hinblick auf inhaltliche als auch auf methodische Aspekte. Die Artikel, die im Kurs behandelt werden, umfassen z.B. folgende Themengebiete: The food system transformation and smallholder farmers; rural livelihood strategies and income diversification; adoption and impacts of modern agricultural technology; economics of nutrition and health; gender and intra-household resource allocation.	4 SWS
Prüfung: Präsentation, Referat oder Korreferat (ca. 10 Minuten, Gewichtung: 40%) und Hausarbeit (max. 4 Seiten, Gewichtung: 60%) **Prüfungsanforderungen:** Konstruktive Beteiligung an der Diskussion in den Vorlesungen, was die Lektüre der angegebenen Artikel voraussetzt. In den Prüfungen sollen die Studierenden demonstrieren, dass sie Forschungsfragen, Methode und Ergebnisse in den behandelten Themengebieten kritisch hinterfragen können.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Meike Wollni
Angebotshäufigkeit: jedes Sommersemester; Göttingen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E31: Strategic management**	6 C 4 WLH

Learning outcome, core skills: none	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Strategic management (Lecture, Seminar)	4 WLH
Examination: Presentation (ca. 15-20 minutes) with hand-out (max. 2 pages) (30%) and written report (max. 30 pages, 70%)	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Bettina König
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E34: Economic Valuation of Ecosystem Services**	6 C 4 WLH

Learning outcome, core skills: Students get introduced to the essential concepts and methods of interdisciplinary Ecosystem Services (ES) research. Special emphasis will be put on the integrated and systematic assessment of ES, including their dependencies of and impacts on biodiversity, climate change and economic development. Students will familiarize themselves with common methods of economic valuation of ES and learn about different real-world examples of practical implementation. At the same time and working in groups, students will be able to work through different theoretical concepts and methods in the analysis of a fictitious case study that mirrors many conditions and challenges that can be found in real scenarios. This combination of theoretical and practical sessions will allow students to learn how to design economic valuations strategically. That is, covering not only which ES can be valued and how, but also when and why economic valuation can be useful for particular policy purposes and decision-making contexts.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Economic valuation of ecosystem services in developing countries (Seminar) *Contents*: • Integrated and interdisciplinary analysis of ES • Linkages between ES, biodiversity, climate change and development • Selection and application of economic valuation methods • Integration of ES and their values into the policy cycle	4 WLH
Examination: Written exam (50 minutes, grading: 60%) and oral presentation (approx. 30 minutes, grading: 40%) **Examination requirements:** **Examination requirements:** General knowledge about the theoretical background of ES, biodiversity and natural capital, integrated and systematic assessments of ES, and economic valuation methods and their usefulness for decision-making. **Oral presentation requirements:** Students will present in groups the main findings of the assigned fictitious case study. The presentation should highlight the challenges encountered throughout the implementation of economic valuation and provide policy recommendations based on the main findings.	6 C

Admission requirements: none	**Recommended previous knowledge:** M.Agr.0124: Environmental Economics and Policy or similar skills
Language: English	**Person responsible for module:** Prof. Dr. Meike Wollni

Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E37: Agricultural policy analysis**	6 C 6 WLH

Learning outcome, core skills: Students get an overview on EU institutions and the history of the EU's common agricultural policy (CAP) Students learn different theories and methods for the analysis of agricultural policies Students learn how to analyse different policy measures and instruments and evaluate them.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Agricultural policy analysis (Lecture) *Contents*: 1. The history of the European Union's Common Agricultural Policy (CAP) 2. Decision-making in the European Union – who makes agricultural policy decisions and how? 3. The economic evaluation of agricultural policies: welfare effect, distributional effects, transparency and administrative costs. Selected readings and lecture notes / slides provided by the lecturer on StudIP B. Hill (2013): Understanding the Common Agricultural Policy, Earthscan A. Cunha & A. Swinbank (2011): An Inside View of the CAP Reform Process, Oxford University Press A. Oskam, G. Meester & H. Silvis (2011): EU policy for agriculture, food and rural areas, Wageningen, University Press Selected readings and lecture notes / slides provided by the lecturer on StudIP	6 WLH
Examination: Written examination (90 minutes) **Examination requirements:** • Knowledge of EU institutions and the CAP • Understanding of different theories and methods for analyzing agricultural policies • Ability to analyse different measures and instruments of the CAP • Written Exam: partly multiple choice, partly essay	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic micro- and macroeconomics
Language: English	**Person responsible for module:** Prof. Dr. Stephan von Cramon-Taubadel
Course frequency: Every second summer semester (Start: 2020)	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 2
Maximum number of students: 50	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E38: Scientific working in Agricultural Economics**	6 C 4 WLH

Learning outcome, core skills: Students have a deep understanding of the following aspects of scientific writing and good academic practice and are prepared to apply them appropriately • Scientific writing and structuring • Literature search • Good academic practice, citation and avoidance of plagiarism • Use of citation software • Structuring and preparation of primary and secondary datasets • Result illustration • Presentation of academic content	**Workload:** Attendance time: 48 h Self-study time: 132 h

Course: Scientific writing in Agricultural Economics (Lecture, Exercise) *Contents*: 1) **Research process and paper structure**: An introduction is given on structuring seminar-papers and master-theses, literature search in various literature databases, formulating valid objectives, research questions and hypotheses. Thereby, the basic principles of describing the research gap based on previous findings and correct citing are covered. Students practice structuring and writing during different practical assignments like creating a commented outline , a reference list or writing an introduction and conclusion for a seminar-paper or a thesis. 2) **Literature review, citation and plagiarism:** An introduction is given on the rules of “good academic practice” according to the standards of the German Research Association (DFG). In addition to detailed explanations about the appropriate use of references and correct citing, the topic of plagiarism and intellectual property rights is addressed in detail including concrete examples. Furthermore, software applications such as Citavi are introduced. 3) **Data and methods:** An introduction is given on (i) how to structure, process and present primary and secondary data, and (ii) how to choose and present a method in accordance to the respective research question. Formal requirements and good scientific practice for the illustration in written text, tables and figures are presented. Special emphasis will be given to the interpretation of results (hypothesis testing). Students practice data and results illustration during different practical assignments like structuring datasets, creating a methods & data chapter, preparing tables and figures and embed them into a results chapter. 4) **Presentation:** An introduction is given on the design and structure of scientific presentations. In detail, common practices for presenting scientific contents are explained and the typical corporate design of the Georg-August-University is introduced. As an assignment students prepare a presentation about scientific contents.	4 WLH
Examination: 2 Written assignments (each max 800 words) , 1 data sheet and 1 presentation-file (max. 6 slides)	6 C

Examination requirements:
Students have to prepare two written assignments, one data sheet and one presentation file (se above) and upload the documents. The required assignments accompany the content of the lecture and include the following topics:

- Sections of scientific manuscripts (Introduction; Methods&Data, Results)
- data documentation (e.g. descriptive tables)
- presentation slides.

Admission requirements: Enrolled in SIA study-program with focus on International Agribusiness and Rural Development Economics	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Hartmut Ernst Reinhard Uehleke
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E39: Critical and Collective Perspectives on the Global Food System**	6 C 4 WLH

Learning outcome, core skills: Students • will be aware of development tendencies of the global food system • will be able to critically analyse the global food system informed by political ecology • will be introduced to collective action theory and critical approaches advocating the spread of “Commoning” in the Global Food System • will be familiar with different conceptions of society-nature relationships • will be acquainted with methods of political ecology • will be acquainted with transition and transformation studies • will be acquainted with food regime studies • will be able to critically evaluate and apply the corresponding approaches	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Critical and Collective Perspectives on the Global Food System (Lecture, Seminar) *Contents*: The course introduces students to critical and commoning approaches and studies of the global food system. It introduces the concepts, theories and methods of political ecology, food regime theory collective action theory and transitions studies and discusses these in relation to empirical studies worldwide.	4 WLH
Examination: Presentation (approx. 45 minutes, 40%) and term paper (max. 15 pages, 60%) **Examination prerequisites:** Submission of protocols (literature-related questions) in regard to 80% of assigned readings (max 8 articles) **Examination requirements:** Students will need to demonstrate: • Understanding of political ecology, collective action and commoning perspectives, transition approaches and critical perspectives • Understanding of a food systems approach • Ability to apply political ecology approaches to the food system and its change • Knowledge of global drivers of food and agricultural production systems • Academic presentation, discussion and writing skills Details on Examination: Presentation 20 min. + 25 minutes guided discussion (student-led seminar) (40%) and term paper (15 pages, 3000 words) (60%)	6 C

Admission requirements: none	**Recommended previous knowledge:** Background in agricultural and environmental policy and economics

Language: English	**Person responsible for module:** Prof. Dr. Andreas Thiel
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Literature:

Literature will be circulated to students at the beginning of term and throughout

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E40: Agriculture, Environment and Development**	6 C 4 WLH

Learning outcome, core skills: Dieses Modul widmet sich den ökonomischen und politischen Ursachen für Umweltprobleme im Kontext von Landwirtschaft und Entwicklung. Globale Herausforderungen wie Klimawandel, Nachhaltige Entwicklung und Armut bilden die Themenschwerpunkte. Es werden zunächst ausgewählte umwelt- und ressourcenökonomische Grundlagen vermittelt und sodann wichtige Aspekte wie die Nutzung von Gemeingütern, sowie Verschmutzungskontrolle und Klimaschutz in internationalen Agrar-Umwelt-Kontexten vertieft.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Agriculture, Environment and Development (Lecture, Exercise, Seminar) *Contents*: Dieses Modul bietet in der ersten Semesterhälfte eine Kombination aus Vorlesung und Übung, wobei die theoretischen Konzepte aus der Vorlesung in jeweils zugehörigen Übungen vertieft und mit Anwendungsbeispielen aus Wissenschaft und Praxis ergänzt werden. In der zweiten Semesterhälfte präsentieren die Studierenden zu ausgewählten Themen eine Analyse einer wissenschaftlichen Publikation. Dies dient dazu, dass die Studierenden erlernte Inhalte gezielt selbstständig vertiefen und in der Beurteilung einer Fallstudie anwenden können. Inhalte: • Grundlagen (Marktversagen, natürliche Ressourcen, Naturkapital) • Effizienz und Nachhaltigkeit: Konzepte, Kriterien und Anwendung • Ökonomie von Gemeingütern in Entwicklungsländern • Ökonomie der Landnutzung in Entwicklungsländern • Ökonomie der Wassernutzung in Entwicklungsländern • Armut, Entwicklung und Umwelt • Landwirtschaft und Klimawandel • Globale Initiativen und Internationale Abkommen zur Nachhaltigen Entwicklung und Klimaschutz	4 WLH
Examination: Klausur (60 Minuten, 70%) und Präsentation (ca. 20 Minuten, 30%) **Examination prerequisites:** Regelmäßige Teilnahme am Seminar **Examination requirements:** Ausgewählte Grundlagenkenntnisse der Umwelt-und Ressourcenökonomie. Verständnis wichtiger Konzepte wie ökonomische Effizienz und Nachhaltigkeit. Kenntnisse wichtiger Zusammenhänge zwischen Landwirtschaft, Ressourcennutzung, Nachhaltigkeit und Klimawandel im Entwicklungskontext. Diskussion gegenwärtiger Handlungsansätze.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language:	**Person responsible for module:**

English	Prof. Dr. Meike Wollni
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 40	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E41: EU Policies and Organic Agriculture**	6 C 4 WLH

Learning outcome, core skills: The students deal with selected key issues of European agricultural policy that are relevant to organic farming. They work on these policies in a project-oriented way and apply concepts and methods of knowledge integration, policy process analysis and policy evaluation. This enables them to transfer the knowledge that they have acquired in their agricultural policy and governance courses to concrete issues and to link them to particular political and international contexts. At the same time, the aim of the course is to make students from Europe and beyond familiar with the relevance of these dimensions for their future professional life and to understand European organic agricultural policy through discussions from the perspectives of different the regional contexts represented by students of the course.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: EU Policies and Organic Agriculture *Contents*: Critical and Collective Perspectives on the Global Food System (Lecture, Seminar, Excursion) Organic farming is influenced both by the EU Organic Farming Regulation (Regulation (EC) No 834/2007) and by the policy measures of the EU Common Agricultural Policy. Working on selected key issues of EU agricultural policy during the course, students analyse specific policy processes and evaluate policy measures. To start with, the lecturers introduce the role of the EU for organic farming, highlight selected key issues of and they re-fresh the different conceptual and methodological issues of analysing them. Students then work on these key issues from different lenses in topic-related small groups which are supervised by the lecturers. Each group first develops the project concept (definition of a research question, methodological approach). These project concepts are presented by the different groups and discussed in the plenary before the small group projects are implemented. At the end of the semester, all groups present and reflect their project results. Finally, the project results are discussed from both the European and the international perspective. Parallel to working on these key issues, students learn about methods of knowledge integration (e.g. system analysis, multi-criteria analysis), policy evaluation and policy process analysis and they are able to apply these methods. Literature und publications will be provided for the course. Vedung, E., 1997. Public policy and program evaluation. Transaction Publishers, New Brunswick, London. Scholz, R.W., Tietje, O., 2002. Embedded case study methods: Integrating quantitative and qualitative knowledge. Sage Publications, Thousand Oaks.	4 WLH
Examination: presentation (approx. 30min, 50%), written exam (60min, 50%) **Examination prerequisites:**	6 C

submission of protocols (literature-related questions, max. 1 page) in regard to 80% of assigned readings (max 8 articles) **Examination requirements:** The course presupposes attendance of one of the following modules: „Institutions and the food system“ or “Critical and collective perspectives on the global food system“	

Admission requirements: none	**Recommended previous knowledge:** Background in agricultural and environmental policy and economics
Language: English	**Person responsible for module:** Prof. Dr. Andreas Thiel Dr. Matthias Stolze
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E42: Agriculture, Nutrition and Sustainable food systems**	6 C 4 WLH

Learning outcome, core skills: Students learn how food systems and food policies are shaping what we eat, how we produce our food, and how this links to sustainable development in a global context. The course covers food systems in both developing and developed countries. Students learn to engage in a critical debate on the role of food policies and other drivers in shaping what we consume, how this links to food production and sustainable development, including health, environment and the economy. Students learn to analyze these themes by engaging in basic data analysis, case studies and the critical analysis and exposition of arguments.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Agriculture, Nutrition and Sustainable food systems (Lecture) *Contents*: This module introduces students to apply systems thinking to the global challenges of food security, nutrition, health and sustainability. It introduces the relevant concepts, analyses the drivers and food policies that may transform food systems using an interdisciplinary approach. Every lecture is accompanied by a more practical session in which basic analysis of data (using Stata) or comparative and critical analysis are applied to the specific themes or policies covered in the lecture. Course material consists of presentations and lecture notes. A list of scientific reports, research articles and relevant data will be provided to students. *Course frequency:* each winter semester	4 WLH
Examination: Written examination (60 minutes, 50%) and paper (max. 15 pages, 50%) **Examination requirements:** Students are able to explain the concepts related to food systems, to analyse food policies, and to generate and interpret relevant statistics related to nutrition, food policies and global sustainability. In a written assignment, students provide critical analysis of a specific food system and/or food policy intervention.	6 C

Admission requirements: none	**Recommended previous knowledge:** Prior knowledge of microeocnomics at BSc level is useful. Prior experience with Stata or SPSS may be helpful but is not a requirement.
Language: English	**Person responsible for module:** Prof. Dr. Liesbeth Colen
Course frequency: each summer semester	**Duration:** 1 semester[s]

Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 45	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E45: Introduction to choice experiments in food economics**	6 C 4 WLH

Learning outcome, core skills: • Students experience the entire process of (choice) experimental practice in the field of social sciences, including its possibilities, limitations and interpretation of results • Students learn how to identify and narrow down a research question into a testable hypothesis. Students learn how to test such a hypothesis by identifying control and treatment groups, the importance of power calculations, sampling design and analysis of data. • Students improve their general understanding of the scientific practice, correct interpretation of scientific results and their contribution to (public) decision making. • Students train their teamworking skills, through brainstorming exercises, discussions, self-organization and distribution of tasks of the team.	**Workload:** Attendance time: 55 h Self-study time: 125 h

Course: Introduction to choice experiments in food economics (Block course, Exercise) *Contents*: This module consists of two blocks. • The first block concerns the introduction to choice experimental practice and the set-up of a small online experiment addressing a specific research question in the field of agricultural, food or nutrition economics. • The second block concerns the analysis of the obtained data and interpretation of results. Students will work in groups of 4-5 students to identify and narrow down a research question in the field of agriculture, food or nutrition economics, learn how to translate a research question into a testable hypothesis, design the choice experiment, perform power calculations, and effectively launch the online survey. In the second part, the results of the survey will be analysed and each group will present the results, limitations and lessons learned.	4 WLH
Examination: Term Paper (max. 10 pages, 70%) and presentation (approx. 20 minutes, 30%) **Examination requirements:** Short paper describing the set-up and execution of the experiment (70%), and presentation presenting the approach, results and limitations/lessons learned (30%)	6 C

Admission requirements:	**Recommended previous knowledge:**
Econometrics I (M.WIWI-QMW.004), M.SIA.E12M: Quantitative research methods in rural development economics	Basic statistics/econometrics Students proof that they are capable of

Or a similar introduction to statistics or econometrics	• Identifying research question and developing a testable hypothesis • Collaborate in groups to brainstorm, guide the discussion towards a practically implementable outcome, and implement the experiment • Analyse, interpret and discuss experimental results
Language: German, English	**Person responsible for module:** Prof. Dr. Liesbeth Colen
Course frequency: each summer semester; Göttingen	**Duration:**
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E46: Food Systems Governance and Agriculture**	6 C 4 WLH

Learning outcome, core skills: Students • will understand the food system concept and the role of governance and institutions within it against the background of the European Union, and its role for and interactions with diverse production systems worldwide • will obtain an overview of the ways in which the many European food systems and demands for agricultural produce shape local agriculture and rural areas in Europe and worldwide • will obtain an overview of the role of policies, governance arrangements and institutions for the way Europe shapes global food systems and agriculture • will become familiar with a public choice and institutionalist perspective on public policy making • will become familiar with a constitutional, new institutional economic and a critical institutionalist perspective on food system interactions and their change • will reflect on the concepts of the course throughout seminar discussions • will explore analytical tools throughout issue-related discussions with practice partners.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Food Systems Governance and Agriculture (Lecture, Seminar) *Contents*: Agricultural production is nowadays conceived as integral part of global food, feed, fuel, and fibre-related supply systems. The European Union plays a major role in structuring global agriculture, food and supply systems. Policies structuring governance and institutions are core elements shaping economic exchange in the food system and the exploitation of natural resources. The course covers what food and agricultural systems are, what roles policies, governance and institutions play in these, and how the European Union’s structure of agricultural production shapes them. To explain policy outcomes, the course relies on a public choice and institutionalist perspective. For analyzing the food system, it further introduces new and critical institutionalist approaches and collective action theory, and illustrates these through case materials and literature discussions. Analytical perspectives will further be explored through the discussion of various European governance issues with practice partners and policy makers. Methods: Lecture, seminar, group works, virtual and in presence stakeholder meetings and potentially short excursions, presentations, readings, presentations (learning through teaching)	4 WLH
Examination: Five literature discussions or responses to set questions (graded) 40%; Oral presentation (student-led seminar) (ca. 20 min.) or oral examination (ca.	6 C

25 min.) or written term paper (max. 2500 words) 60%; or working report (max. 2500 words) 100% **Examination requirements:** Throughout term students discuss particular literatures or questions in relation to ongoing course contents in class or at home and submit these short answers in writing, Up to 10 opportunities to submit such work exist. Best 5 graded answers will enter final grading with 40% weight. For 60% of marking students have the choice between overall oral examination (25 minutes), oral seminar-style presentation in relation to a topic related to the course contents and agreed with lecturer (20 minutes presentation per person involved) and term paper on a topic related to the course contents and agreed with lecturer (2500 words (graded) including 10 minutes discussion of the paper) – introductory literatures on term paper topic and presentation would be provided	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Andreas Thiel
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Additional notes and regulations:

Literature:

Literature and seminar papers will be circulated to students at the be ginning of term

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E47: Sustainable food systems and management**	6 C 4 WLH

Learning outcome, core skills: The students - can describe and ethically reflect on the social role(s) of companies and other actors in the agriculture and food sector and their social responsibility and accountability to society. - can explain definitions, concepts and theories that are important for sustainable management and interaction with stakeholders in the agriculture and food sector and are aware of the associated strengths, weaknesses and uncertainties. - can use their knowledge of management systems and approaches as well as systems for sustainability assessment and communication to select and apply suitable instruments for the respective needs and analyse and discuss examples of entrepreneurial action. - can differentiate and discuss the different perspectives with which sustainable food systems and socially responsible corporate behaviour are understood.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Sustainable food systems and management (Lecture, Seminar) *Contents*: *Contents:* • Sustainability challenges in the global food system; history and status quo of CSR and sustainable development • Different stakeholder views on responsibility and sustainability (NGO'S, government, employees, investors…) • Voluntary and mandatory approaches to addressing responsibility and sustainability challenges in the food system • Contemporary research and practice examples **Literature:** Hahn, R. (2022). Sustainability Management: Global Perspectives on Concepts, Instruments, and Stakeholders. Germany: Rüdiger Hahn. Rasche, A., Morsing, M., & Moon, J. (Eds.). (2017). Corporate Social Responsibility: Strategy, Communication, Governance. Cambridge University Press.	4 WLH
Examination: Oral presentation (ca. 15 min.) including 400-800 words exposé 40%, written assignment (max. 8000 words) 60%	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Bettina König
Course frequency:	**Duration:**

each winter semester; Witzenhausen	1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 35	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.I02: Management of (sub-)tropical landuse systems** *English title: Management of (sub-)tropical landuse systems*	6 C

Lernziele/Kompetenzen: Studierende werden in die Lage versetzt, Ursache-Folgebeziehungen bei bio-physikalischen Begrenzungen von agro-pastoralen Landnutzungssystemen in den Tropen und Subtropen herzustellen und die Notwendigkeit für interdisziplinäre Forschungs- und Beratungsansätze selbständig zu begründen. Studierende werden befähigt, aktuelle Methoden der Landnutzungsanalyse zu bewerten und weiterzuvermitteln	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 152 Stunden

Lehrveranstaltung: Management of (sub-)tropical landuse systems (Blockveranstaltung, Vorlesung) *Inhalte*: Witzenhausen: Tier-Pflanze Interaktionen und Selektionsvermögen von Tieren bei Futteraufnahme, Folgen der Beweidung auf das Weideland; statistische Verfahren zur Messung der kleinräumigen Variabilität im Pflanzenwachstum und Anpassung an dieselbe, Verfahren zur Stoffflussmessung in verschiedenen Agrarökosystemen Prag: Landnutzungsmanagement: Farm- und Familieneinkommen in verschiedenen Betriebssystemen, Bodenschutztechniken für kleinbäuerliche Betriebssysteme, bodenschützende Bodenbearbeitungssysteme, potentielle Nutzung von Abfällen zur Produktivitätssteigerung in urbanen und peri-urbanen Landnutzungssystemen der Tropen, Bedeutung der Agrarbiodiversität in tropischen Landnutzungssystemen. Altieri, M. 1995: Agroecology, Westview Press, USA; Martius, C. 2002: Managing Organic Matter in Tropical Soils: Scope and Limitations. Kluwer Academic Publishers; Van Soest, P. 1994: Nutritional ecology of the ruminant. Cornell University Press, London, UK; Provenza, F.D. 1995: Post-ingestive feedback as an elementary determinant of food preference and intake in ruminants. Journal of Range Management, 48: 2-17.	
Prüfung: Klausur (90 Minuten) **Prüfungsanforderungen:** Kenntnisse des Selektionsvermögens von Tieren bei der Futteraufnahme, von Tier-Pflanze Interaktionen, der Folgen der Beweidung auf das Weideland, von statistischen Verfahren sowie von Verfahren zur Stoffflussmessung in verschiedenen Agrarökosystemen. Wissen über Landnutzungsmanagement, über Einkommen in verschiedenen Betriebssystemen, über Bodenschutztechniken für kleinbäuerliche Betriebssysteme sowie über bodenschützende Bodenbearbeitungssysteme. Weiterhin Kenntnisse der potentiellen Nutzung von Abfällen zur Produktivitätssteigerung und der Bedeutung der Agrarbiodiversität.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Fachkenntnisse in der Tierhaltung, in den Pflanzenbauwissenschaften und in der Bodenkunde

Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Andreas Bürkert
Angebotshäufigkeit: WiSe 13/14, einmal in 2 Jahren, alternierend mit Modul I07; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 25	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.I03: Food quality and organic food processing** *English title: Food quality and organic food processing*	6 C 4 SWS

Lernziele/Kompetenzen: Verständnis von Lebensmittelqualität und Prozessführung	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Food quality and organic food processing (Vorlesung) *Inhalte*: Qualität ökologischer Lebensmittel, Management und Verarbeitung, Richtlinien, Lebensmittel und Gesundheit Florkowski et al. 2000: Integrated View of Fruit and Vegetable Quality, Technomic; Welti-Chanes et al. 2001: International Congress on Engineering and Food, Volume I and II, Technomic; Luning et al. 2002: Food quality management, Wageningen Pers; Lawless et al. 1999: Sensory evaluation of Food, Kluwer; Kent et al.1994: Technology of cereals, Pergamon; Bidlack et al. 2000: Phytochemicals as bioactive agents, Technomic; Linden et al. 1994: New ingredients in food processing, CRC; Souci et al. 2000: Nutrition Tables, Medpharm	4 SWS
Prüfung: Präsentation, Referat oder Korreferat (ca. 20 Minuten, Gewichtung: 50%) und Projektarbeit (max. 20 Seiten, Gewichtung: 50%) **Prüfungsanforderungen:** Kenntnisse über Prozessführung und Lebensmittelqualität, sowie Wissen über die Qualität ökologischer Lebensmittel, über Management und Verarbeitung sowie über Richtlinien, Lebensmittel und Gesundheit. Kenntnisse über HACCP und QACCP eines Lebensmittels.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Grundkenntnisse in Chemie
Sprache: Englisch	**Modulverantwortliche[r]:** Dr. Nicolaas Busscher
Angebotshäufigkeit: jedes Sommersemester; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 40	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I06M: Exercise on the quality of tropical and subtropical products**	6 C 4 WLH

Learning outcome, core skills: Die Studierenden erlernen, analytische Daten zu gewinnen, auszuwerten und im Kontext von Ökonomie und Verbrauchererwartungen zu bewerten. Sie erlernen, sich selbständig Wissen anzueignen bzw. den Umgang mit wissenschaftlicher Primärliteratur. Weiterhin werden sie befähigt, im Team zu arbeiten und sich z.B. über sensorische Bewertungen auszutauschen.	**Workload:** Attendance time: 40 h Self-study time: 140 h

Course: Exercise on the quality of tropical and subtropical products (Block course, Exercise) *Contents*: Übungen zu ausgewählten Qualitätsmerkmalen von Getreide, Kartoffeln, Obst und Gemüse: Stärke- und Proteinqualität sowie; rheologische Eigenschaften; Teig- und Backeigenschaften von Getreide; Sensorik von Backwaren; ; Koch- und Frittiereigenschaften bei Kartoffeln; Konsumentenakzeptanz von Kartoffeln, Vermarktungseigenschaften von Obst und Gemüse; Texturanalyse, Ermittlung des Reifegrades; innere Qualitätsmerkmale von Obst und Gemüse und daraus hergestellte Säfte (u.a. Zucker/Säureverhältnis, Ethanol in Fruchtsaft), Sensorik von Obst- und Gemüsesäften.	4 WLH
Examination: Projektarbeit (max. 20 Seiten) **Examination prerequisites:** Teilnahme an den experimentellen Arbeiten im Labor verpflichtend **Examination requirements:** Kenntnisse der Qualitätsmerkmale von Getreide, Kartoffeln, sowie Obst und Gemüse. Kritische Einordnung der eigenen Messwerte im Vergleich zur Primärliteratur und in Kontexte des Lebensmittelrechts, der Verbrauchererwartungen und/oder der Ökonomie.	6 C

Admission requirements: none	**Recommended previous knowledge:** Modul Verarbeitung pflanzlicher Erzeugnisse oder vergleichbare Module/Kenntnisse
Language: English	**Person responsible for module:** Prof. Dr. Susanne Neugart
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.I07: International land use systems research - an interdisciplinary study tour** *English title: International land use systems research - an interdisciplinary study tour*	6 C 8,5 SWS

Lernziele/Kompetenzen: Die Studierenden • gewinnen multi- und interdisziplinäre Einsicht in (internationales) Umgehen mit den Chancen und Grenzen agro-silvo-pastoraler Landnutzungssysteme, nachhaltiger Ressourcennutzung und Entwicklungszusammenarbeit • lernen theoretische und praktische Aspekte der Feldforschung im internationalen Kontext kennen	**Arbeitsaufwand:** Präsenzzeit: 119 Stunden Selbststudium: 61 Stunden

Lehrveranstaltung: International land use systems research - an interdisciplinary study tour (Vorlesung, Exkursion, Seminar) *Inhalte*: Durch die Kombination eines Semesters vorbereitender Impulsvorträge mit Seminarbeiträgen der KursteilnehmerInnen und der 12-14 tägigen Exkursion in ein Land der (Sub)Tropen vermittelt dieses Modul den Studierenden interdisziplinäre Einblicke in die biophysikalischen und sozioökonomischen Aspekte agro-silvo-pastoraler Landnutzungssysteme im globalen Kontext. Die während der Exkursion zu besuchenden Kleinst- bis Großbetriebe, Verarbeitungsanlagen und Marketingorganisationen veranschaulichen die Möglichkeiten und Grenzen landwirtschaftlicher Tätigkeiten in ihrem spezifischen Kontext; dabei werden Aspekte der Nachhaltigkeit und Umweltverträglichkeit des Wirtschaftens besonders beleuchtet. Die Exkursion führt in Länder, in denen die beiden Universitäten Forschungsprojekte unterhalten und schließt Besuche von Partneruniversitäten und (inter)nationalen Forschungsinstituten mit ein. Dies vermittelt den MasterstudentInnen einen ersten direkten Eindruck von der Organisation und Durchführung von Forschungsprojekten in (sub)tropischen Ländern. Aktuelle Forschungsansätze und ¿methoden werden vermittelt und Fragen der nachhaltigen Nutzung natürlicher Ressourcen sowie der Entwicklungszusammenarbeit im interdisziplinären und internationalen Kontext besprochen.	8,5 SWS
Prüfung: Mündliche Prüfung (ca. 20 Minuten, Gewichtung: 50%) und Präsentation, Referat oder Korreferat (ca. 20 Minuten) mit schriftlicher Ausarbeitung (max. 4 Seiten) (Gewichtung: 50%) **Prüfungsvorleistungen:** Protokoll (Tagesbericht) max. 2 Seiten **Prüfungsanforderungen:** Inhalte der Lehrveranstaltungen werden in einer mündlichen Prüfung abgefragt, wobei die zwei unten genannten Prüfer, jeweils 10 Minuten aus ihrem Themenfeld befragen.	6 C

Bürkert: Bodenkundliche und pflanzenbauliche sowie forstwirtschaftliche Fragestellungen zu den während der Exkursion besuchten Betriebstypen und Naturräumen. Schlecht: Tierhalterische uns sozio-ökonomische Fragestellungen zu den während der Exkursion besuchten Betriebstypen und Naturräumen.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Studienschwerpunkt internationale Agrarwissenschaften und Entwicklungspolitik
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Eva Schlecht
Angebotshäufigkeit: Winter semester, every second year, alternating with Module I02; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 25	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I10M: Applied statistical modelling**	6 C 5 WLH

Learning outcome, core skills: Students have a detailed understanding of the concepts of statistical modelling, regression analyses and analyses of variance. They are familiar with the basic concepts of 'linear models', 'generalized linear models' and 'non-parametric estimation procedures', which now belong to the standard methods in applied statistics. Students are able to practically apply these methods and carry out statistical analyses in soil, plant and animal sciences using the statistical software R. They are able to apply the acquired skills in the analysis of their own MSc (and PhD) datasets.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Applied statistical modelling (Lecture, Exercise) *Contents*: Course Part I: Statistical analyses in soil and plant sciences (Lecture, Internship) • Review of statistical concepts (boxplots, QQ plots, distributions, classical tests, correlations, analyses of count and proportion data) • Experimental design: populations and samples • Introduction to the software R • Regression (multiple linear, polynomic, non-linear) • Statistical modelling, model types and model simplifications • Transformations Course Part II: Statistical analyses in animal sciences (Lecture, computer practical) • General aspects of hypotheses formulation and testing • Data distribution (normal, categorical, Poisson) and model selection criteria • Analyses of variance, post-hoc tests • Non-parametric test procedures • Mixed model procedures (linear, non-linear) • Formulation of statistical models and basic programming in R	5 WLH
Examination: Written examination (120 minutes) **Examination requirements:** One written exam with two parts. Knowledge of basic statistical terms and approaches, linear and generalized linear models and non-parametric estimation procedures. Ability to apply the methods and models to real data by using the software package R.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of applied statistics
Language: English	**Person responsible for module:** Prof. Dr. Bernard Ludwig
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

twice	
Maximum number of students: 25	

Additional notes and regulations:

Literature:

Lecture notes

- Crawley, M.J. 2012. The R Book, Wiley
- Dobson A. & Barnett A. (2008) An Introduction to Generalized Linear Models, Chapman & Hall.
- Field, A., Miles, J., Field, Z. 2012. Discovering Statistics using R, SAGE
- Mrode R. A. (2005) Linear Models for the Prediction of Animal Breeding Values, CABI Publishing.
- Searle S. R. (1982) Matrix Algebra Useful for Statistics, Wiley Series in Probability and Statistics.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.I11M: Free Project** *English title: Free Project*	6 C

Lernziele/Kompetenzen: Studierende sind imstande, eine wissenschaftliche Arbeit selbständig zu konzipieren und durchzuführen. Dies schließt auch die kritische Evaluation von Veröffentlichungen mit ein und die Fähigkeit, dieses Wissen auf aktuelle Probleme im Feld bzw. in den Wirtschafts- und Sozialwissenschaften anzuwenden. Ebenso sind sie imstande, Ergebnisse darzustellen und im Licht des bereits vorhandenen Wissens zu diskutieren.	**Arbeitsaufwand:** Präsenzzeit: 0 Stunden Selbststudium: 180 Stunden

Lehrveranstaltung: Free project *Inhalte*: In Vereinbarung mit dem Betreuer wird ein Thema für eine Projektarbeit festgelegt mit dem Ziel, ein Thema wissenschaftlich zu vertiefen. Dies kann auch experimentelle Arbeit einschließen. Das Ergebnis einer Projektarbeit ist je nach Aufgabenstellung eine schriftliche Darstellung der Ergebnisse, ein elektronisch auf einem Datenträger gesichertes Ergebnis und/oder eine Präsentation.	
Prüfung: Üblicher Weise Projektarbeit (ca. 15 Seiten bzw. 4000 Wörter)	6 C

Zugangsvoraussetzungen: Schriftliche Vereinbarung mit dem Betreuer über Thema, Umfang, Form und Zeitraum, in dem die Projektarbeit durchzuführen ist.	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Stephan von Cramon-Taubadel
Angebotshäufigkeit: jedes Semester; Göttingen oder Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.I12: Sustainable International Agriculture: basic principles and approaches** *English title: Sustainable international agriculture: basic principles and approaches*	6 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden: • sind in der Lage, die wichtigsten bio-physikalischen und sozio-ökonomischen Einflussfaktoren zu charakterisieren, die landwirtschaftliche Produktionssysteme und Ressourcennutzungsstrategien prägen. • kennen relevante ökologische, ökonomische und soziale Indikatoren für Nachhaltigkeit • können integrierende Verfahren zum Einsatz von Indikatoren für die Überprüfung der Nachhaltigkeit eines Systems erklären und auf Beispiele anwenden.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Sustainable International Agriculture: basic principles and approaches (Vorlesung) *Inhalte*: Globale Veränderungen, die von Bevölkerungswachstum, Migration und Urbanisierung über Klimawandel, Landdegradierung bis zu Wasserknappheit reichen, stellen große Herausforderungen für die nachhaltige Nutzung der natürlichen Ressourcen und des Humankapitals dar. Damit müssen sich weltweit alle mit landwirtschaftlicher Produktion beschäftigten Akteure auseinandersetzen, um auch zukünftig die quantitativ und qualitativ adäquate Bereitstellung von Nahrungsmitteln sicherzustellen. Dieses Modul behandelt daher die grundlegenden Konzepte und Prinzipien der Nachhaltigkeit und nachhaltiger Landwirtschaft in ihren ökologischen, ökonomischen und sozialen Dimensionen. Methodische Ansätze zur Erfassung und Beurteilung der bio-physikalischen und sozio-ökonomischen Nachhaltigkeit eines Landnutzungssystems und agrarischer Wertschöpfungsketten werden erörtert. Möglichkeiten für ein nachhaltiges Management von Wasser, Boden, Pflanzen und Tieren, sowie den landwirtschaftlichen Erzeugnissen entlang der Wertschöpfungsketten werden diskutiert, dabei werden die jeweils relevanten zeitliche und räumlichen Skalenebenen berücksichtigt.	4 SWS
Prüfung: Klausur (90 Minuten) **Prüfungsanforderungen:** **Barkmann (SE)**: Allgemeine Definitionen und Indikatoren für nachhaltigen Entwicklung; starke und schwache Nachhaltigkeit, das Substitutions-Paradigma und seine Grenzen, Tragfähigkeit und kritisches natürliches Kapitals, Wirtschaftswachstums-Modelle; ökonomische Ansätze für die Quantifizierung nachhaltiger Entwicklung; SNA / grüne Buchführung, Kosten-Nutzen-Analyse. **Bürkert (NW):** Konzepte der Nachhaltigkeit; Agroforst-Systeme, Wanderfeldbau; Auswirkungen auf Bodenfruchtbarkeit und Nachhaltigkeit.	6 C

Liebe (SE): Dimensionen der sozialen Nachhaltigkeit; Bewirtschaftung kommunaler Ressiourcen; McDonaldisierung der Landwirtschaft; Landwirtschaft und ökologische Gerechtigkeit. **Ludwig (NW):** Böden - Texturen, Mineralien, Typen, organische Substanz, Funktionen und Formen, N-Dynamik. Wassererosion, Winderosion, Prozesse und Raten, Gegenmaßnahmen. Emissionen von Treibhausgasen (THG) und Ammoniak: Quellen und Prozesse, Optionen der Emissionsminderung. **Möller (SE):** Multifunktionalität und Farm-Management; Verwirklichung von Nachhaltigkeitskonzepten im Betrieb; Agri-Umwelt-Systeme und nachhaltige Betriebsführung; Indikatoren zur Bestimmung der betrieblichen Nachhaltigkeit; Controlling der Nachhaltigkeit; Wirtschaftlichkeit des ökologischen Landbaus; Gemeinschaftsformen in der Landwirtschaft. **Schlecht (NW):** Nachhaltigkeit in der Tierproduktion, Umweltwirkung von Tierhaltungssystemen und ihre Vermeidung: a) THG-Emissionen, Umweltverschmutzung; b) Überweidung.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Eva Schlecht
Angebotshäufigkeit: jedes Wintersemester; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

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

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

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

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

Additional notes and regulations:

Literature:

Principles of Geographical Information Systems

by Peter A. Burrough and Rachael A. McDonnell (2015)

Introduction to Remote Sensing

by James B. Campbell andRandolph H. Wynne (2011)

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I17: Sustainable diets**	6 C 6 WLH

Learning outcome, core skills: Students are able to describe the interactions of diets, sustainability and human nutrition/health. Students are able to assess the impacts of a dish/meal (as unit) on sustainability and nutrition parameters.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Sustainable diets (Lecture, Excursion) *Contents*: • Culture and cultural patterns of diets • Interactions of food quality and lifestyle on sustainability and human health • Healthy diets within sustainable food systems • Model diets such as Med. Diet and New Nordic Diet • Optimization of a dish/meal according sustainability and nutrition impacts • Role of organic food systems	6 WLH
Examination: Presentation (ca. 15 minutes, 50%) with written outline (max. 15 pages, 50%) **Examination requirements:** Knowledge of lifestyles and interaction with food quality (in selected countries). Knowledge of methods for the collection of environmental and nutritional parameters. Knowledge of legal requirements for the labelling of foodstuffs as well as guidelines for the processing of sustainable food products.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge on nutrition, statistics and environmental issues.
Language: English	**Person responsible for module:** Liliana Stefanovic
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 40	

Additional notes and regulations:

Literature:

Will be provides via the system2teach platform.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I19M: Participatory research methods for sustainability**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
This course will look at the importance of place-based, participatory and transdisciplinary research methods in sustainability science. Students will learn different participatory methods to capture the knowledge and aspirations of the different agents that operate in agricultural landscapes and will be able to integrate this knowledge in practical outcomes for sustainable land management. After successfully completing this module students should: • comprehend the fundaments of participatory research • be familiar with the different types of participatory research methods • be able to design and implement participatory processes This module contributes to the following skills: • performance of transdisciplinary processes • integration of knowledge and aspirations of different agents towards sustainable land management • data collection and analysis using participatory methods • group work techniques (organization of working schedule, team work) • presentation skills and communication of main research results	Attendance time: 56 h Self-study time: 124 h

Course: Participatory research methods for sustainability (Lecture, Seminar) *Contents*: The course is structured in three parts. An introductory part focuses on research principles of sustainability science, paying particular attention to the role of transdisciplinary and ethics in the participation processes. A second part showcases a broad suite of different participatory research methods (e.g. photo-voice, participatory mapping, storytelling) for sustainable landscapes management and land-use conflict resolution. The full research process is addressed, from participatory process design, the approaching and involvement of participants and the organisation and facilitation of participatory activities, to the analysis, integration and presentation of the outcomes. In the third part of the course, students have the opportunity to choose and design a protocol for a participatory study, applied to a specific geographical location and a specific problem, and share the insights of the process with the class. The first part will be outlined in lectures, the second part will take the form of seminars and the third part will consist of group work with a final presentation to the class where the different experiences will be critically discussed.	4 WLH

Examination: Presentation (approx. 30 minutes, 50%) and Term paper (max. 20 pages, 50%) **Examination requirements:** Presentation and critical analysis of a participatory research approach applied to a land-use topic of the students' choice.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Maria Chiara Camporese
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Additional notes and regulations:

Literature:

Bergmann, M. et al. (2012). Methods for Transdisciplinary Research: A Primer for Practice. Campus Verlag.
Course materials to be provided.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I20: Agriculture and ecosystem services**	6 C 4 WLH

Learning outcome, core skills: This course will introduce students into the concepts of ecosystem services and human well-being, with a particular focus on their relevance for agriculture and other land uses. It will foster the ability of students to assume an interdisciplinary research perspective (including ecological, socio-cultural, and economic approaches) and to critically discuss and analyse the concept of ecosystem services in its multiple scientific, political and practical meanings.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Agriculture and ecosystem services (Lecture, Exercise, Seminar) *Contents*: Global environmental assessments (e.g., the Intergovernmental Platform on Biodiversity and Ecosystem Services, IPBES) have highlighted that human well-being is critically dependent on ecosystem services – the benefits that nature provides to people. Depending on the particular land-use system and its social-ecological context, agriculture can either degrade or enhance such ecosystem services. This course gives an overview on the rising field of ecosystem services science. Focus will be on: • techniques for decision support, • practical applications of the approach in agriculture and other land-use sectors, and • linkages to other sustainability issues (e.g., biodiversity, climate change, water security, poverty). These topics will be outlined in lectures and deepened in seminars and field exercises, where key issues will be explored and critically discussed.	4 WLH
Examination: Presentation (approx. 30 minutes, 50%) and term paper (max. 20 pages, 50%) **Examination requirements:** Presentation and critical analysis of a case study that takes a particular ecosystem services problem in a land-use setting and geographic location of the participants' choice into focus.	6 C

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

25	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I21M: From conceptualisation to communication: key steps in empirical research**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
This course will enable students to develop and execute their own empirical (MSc) research project, to elaborate empirical real-world data in a meaningful way and to communicate major insights in a professional manner. The approaches and methods taught are applicable to a wide range of research topics. After successful completion of this module, students can: • Formulate research questions and hypotheses; • Write a grant application for acquisition of funding for their research project; • Design an e-questionnaire for interview-based data acquisition; • Recover interview data in a tabulation program and elaborate meaningful results; • Pinpoint research highlights in a prize-winning poster.	Attendance time: 56 h Self-study time: 124 h

Course: From conceptualisation to communication: key steps in empirical research (Lecture, Exercise) *Contents*: This module prepares students with a natural sciences focus for international agricultural research in the framework of their M.Sc. thesis, the prerequisites of which include the ability to identify a research topic, formulate research questions and working hypotheses, elaborate a data collection matrix, analyse the collected data and communicate the obtained results in an effective manner. Therefore this module emphasises the practice of skills concerning the conceptualisation of a research project, data acquisition and analysis, and presentation skills. It is organised in four major sections: **Part I: Conceptualisation of a research project** – 15% of time In a participatory process, students will brainstorm on research topics, learn to formulate research questions and working hypotheses, and familiarize with the full conceptualisation of an MSc study proposal, for submission to, e.g., PROMOS or *fiat panis* grants. **Part II: Elaboration of a structured e-questionnaire using freeware** – 20% of time Students are introduced to the CS PRO freeware for the setup of e-questionnaires; they then individually conceptualise and computerise their own questionnaire of 20-30 differently scaled questions and test its functionality. **Part III: Descriptive and creative analysis of data using tabulation software** – 50% of time Participants receive real-world interview-based data from finalised or ongoing research projects of the principal instructor's group. In groups of 2 to 3 persons, they elaborate the information contained in the database, thereby answering to a series of simple as well as more complex research questions that guide this analytical step.	4 WLH

Part IV: Preparation and presentation of a research poster – 15% of time Being provided with guidelines and templates, each group of students designs a research poster to present their most relevant results (see part III), thereby using PowerPoint or corresponding freeware. Posters are printed on A0 paper and are presented in short oral communications of 3-5 minutes, just as at a conference. Each poster is evaluated by the non-involved participants (standardized evaluation sheet, covered) and the three best posters receive a poster price.	
Examination: Written exam (90 minutes; weight: 50%) and presentation (ca. 20 minutes; weight: 50%) **Examination requirements:** Knowledge of the steps, do's and don'ts of research project conceptualisation, grant application, interview/questionnaire design, data elaboration and poster presentation. Part of the examination is an assessment of data evluation.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of Excel and PowerPoint or corresponding freeware
Language: English	**Person responsible for module:** Prof. Dr. Eva Schlecht
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Additional notes and regulations:

Literature:

- Lecture notes
- Schoonmaker-Freudenberger, K. 2008: Rapid rural appraisal (RRA) and participatory rural appraisal (PRA):
  a manual for CRS field workers and partners. (online resource; www.crs.org).
- de Hoyos, M., Barnes, S.A. 2012. Analysing interview data. Warwick Institute for Employment Research (online resource).

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I23: Sustainable agricultural practices in Mediterranean regions**	6 C 2 WLH

Learning outcome, core skills: To gain interdisciplinary insights into (international) approaches towards opportunities and challenges of sustainable agricultural systems under limited water conditions, sustainable resource use, and agricultural development interventions. Students will get to know socio-cultural contexts on the ground about the impacts of agricultural intensification and their repercussions on local well-being (e.g., immigrated population welfare, labor issues, and environmental degradation) and sustainable agricultural alternatives. To familiarize participants with theoretical and practical questions of field research in an international contexts. Learn and put into practice research methods of data collection and analysis.	**Workload:** Attendance time: 96 h Self-study time: 84 h

Course: Sustainable agricultural practices in Mediterranean regions *Contents*: Sustainable agricultural practices in the context of Mediterranean water-scarce regions: an interdisciplinary field trip (Lecture, Excursion, Seminar) Through the combination of preparatory lectures and student seminars and the 10 days excursion to a Mediterranean country, this module provides participants with interdisciplinary insights into the ecological, socio-cultural and economic components of sustainable agricultural systems and practices within the Mediterranean context. The different agricultural systems, from small- to large size farms, enterprises, local associations and non-governmental organisations to be visited during the excursion will exemplify the opportunities and challenges of agricultural activities in their specific context. In addition, particular attention will be paid to aspects of sustainability, water management, social and local well-being, and environmental safety. The participation of different universities and international research institutions will allow the MSc students to gain a first impression on how field research is organized and carried out in the Mediterranean countries. In addition, the participation of local associations and non-governmental institutions will provide another view of the social, and economic contexts, as well as, conflicts of the specific visited region/country. Specific general and scientific articles dealing with the excursion country, distributed in the course	2 WLH
Examination: Presentation (approx ca. 20 minutes) (50%) and written outline (max. 4 pages) (50%) **Examination requirements:** Examination prerequisites: Day protocol of the excursion (max. 2 pages)	6 C

Examination requirements: Presentation and critical analysis of a case study that will be covered during the excursion, focusing on interdisciplinary aspects from the ecological (agricultural oriented) dimension to the socio-cultural and human well-being contexts, developed during the preparatory seminars.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Sören Köpke
Course frequency: each winter semester	**Duration:** 2 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I24: Modelling climate impacts on agroecosystems**	6 C 4 WLH

Learning outcome, core skills: The students have an overview of models used to capture climate change impacts on different agroecosystems and the effects of climate adaptation measures. The module teaches climate change impacts on various agroecosystems, adaptation measures and how these aspects can be captured by different types of statistical and process-based agricultural models. With this knowledge, the students are able understand and develop agricultural models to assess climate impacts, risks and resilience. In the last section, adaptation measures to climate change are modeled, discussed and evaluated using various methods and indicators.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Modelling climate impacts on agroecosystems (Lecture, Exercise, Seminar) *Contents*: The course gives an overview of climate change impacts across different agroecosystems, a solid understanding of climate and agricultural models and the projected climate impacts on the agricultural production, resilience and adaptation. In addition, short term climate and weather risks are discussed in the course. The lecture is in parallel with an exercise, where the students rebuild and develop own models in the statistic software R.	4 WLH
Examination: Oral examination (approx. 30 minutes, 50%) and written report (max. 7 pages, 50%) **Examination requirements:** Students write a written report which includes an data exercise in R and understand the content taught in the lecture.	6 C

Admission requirements: none	**Recommended previous knowledge:** First experience with the statistic software R is valuable.
Language: German, English	**Person responsible for module:** Prof. Dr. Christoph Gornott
Course frequency: each summer semester1	**Duration:**
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:

Literature:

Shukla, Gleixner, Yalew, Schauberger, Sietz, Gornott, 2021: Dynamic vulnerability of smallholder agricultural systems in the face of climate change for Ethiopia, Environmental Research Letters.Laudien,

Schauberger, Makowski, Gornott, 2020: Robustly forecasting maize yields in Tanzania based on climatic predictors, Nature Scientific Reports.

Iizumi, T., Hirata, R., Matsuda, R. (2019) Adaptation to Climate Change in Agriculture, Springer, ISBN 978-981-13-9235-1

Bryant, C.R., Sarr, M.A., Délusca K. (2020) Agricultural Adaptation to Climate Change, Springer, ISBN 978-3-319-31392-4

Torquebiau, E. (2016) Climate Change and Agriculture Worldwide, Springer, ISBN 978-94-017-7462-8

Castro, P., Azul, A.M., Leal Filho, W., Azeiteiro, U.M. (2019) Climate Change-Resilient Agriculture and Agroforestry, Springer, ISBN 978-3-319-75004-0

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I25: Engineering software in agriculture and livestock farming**	6 C 4 WLH

Learning outcome, core skills: The participants will have gained computer programming skills in image processing, signal processing, machine learning in agriculture and livestock farming. They will also learn about the related software and application in the context.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Engineering software in agriculture and livestock farming (Exercise, Seminar) *Contents*: • Introduction to engineering solutions in agriculture and livestock farming • Advanced Machine vision for agricultural context • Advanced computer programming in MATLAB®software • Image and signal processing algorithms in MATLAB® • Machine learning algorithms • Training, validation and test set selection in machine learning models	4 WLH
Examination: Report (field work) 30% (max. 8 pages), practical exam 70% (software application) **Examination prerequisites:** attendance is compulsory **Examination requirements:** • Understanding of computer programming in MATLAB • Knowledge of image processing in agriculture and livestock farming • Ability of data analysis and classification • Ability to work and use optical sensors in agriculture and livestock farming	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of MATLAB, scientific research and data collecting
Language: English	**Person responsible for module:** Dr. Sowah Addo
Course frequency: each summer semester1	**Duration:**
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:
Papajorgji P. J. und P. Pardalos 2006: Software Engineering Techniques Applied to Agricultural System. Springer.

Gonzalez R. C., Woods R. E. and S. L. Eddins 2003: Digital Image Processing Using Matlab. Prentice-Hall, Inc., USA

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I27: Postharvest Technology**	6 C 4 WLH

Learning outcome, core skills: Students are able to understand Postharvest operations and can evaluate them in respect to loss reduction and quality aspects. They can select proper criteria for quality assurance and can decide fitting instrumentation for control purposes.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Postharvest Technology (Lecture) *Contents*: Basics of processing and storage of agricultural products (drying, cooling) Selection of machinery and process technology Quality assessment and respective instruments	4 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** Students are able to critically select process technology, chose instrumentation for process control and quality assessment, and they are able to interpret the measurements	6 C

Admission requirements: Fundamentals of Physics	**Recommended previous knowledge:** Basic course in agricultural engineering
Language: English	**Person responsible for module:** Prof. Dr. Oliver Hensel
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:

Literature:

- Hand-outs in lectures and exercises

Wild, Y. and R. Scharnow, Container Handbook, Vol. 3, German Insurance Association – GDV, Berlin, 2003

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I28M: Unoccupied aerial vehicle (UAV) applications in agriculture**	6 C 4 WLH

Learning outcome, core skills: The students will learn about the unoccupied aerial vehicle (UAV) based remote sensing data acquisition and use in the agricultural context. They will understand the logic of using UAVs for agricultural applications and challenges and the essential theoretical background of available airborne technology, including international legislation and regulations for UAVs. They will learn to prepare a flight plan with all the prerequisites and to execute a safe flight mission. They will get experience in collecting UAV remote sensing data and the corresponding validation in-situ data on the field. Students will develop the ability to process the collected remote sensing data using open-source software to prepare maps and interpret them. They will obtain basic modelling skills to calibrate/validate models and estimate crop parameters with collected in-situ data and UAV remote sensing data	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Unoccupied aerial vehicle (UAV) applications in agriculture (Exercise) *Contents*: • Basic principles of vegetation remote sensing with a focus on different sensors and their characteristics. • Overview of the UAV application for agriculture, including opportunities and challenges. * Understanding of essential components of UAVs and international rules and regulations for UAVs. • Design an agricultural application with UAVs (Problem identification, data to be collected, selection of UAV and sensor, designing flying plans) • Field-level experience in UAV flying, mission planning, remote sensing and crop in-situ data (e.g., LAI, plant height), and ground control point data collection. • Introduction to structure from motion (SfM) technology for processing UAV images. • Processing of UAV remote sensing data using Open-Drone-Map (ODM) to develop image ortho-mosaics. • Visualisation of developed image products in Quantum GIS (QGIS) and their interpretation. • Basic principles of regression models and introduction to R. • Calibration and validation of crop in-situ data models using UAV remote sensing data, generation of estimated crop parameter maps, and interpretation of outputs.	4 WLH
Examination: Oral exam (approx. 30 min) 70 %; Presentation (approx. 15 min + 2 side handout) 30 % (45 minutes) **Examination prerequisites:** Basic understanding of remote sensing for vegetation analysis, opportunities and limitations of UAV for agriculture, and how to design UAV data collection for agriculture applications.	6 C

Admission requirements:	**Recommended previous knowledge:**

none	Participation in the I14M SIA module and programming with R would be advantageous.
Language: English	**Person responsible for module:** Jayan Wijesingha
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Additional notes and regulations:

Literature:

- Unmanned Aerial Vehicle: Applications in Agriculture and Environment, edited by Ram Avtar, and Teiji Watanabe, Springer International Publishing AG, 2019. ProQuest Ebook Central, https://ebookcentral.proquest.com/lib/unikassel/detail.action?docID=5979944.
- E-agriculture in action: Drones for agriculture. Thailand, Food & Agriculture Org., 2018.; UAV Remote Sensing for Plant Traits and Stress. N.p., Frontiers Media SA, 2022.
- UAS-Remote Sensing Methods for Mapping, Monitoring and Modeling Crops. N.p., MDPI AG, 2021.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I29M: Research Methods and Data Science in the Life Sciences**	6 C 4 WLH

Learning outcome, core skills: Students have an understanding of the methods of quantitative and qualitative data collection in the life sciences and the different sampling techniques and experimental designs. They are able to apply standard data analysis techniques. They understand the usefulness and limitations of selected multivariate approaches for regressions and pattern recognitions in the data science and learn the concepts of different machine learning approaches. They are able to apply the acquired skills in the analysis of their own MSc (and PhD) datasets.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Research Methods and Data Science in the Life Sciences (Internship, Lecture) *Contents*: Research methods and standard analyses in the life sciences • Introduction to methods of quantitative and qualitative data collection in the life sciences • introduction to sampling techniques and standard statistical techniques (regressions and analyses of variance) Data science in the life sciences • Application of multivariate approaches: principal component analysis (PCA) and regression (PCR), cluster analyses, factor analyses • Introduction to machine learning: perceptron, artificial neural networks, regression trees, rule-based models and support vector machine classification and regression	4 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** Profound knowledge of existing research methods and standard analyses in the life sciences. Solid understanding of the concepts, usefulness and limitations of multivariate and machine learning approaches for data analyses in the life sciences.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic Knowledge (B.Sc. level) of Soil and Plant Sciences
Language: English	**Person responsible for module:** Prof. Dr. Bernard Ludwig
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**

Maximum number of students: 20	

Additional notes and regulations:

Literature:

Everitt, B., Hothorn, T. P. 2011. An Introduction to Applied Multivariate Analysis with R. Springer, New York

Jones, E., Harden, S., Crawley, M.J. 2023. The R Book. 3rded. Wiley

Holmes, D., Moody, P., Dine, D., Trueman, L. 2017. Research Methods for the Biosciences. Oxford University Press

Touchon, J.C. 2021. Applied Statistics With R: A Practical Guide for the Life Sciences. Oxford University Press

Wehrens, R. 2020. Chemometrics with R. 2nd ed. Springer

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I30: Organic Agriculture in Europe**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Students understand the situation of organic agriculture in different European countries. Students are able to discuss and judge standards of organic agriculture.	Attendance time: 50 h Self-study time: 130 h

Course: Organic Agriculture in Europe (Seminar) *Contents*: Online seminar: Comparison of standards of organic agriculture (IFOAM, EU, within EU). Situation of organic production, processing and markets in different European countries. Organic agriculture in European Universities: current research projects, teaching activities. Necessary measures on all levels in the coming future to transform agriculture production in different countries to organic agriculture.	
Examination: Work report (max. 15 p.) 80% or presentation (approx. 25 min) 40% and work report (max. 10 p.) 40%; oral test (approx. 15 min) 20% **Examination requirements:** Students have to analyze the situation of organic agriculture in different European countries and to compare the situation and development under defined criteria.	6 C

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

Additional notes and regulations:
The international module is offered online by ENOAT (European network of organic agriculture teachers) for students of all participating European universities.

Literature:

FIBL and IFOAM (ed.) 2022: The world of organic agriculture. Frick/Switzerland

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I31: Sustainable land-use and climate mitigation**	6 C 4 WLH

Learning outcome, core skills: Upon successful completion of the module students • will be able to understand key scientific concepts around climate change and its mitigation. • have deep knowledge on land-based mitigation options, their potentials, interplays and side-effects • will understand the scientific principles of the interplay between climate mitigation and other sustainable development targets • will be able to develop interdisciplinary and holistic viewpoints on sustainable land management including land-based mitigation • will obtain an overview of models used to assess mitigation pathways • will be able to understand land-use models and Integrated Assessment Models that are used to derive future pathways • will become familiar with international assessment bodies such as IPCC or IPBES • develop critical thinking of the scenarios used in international assessments such as IPCC and IPBES • will explore analytical tools such as scenario explorers and land-use models • will reflect on the concepts of the course throughout seminar presentations and discussions	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Sustainable land-use and climate mitigation (Lecture) *Contents*: Land-based climate mitigation measures have gained significant attention and importance in public and private sector climate policies. To start with, this course provides an overview on climate change and its mitigation in general, focusing on the land-use sector. It will highlight the contributions of land use to as well as its potentials for mitigating climate change. Hereby, the course will help to increase the understanding of the needs, opportunities, potentials, interplays of different land-based mitigation options as well as their interaction with other sustainable development targets such as biodiversity protection. The course continues introducing international assessment bodies such as IPCC and IPBES being one of the major scientific basis of public and private sector decision making. Moreover, the scenarios as well as the tools applied for developing these scenarios will be assessed and discussed. Students then work on selected current topics of Land-Based Climate Mitigation from different perspectives which are accompanied by the lecturers. At the end of the semester, all students present their outcomes. Part of the module will take place at the Potsdam Institute of Climate change. Leimbach, M., et al. (2011): Integrated assessment models -the interplay of climate change, agriculture, and land use in a policy tool. In: Dinar, A., Mendelsohn, R. (eds.):	4 WLH

Handbook on Climate Change in Agriculture. Edward Elgar, Cheltenham, UK. (Chapter 10) Dietrich, J. et al (2019): MAgPIE 4 -A modular open source framework for modeling global land-systems. Geoscientific Model Development. 12, 1299-1317. Pörtner, H.O., et al (2021) IPBES-IPCC co-sponsored workshop report on biodiversity and climate change; IPBES and IPCC. DOI:10.5281/zenodo.4782538.	
Examination: Oral presentation (approx. 15 min.) 40% and oral exam (approx. 15 min.) 60% **Examination requirements:** Presentation – appropriate according to the standard of international conferences: relevant and sound content, clear structure, style, language (written and spoken) and pronunciation, citation and use of sources according to good scientific practice. Oral exam – The exam will ask knowledge and transfer questions related to the lecture content (i.e. climate change and mitigation, land-based mitigation options (potentials, sustainability dimension), land-use and IAM models, scenarios, international assessments such as IPCC, IPBES).	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Alexander Popp
Course frequency: each summer semester; Witzenhausen/Potsdam	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I32: Biodynamic agriculture**	6 C 4 WLH

Learning outcome, core skills: Learn to know basic principles of biodynamic agriculture (in Germany and worldwide), critical discussion of practical examples and scientific studies on the topic, as well as insight into practice on a biodynamic farm and into research work on the issue**.**	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Biodynamic agriculture (Lecture) *Contents*: Introduction to the basics of biodynamic agriculture with practical examples from Germany and around the world. The areas of animal husbandry, plant breeding and product quality as well as the underlying principles of biodynamic agriculture will be discussed. With a focus also on scientific studies on the subject and current concepts like one health. The course includes a 3-day excursion to a biodynamic farm and a research institution. Brock et al. (2019): Research in biodynamic food and farming – a review. Open Agriculture https://doi.org/10.1515/opag-2019-0064	4 WLH
Examination: Presentation (approx. 30 min.) 50% and oral exam (approx. 30 min.) 50% **Examination requirements:** Good knowledge about biodynamic agriculture and practical examples	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Daniel Kusche
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 16	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I33: Food Processing**	6 C 4 WLH

Learning outcome, core skills: Students can: - Describe the basic processes and systems of food processing - Derive quality-relevant steps, raw material and product properties - Discuss the differences between industrial and artisanal production - Classify the production of food in the wider context of sustainable development	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Food Processing (Lecture, Seminar) *Contents*: Students gain in-depth knowledge of the production of the most important food product groups and the chemical reactions that take place. Furthermore, a principle knowledge of analytical methods for quality and authenticity testing of these product groups will be provided. Animal foodstuffs: milk and dairy products; eggs and egg products; meat and meat products; fish and fish products. Plant foods: vegetable fats and oils; fruit and fruit products; vegetables and vegetable products; Legumes; cereals and cereal products; sugar, cocoa and chocolate; coffee and tea; Alcoholic beverages: beer, wine and spirits; Flavors and spices **Additional notes and regulations:** Seminars include research-based learning elements such as case studies and research activities involving students giving short presentations	4 WLH
Examination: Oral examination (approx. 20 minutes) **Examination requirements:** basic processes and systems of food processing, quality of processing and products, industrial and artisanal production	6 C

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

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P01: Ecology and agroecosystems**	6 C 4 WLH

Learning outcome, core skills: Studierende sind in der Lage, standortspezifische Bedingungen der Nachhaltigkeit zu definieren, Schlüsselkomponenten der Produktivität und nachhaltigen Nutzung von Agrarökosystemen zu identifizieren, die Bedeutung menschlicher Eingriffsmöglichkeiten zu beurteilen, die Ursachen eines Produktivitätsabfalls zu entschlüsseln und die Effektivität geeigneter Gegenmaßnahmen vorherzusagen.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Ecology and agroecosystems (Lecture, Seminar) *Contents*: Fallstudienbasierte Analyse und Diskussion der ökologischen Rahmenbedingungen verschiedener Agrarökosysteme der trockenen und sub-humiden Klimazone mit Schwerpunkt auf Grenzstandorten oder schwierigen infrastrukturellen Bedingungen, bei denen die effektive Nutzung von Stoffkreisläufen, die Integration pflanzlicher und tierischer Betriebszweige und die Nutzung der Agrarbiodiversität von grundlegender Bedeutung für das bäuerliche Einkommen sind. Bei jeder Fallstudie wird die Bedeutung und das Potential für die Ökologische Landwirtschaft diskutiert. Ebenfalls analysiert wird das Potential der Ökologischen Landwirtschaft, die Nachhaltigkeit von Agrarökosystemen zu verbessern.	4 WLH
Examination: Written Exam (90 min., 70%) and presentation (25 min., 30%) **Examination requirements:** Studenten sollen in der Lage sein die Funktion und bio-physikalischen Grenzen (sub)tropischer agro-pastoraler Landnutzungssysteme zu erklären, die Notwendigkeit interdisziplinärer Ansätze zu begründen und aktuelle Forschungsmethoden in Landnutzungssystemanalysen zu beschreiben.	6 C

Admission requirements: none	**Recommended previous knowledge:** Grundkenntnisse in den Pflanzenbauwissenschaften, Bodenkunde und Tierhaltung
Language: English	**Person responsible for module:** Prof. Dr. Andreas Bürkert
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.P05: Organic cropping systems under temperate and (sub)tropical conditions** *English title: Organic cropping systems under temperate and (sub)tropical conditions*	6 C 4 SWS

Lernziele/Kompetenzen: Studierende sind in der Lage, die Grundzüge und Funktionsprinzipien von Agrar-Ökosystemen darzustellen, Nährstoffkreisläufe als wichtige Stellglieder der Ökologischen Landwirtschaft zu quantifizieren, Landnutzungssysteme auf ihre Eignung für die Ökologische Landwirtschaft zu überprüfen, und die Rolle der Tierhaltung in Stoffkreisläufen zu beurteilen.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Organic cropping systems under temperate and (sub)tropical conditions (Vorlesung, Exkursion, Seminar) *Inhalte*: Besuch von Ökobetrieben; Entwicklung, Evaluation und Vergleich ökologischer Pflanzenanbausysteme im Kontext diverser natürlicher, ökonomischer und soziokultureller Bedingungen; Management von Nährstoffkreislaufsystemen unter unterschiedlichen Gegebenheiten; gezielte Nutzung von Leguminosen für die standortgerechte N-Versorgung; Grundlagen der P-Verfügbarkeit, der P-Rückführung und der Nutzung von Rohphosphaten; Möglichkeiten der P-Versorgung in verschiedenen Anbausystemen; Unterschiede und Probleme bei den Ökostandards in EU, Japan, Australien und USA; Beitrag der Tierhaltung zur Nachhaltigkeit ökologischer Anbausysteme.	4 SWS
Prüfung: Mündliche Prüfung (ca. 15 Minuten, Gewichtung: 75%) und Präsentation, Referat oder Korreferat (ca. 15 Minuten, Gewichtung: 25%) **Prüfungsanforderungen:** Jeder der Prüfungsteile muss bestanden werden. Kenntnisse von ökologischen Pflanzenanbausystemen, vom Management von Nährstoffkreislaufsystemen, von gezielter Nutzung von Leguminosen für die standortgerechte N-Versorgung sowie Kenntnisse über die Grundlagen der P-Verfügbarkeit, der P-Rückführung und der Nutzung von Rohphosphaten. Wissen über die Möglichkeiten der P-Versorgung in verschiedenen Anbausystemen, über die Unterschiede und Probleme bei den Ökostandards in EU, Japan, Australien und USA sowie Wissen über den Beitrag der Tierhaltung zur Nachhaltigkeit ökologischer Anbausysteme.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Grundkenntnisse in den Pflanzenbauwissenschaften, Bodenkunde und Tierhaltung
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Andreas Bürkert
Angebotshäufigkeit:	**Dauer:**

jedes Wintersemester; Witzenhausen	1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.P07: Soil and plant science** *English title: Soil and plant science*	6 C 4 SWS

Lernziele/Kompetenzen: Brückenmodul um die neuesten Kenntnisse in den pflanzenbaulichen Grundlagenfächern insbesondere im Hinblick auf Fragen der ökologischen Landwirtschaft, die üblicherweise so nicht gelehrt werden, zu vermitteln. Studierende, die diesen Kurs besucht haben können den weiterführenden pflanzenbaulichen Modulen folgen.	**Arbeitsaufwand:** Präsenzzeit: 60 Stunden Selbststudium: 120 Stunden

Lehrveranstaltung: Soil and plant science (Vorlesung, Seminar) *Inhalte*: Einfluss von Bodenbildungsprozessen auf physikalische Eigenschaften (Bodenart, Bodenwasser, Porenraum), chem. Eigenschaften (Puffervermögen, Austauschkapazität, Nährstoffe) und biol. Eigenschaften (organische Substanz, Edaphon). Nährstoffverfügbarkeit und Nährstoffmobilisierung unter konventionellen und ökologischen Anbaubedingungen, Haupt- und Spurennährstoffe und Nahrungsqualität. Züchtungsziele für unterschiedliche landwirtschaftliche Systeme: Pflanzenmorphologie, -genetik und –züchtung, Pflanzendomestikation und Nutzung, Charakterisierung und Beurteilung, Nutzung genetischer Ressourcen in der Pflanzenzüchtung. Genetik von Wirts-Parasit Interaktionen, Epidemiologie der Pflanzenkrankheiten, Pflanzenabwehrmechanismen, Insektenphysiologie und –ökologie. Spezifische allgemeine und wissenschaftliche Artikel, die sich mit dem Zielland der Exkursion befassen werden über eine E-Learning Plattform zur Verfügung gestellt	4 SWS
Prüfung: Klausur (120 Minuten) oder Fachgespräch (ca. 20 Minuten) **Prüfungsanforderungen:** Physikalische Eigenschaften (Bodenart, Bodenwasser, Porenraum); chem. Eigenschaften (Puffervermögen, Austauschkapazität, Nährstoffe); biol. Eigenschaften (organische Substanz, Edaphon); Bodenbildung und –klassifikation. Rolle der Haupt- und Spurennährstoffe in Pflanzen, Nährstoffverfügbarkeit und Nährstoffmobilisierung, Pflanzennährstoffe und Nahrungsqualität. Pflanzenmorphologie, -genetik und –züchtung, Prinzipien der Pflanzendomestikation und Nutzung, Charakterisierung und Beurteilung, Nutzung genetischer Ressourcen in der Pflanzenzüchtung, genetische Grundlagen für die Züchtung. Prinzipien der Pflanzenkrankheiten und Entomologie, Entstehung von Pflanzenkrankheiten, Epidemiologie, Pflanzenabwehrmechanismen, Insektenphysiologie und –ökologie.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine

Sprache: Englisch	**Modulverantwortliche[r]:** Dr. Helmut Saucke
Angebotshäufigkeit: jedes Wintersemester; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P10: Tropical agro-ecosystem functions**	6 C 4 WLH

Learning outcome, core skills: Kenntnis der Prozesse der Bodendegradierung sowie der Maßnahmen zu deren Kontrolle bzw. Verhinderung in ausgewählten Landnutzungssystemen der Tropen und Subtropen; Kenntnis von Ökosystemfunktionen und deren Synthese in agronomische Konzepte zur Anpassung an ungünstige klimatische und pedologische Bedingungen in den Tropen und Subtropen.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Tropical agro-ecosystem functions (Lecture, Seminar) *Contents*: Einführung und Übersicht zu den pflanzenbaulich orientierten Landnutzungssystemen in den Tropen und Subtropen unter Berücksichtigung ökologischer Gesichtspunkte. Analyse der Nachhaltigkeit der Pflanzenproduktion unter besonderer Berücksichtigung der physikalischen, chemischen und biologischen Bodenqualität sowie der effizienten Wassernutzung in den saisonalen Tropen.	4 WLH
Examination: Präsentation, Referat oder Korreferat (ca. 30 Minuten, Gewichtung: 50%) und mündliche Prüfung (ca. 30 Minuten, Gewichtung: 50%) **Examination requirements:** Wissen über die Prozesse der Bodendegradierung sowie der Maßnahmen zu deren Kontrolle bzw. Verhinderung in ausgewählten Landnutzungssystemen der Tropen und Subtropen; Wissen über Ökosystemfunktionen und deren Synthese in agronomische Konzepte zur Anpassung an ungünstige klimatische und pedologische Bedingungen in den Tropen und Subtropen.	6 C

Admission requirements: none	**Recommended previous knowledge:** Grundkenntnisse in Bodenkunde und Nutzpflanzenwissenschaften (BSc-Niveau)
Language: English	**Person responsible for module:** Dr. Ronald Franz Kühne
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

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

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

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

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

Additional notes and regulations:
Literature:
Altieri, M. 1987: Agroecology: the scientific basis of alternative agriculture. Westview Press, Boulder, Colorado, USA; Eyzaguirre, P.B., Linares, O.F. 2004: Home gardens and agrobiodiversity. Smithsonia Books, Washington, USA; Wood, D., Lenne, J.M. 1999: Agrobiodiversity: Characterization, utilization and

management. CABI Publishing, Wallingford, UK.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.P15M: Methods and advances in plant protection** *English title: Methods and advances in plant protection*	6 C 4 SWS

Lernziele/Kompetenzen: Studierende sind imstande, veröffentlichte Ergebnisse kritisch zu evaluieren und dieses Wissen auf aktuelle Probleme im Feld anzuwenden. Ebenso sind sie imstande, Probleme zu identifizieren und experimentelle und analytische Lösungsansätze zu formulieren.	**Arbeitsaufwand:** Präsenzzeit: 60 Stunden Selbststudium: 120 Stunden

Lehrveranstaltung: Methods and advances in plant protection (Vorlesung, Exkursion, Übung) *Inhalte*: • Fortgeschrittener Kurs in Pflanzenschutz (Entomologie und Pathologie) • Methodologie und Auswertungsmethoden im Pflanzenschutz • Fallstudien spezieller Pflanzenschutzthemen im ökologischen Anbau in Form von Vorlesungen, Seminar und praktischen Übungen	4 SWS
Prüfung: Klausur (120 Minuten) oder Fachgespräch (ca. 20 Minuten) (Gewichtung: 70%) und Protokoll (max. 3 Seiten) oder Referat (ca. 10 Minuten) (Gewichtung: 30%) **Prüfungsanforderungen:** Fortgeschrittenes Wissen im Pflanzenschutz (Entomologie und Pathologie), Methodologie und Auswertungsmethoden im Pflanzenschutz anhand von Fallstudien spezieller Pflanzenschutzthemen.	6 C

Zugangsvoraussetzungen: Pflanzenschutz (mindestens 6 ECTS) oder Brückenmodul M.SIA.P07 Soil and Plant Science	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Maria Renate Finckh
Angebotshäufigkeit: jedes Wintersemester; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.P16M: Crop Modelling for Risk Management** *English title: Crop Modelling for Risk Management*	6 C 4 SWS

Lernziele/Kompetenzen: Selbständige Auswahl und Entwicklung, Beschreibung, Präsentation und Diskussion eines Simulationsexperimentes aus den Bereichen Klimawandel, Landnutzungsplanung, agroökologische Zonierung und Faktoreinsatzoptimierung in Teamarbeit.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Crop modelling for risk management (Vorlesung, Seminar) *Inhalte*: Vorstellung der wichtigsten Konzepte in der Modellierung des Wachstums von Nutzpflanzenbeständen; Einführung in die verschiedenen Ansätze der mathematischen, statistischen und prozessorientierten Beschreibung des Pflanzenwachstums; Erweiterung auf und Entwicklung von Schnittstellen zu parzellen- und landschaftsorientierter Modellierung von Boden-Pflanzen Systemen. Praktische Übungen in Arbeitsgruppen in der Benutzung von DSoSeAT- und CERES-Maize Software im Rechenraum der Abteilung.	4 SWS
Prüfung: Präsentation, Referat oder Korreferat (ca. 20 Minuten, Gewichtung: 50%) und Protokoll (max. 20 Seiten, Gewichtung: 50%) **Prüfungsanforderungen:** Selbständige Konzeption, Durchführung, Interpretation und Diskussion eines Simulationsexperimentes zum Risikomanagement im tropischen Pflanzenbau mit Hilfe einer Crop Modelling Software	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Grundkenntnisse in Bodenkunde und Nutzpflanzenwissenschaften (BSc-Niveau); fortgeschrittene Computerkenntnisse
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Reimund Paul Rötter Dr. Gennady Bracho Mujica
Angebotshäufigkeit: jedes Sommersemester; Göttingen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 16	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P19M: Experimental techniques in tropical agronomy**	6 C 4 WLH

Learning outcome, core skills: Kenntnisse der botanischen, ökologischen und agronomischen Fakten der vorgestellten Nutzpflanzen und Vermehrungsarten, wissenschaftlich korrekte Beschreibung und Diskussion der Ergebnisse eines Gewächshausversuches, Grenzen und Möglichkeiten der Interpretation von Messverfahren zur Beschreibung der physiologischen Zustandsvariablen von tropischen Nutzpflanzen.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Experimental Techniques in Tropical Agronomy (Lecture, Exercise, Seminar) *Contents*: Grundlagen und Einübung der vegetativen und generativen Vermehrungsverfahren im Gewächshaus der Abteilung, Einführung in statistische Versuchsplanung und Auswertung von Gewächshausversuchen. Theorie und Praxis von ökophysiologischen Messverfahren für den Wasserhaushalt und -status sowie Gaswechsel/ Photosyntheseraten bei tropischen Nutzpflanzen. **Literatur** Kopien von Powerpoint-Präsentationen, ausgewählte Kapitel von Lehrbüchern.	4 WLH
Examination: Präsentation, Referat oder Korreferat (ca. 30 Minuten, Gewichtung: 50%) und Protokoll (max. 20 Seiten, Gewichtung: 50%) **Examination requirements:** Kenntnisse der botanischen, ökologischen und agronomischen Fakten der vorgestellten Nutzpflanzen; wissenschaftlich korrekte Planung, Durchführung, Auswertung, Beschreibung und Diskussion der Ergebnisse eines Gewächshausversuches; Grenzen und Möglichkeiten der Interpretation von Meßverfahren zur Beschreibung der physiologischen Zustandsvariablen von tropischen Nutzpflanzen.	6 C

Admission requirements: M.SIA.P12	**Recommended previous knowledge:** Grundkenntnisse in Nutzpflanzenwissenschaften (BSc-Niveau)
Language: English	**Person responsible for module:** Dr. Ronald Franz Kühne
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P20: Plant nematology**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Studierende erhalten vertieftes Wissen und Überblick über das Fachgebiet der Pflanzennematologie und den Interaktionen zwischen Nematoden mit anderen Pathogenen und Management Strategien. Ebenfalls erhalten sie praktische Labor- und Feldkenntnisse in Hinblick auf Identifikation, Probennahme, Aufarbeitung und Bonituren. Studierende, die dieses Modul erfolgreich besucht haben, können sowohl durch Nematoden verur-sachte Schäden als auch die Nematoden identifizieren.	Attendance time: 60 h Self-study time: 120 h

Course: Plant nematology (Lecture, Exercise, Seminar) *Contents*: **Einführung**: Geschichte (Erste Beobachtungen, Evolution, Phylogenie), Funktionen von Nematoden (Nährstoffzyklen, nützliche Nematoden, parasitäre Nematoden), Biologie (Anatomie, Klassifikation, Lebenszyklus, Vermehrung, Ernährung, Parasitische Strategien), Ökologie (Verbreitung, Populati-onsdynamik, Vorkommen im Boden, Überlebensstrategien, Weltweite Verbreitung, Interaktionen mit anderen Pathogenen), Symptome (Ober/Unterirdisch), Pflanze-Nematoden Interaktionen (Infekti-onsorte, Mechanismen der Wirtsverteidigung), Ökonomische Wichtigkeit (quantitativ/qualitativ, Er-tragsverluste, Hauptschadarten, Hauptwirte) **Methodologie:** Probennahme (Tiefe, Anzahl Proben, Volumen), Aufareitung der Proben (a) Zysten aus dem Boden (Fenwick Dose, Zentrifugieren/Ausschwemmen, Elutriation), (b) Mobile Stadien aus dem Boden (Baermann Trichter, Siebetechniken), (c) Mobile Stadien aus Pflanzenmaterial (Baermann Trichter, Präparation, Filtern), Färbetechniken für Nematoden (in Wurzeln und Eimassen), Bonituren von Wurzelschäden (Gallenindex) Nematoden Identifikation: Nematoden fischen, Fixieren, Dauerpräparate anlagen, Bestimmungs-schlüssel, Präparation bestimmter Körperteile. **Management:** Schadschwellen, Quarantäne, Fruchtfolgen, (Nicht-Wirte, Fallenpflanzen, Antagonisten, Brache), Resistenz/Toleranz (klassische Zucht, Molekulare Methoden), Organische Zusätze (Kompost, Gründüngung), Biologische Kontrolle (Antagonistische Mikroorganismen, Suppressive Böden), Physikalische Methoden (Hitze, Danmpf, Fluten, Bestrahlung), Chemische Kontrolle (Mematizide, Fumigantien),	4 WLH
Examination: Referat (ca. 15 Minuten, Gewichtung: 50%) und entweder mündliche Prüfung (ca. 20 Minuten) oder Klausur (120 Minuten) (Gewichtung 50%) **Examination requirements:** Generelle und spezielle Biologie der Nematoden, insbesondere Pflanzenparasiten. Methodologie in der Nematologie und Identifikation, allgemeine Grundlagen des Managements.	6 C

Admission requirements:	**Recommended previous knowledge:**
none	Grundkenntnisse (B.Sc.Niveau) in Boden-, Pflanzen- und Tierwissenschaften

Language: English	**Person responsible for module:** Prof. Dr. Maria Renate Finckh
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P21: Energetic use of agricultural crops and Field forage production**	6 C 4 WLH

Learning outcome, core skills: Basierend auf den präsentierten Daten sind die Studierenden in der Lage, Potentiale und Beschränkungen der Energieproduktion aus landwirtschaftlicher Biomasse zu identifizieren und abzuschätzen	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Energetic and technical use of agricultural crops (Lecture, Excursion) *Contents*: Energetische Verwertung landwirtschaftlich erzeugter Biomasse: Management landwirtschaftlicher Kulturpflanzen zur energetischen Nutzung. Energieszenarien und ¿potentiale, Klimagasemissionen, Biomasse und Abfallstoffe als Energiequellen, Wahl und Verarbeitung von Biomasse als Treibstoff. Biogas, Fermentationsprozesse und Anlagentechnik. Pflanzenöle, Biodiesel. Erzeugung von Alkoholester aus Triglyceriden und freien Fettsäuren. Ethanolproduktion. Fermentation, Destillation und Dehydrierung. Thermo-chemische Prozesse. Vergasung, Fischer-Tropsch-Prozess. Stoffliche Verwertung landwirtschaftlich erzeugter Biomasse: Management landwirtschaftlicher Kulturpflanzen zur stofflichen Nutzung; Technologien zur Verarbeitung von Biomasse zu pflanzlichen Rohstoffen für Fasern, Farben, Proteine, Fette, etc.; Nutzen und Limits des Ersatzes von Rohstoffen auf fossiler Basis durch pflanzliche Rohstoffe.	4 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** Grundlegende und themenspezifisch vertiefte Kenntnisse zur energetischen und stofflichen Verwertung landwirtschaftlicher Biomasse.	6 C

Admission requirements: none	**Recommended previous knowledge:** Grundkenntnisse in Pflanzenbauwissenschaften, Bodenkunde, Physik und Chemie
Language: English	**Person responsible for module:** Prof. Dr. Michael Wachendorf
Course frequency: every 4th semester; Start WiSe 2017/2018; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.P22: Management of tropical plant production systems** *English title: Management of tropical plant production systems*	6 C 4 SWS

Lernziele/Kompetenzen: Kenntnisse der botanischen, ökologischen und agronomischen Fakten der vorgestellten Nutzpflanzen und Anbausysteme, Zuordnung von Nutzpflanzen und Anbausystemen zu verschiedenen Standortbedingungen und systemorientierte Beurteilung einer nachhaltigen Produktion an ausgewählten Standorten.	**Arbeitsaufwand:** Präsenzzeit: 60 Stunden Selbststudium: 120 Stunden

Lehrveranstaltung: Management of tropical plant production systems (Vorlesung) *Inhalte*: Vorstellung der wichtigsten Nutzpflanzen der Tropen und Subtropen bezüglich Botanik, Morphologie, Herkunft, klimatischer und ökologischer Ansprüche, Anbausystem, Ernteverfahren, Bedeutung in Landnutzungssystemen, Nutzung als Nahrungsmittel, Futter, Rohstoff und zur Energiegewinnung aus Biomasse. Diskussion der verschiedenen Anbausysteme in den Tropen und Subtropen und des spezifischen Managements für eine nachhaltige Steigerung der Produktivität **Literatur** Rehm, S., Espig, G. 1991: The Cultivated Plants of the Tropics and Subtropics. Verlag Josef Margraf. Weikersheim, Germany; lecture notes	4 SWS
Prüfung: Written exam (90 minutes) or oral exam (ca. 30 minutes) **Prüfungsanforderungen:** Wissen der botanischen, ökologischen und agronomischen Fakten der vorgestellten Nutzpflanzen und Anbausysteme. Kenntnisse der Zuordnung von Nutzpflanzen und Anbausystemen an verschiedene Standortbedingungen, sowie systemorientierte Beurteilung einer nachhaltigen Produktion an ausgewählten Standorten.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Reimund Paul Rötter
Angebotshäufigkeit: jedes Wintersemester; Göttingen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 35	

Bemerkungen:
Die schriftliche Prüfung erfolgt am ersten, die mündliche Prüfung am zweiten Termin.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P27M: Nutrient dynamics, experimental design and statistical modelling - bilingual**	6 C

Learning outcome, core skills: • Anwendung der statistischen Software R für eine Untersuchung und Beschreibung ökologischer Prozesse in Ackerböden. • Verständnis der Nährstoffdynamik in Böden und der Versuchsdesigns, um die Aussagekraft von Feld- und Laborversuchen zur Untersuchung der C-, N- und P-Dynamik kritisch zu beurteilen.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Nutrient dynamics: long-term experiments and modelling - bilingual (Lecture, Exercise) *Contents*: • Vertiefung der Kenntnisse bezüglich der C-, N- und P-Dynamik (Formen, Transformationen und Verfügbarkeit) in Ackerböden • Versuchsdesigns in landwirtschaftlichen Experimenten: vollständig randomisierte Anlage, randomisierte vollständige Blockanlage, lateinisches Quadrat, Spaltanlage und balancierte unvollständige Blockanlage • Statistische Modellierung: gemischte Varianz- und Regressionsanalysen und lineare gemischte Modelle • Modellierung der Umsatzdynamik der organischen Bodensubstanz mit dem SoilR-Paket in R • Anwendung der statistischen Software R für eine Beschreibung der C- und N-Dynamik Crawley, M.J. 2012: The R book. 2nd edition, Wiley Everitt, B., Hothorn, T. P. 2011. An Introduction to Applied Multivariate Analysis with R. Springer, New York Field, A., Miles, J., Field, Z. 2012. Discovering Statistics using R, SAGE Welham, S.J., Gezan, S.A., Clark, S.J., Mead, A. 2014. Statistical Methods in Biology. Design and Analysis of Experiments and Regression, CRC Press, Boca Raton	
Examination: Oral examination (approx. 25 minutes)	6 C

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

Maximum number of students: not limited	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P28: Digitilization in agriculture**	6 C 4 WLH

Learning outcome, core skills: The participants will have gained a holistic understanding of precision agriculture, digitalization in agriculture, image processing and machine learning, data classification and pattern recognising and prediction methodologies around agricultural and animal farming stuffs.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Digitalization in agriculture (Exercise, Seminar) *Contents*: • Introduction to sensor solutions, digital technologies in agricultural science • Application and principle of optical and infrared technology for monitoring of agricultural and animal products • Machine vision and image processing in agricultural context • Basic techniques and functions of matrices in MATLAB® • Computer programming in MATLAB® • Machine learning algorithms • Pattern recognition and object detections algorithms • Development of data classification and pattern forecasting models in agricultural and livestock farming datasets	4 WLH
Examination: Report (field work) 50% (max. 8 pages), practical exam 50% (software application) **Examination prerequisites:** Regular participation **Examination requirements:** • Fundamental understanding of digitalization concepts and approaches in smart farming • Knowledge of technology application for crop, animal and food monitoring • Knowledge and basic ability to program MATLAB software in the context of agricultural science application • Ability to work and use optical sensors in crop monitoring	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of scientific research and data collecting
Language: English	**Person responsible for module:** Dr. Abozar Nasirahmadi
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students:	

20	

Additional notes and regulations:

- Gonzalez R.C., Woods R.E. and S.L. Eddins 2010: Digital Image Processing using MATLAB. New Delhi: Tata McGraw Hill Education;
- Stafford S. (ed.) 2019: Precision agriculture for sustainability. Cambridge, UK: Burleigh Dodds Science Publishing

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P29: Impact of climate extremes on plant production systems around the globe**	6 C 4 WLH

Learning outcome, core skills: Students will: • Gain a deeper understanding of shifts in climate variability and weather extremes and its relevance in important agricultural regions • Get a global perspective on how ongoing climate change is projected to amplify the occurrence of climate extremes • Learn about major impacts of climate extremes on important plant production systems around the globe • Get familiarized with widely used tools for quantifying impacts of climate extremes on plant production systems (i.e. experiments, eco-physiological & statistical and systems modelling). • Learn about current progress in experimentation aimed at getting a deeper understanding of responses of major crops to different types of climate extremes.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Impact of climate extremes on plant production systems around the globe (Lecture, Seminar) *Contents*: • Weather/climate and plant production. Climate variables determining growth and development of plants, and operational and strategic management. • Natural and anthropogenic weather and climate variability. Temporal and spatial scales. Statistical methods for detecting extremes. • What makes an event or series of events extreme? Theory on climate extreme events. Major climate extremes and their damage potential, likely shifts under future climate: illustrated by in-depth cases studies from major plant production systems. • Data sources, data types and scales required for quantitative analysis of potential impacts (e.g. yield loss) and adaptation options/management of risk and opportunities for major plant production systems. Available experimental and modelling data on indicators and thresholds for major plant production systems. • Introduction to state of the art analysis (statistical and systems modelling) techniques for quantifying impacts, adaptations and risk management strategies at different scales/ levels of organization - from plant/field via farm to landscape/ regional level.	4 WLH
Examination: Written exam (60 minutes, 50%) and written report (10 pages max. 50%) **Examination requirements:** written report on a specific case, i.e. combination of agro-climatic extreme x cropping systems (10 pages max. 50%) Basic knowledge of agronomy, agro-meteorology and soil science	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Reimund Paul Rötter
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 24	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P31: Biochar for Environmental Management**	6 C 4 WLH

Learning outcome, core skills: The students obtain basic knowledge in the areas of the production of biochar and activated carbon from residual biomass, as well as their use in agricultural and environmental applications. They develop a deeper understanding of pyrolytic processes and procedures, as well as different technological conversion processes for the production of biochar and activated carbon from biomass. They understand relationships between biomass composition, characteristics of biochar and activated carbons, and their potential applications. The students develop the ability to evaluate thermo-chemical conversion processes of biomasses, as well as to identify relevant influencing parameters on the quality and possible applications of biochars and activated carbons. The students have basic knowledge regarding the advantages and limitations of a material and energetic utilization of residual biomasses for the production of biochar and activated carbon, as well as their use in the agricultural and environmental sector for a sustainable environmental and resource management	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Biochar for Environmental Management (Lecture, Practical course, Seminar) *Contents*: Lecture 20h, Work experience 20h, Seminar 20h Theoretical basics of thermo-chemical conversion (pyrolysis) of biomasses to produce biochar, with a focus on the use of (agricultural) residual biomasses for sustainable resource use, as well as the production of biogenic activated carbons for the substitution of fossil activated carbons in environmental applications. Fundamentals of possible treatment processes of grass and herbaceous residual biomasses for pyrolytic utilization. Possible uses of biochar and activated carbon in agricultural and environmental applications. Material and energetic balances of thermo-chemical processes. Requirements for purity and quality of biochar and activated carbon for different fields of application. Production of biochar and activated carbon from residual biomass (incl. treatment) on laboratory scale using different processes. Laboratory work for basic analytical characterization of the produced biochar and activated carbon and evaluation of their performance for environmental management.	4 WLH
Examination: Oral exam (approx. 30 minutes; 60 %) and presentation (approx. 20 minutes; 40 %) **Examination requirements:** Presentation and critical analysis of a potential utilization case of biochar and biogenic activated carbon in relevant environmental applications. Knowledge in biochar and activated carbon production, handling of residual biomass, biomass pre-treatment,	6 C

characterization of biochar and activated carbon, insights into different conversion technologies, interactions between biomass characteristics and biochar/activated carbon quality.	

Admission requirements: M.Sc.SIA Students Only	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr.-Ing. Korbinian Kaetzl
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Additional notes and regulations:

Location:

The practical part of the module will take place at our research site in Neu-Eichenberg.

Literature:

Johannes Lehmann and Joseph Stephen (Eds.): Biochar for Environmental Management: Science, Technology and Implementation. Routledge, 2015.

Jay Shankar Singh and Chhatarpal Singh (Eds.): Biochar Applications in Agriculture and Environment Management. Springer, 2020.

Harry Marsh and Francisco Rodríguez Reinoso (Eds.) Activated Carbon. Elsevier Science, 2006.

Balwant Singh, Marta Camps-Arbestain, and Johannes Lehmann (Eds.) Biochar: A Guide to Analytical Methods. Csiro Publishing, 2017.

Peter Quicker and Kathrin Weber (Eds.): Biokohle: Herstellung, Eigenschaften und Verwendung von Biomassekarbonisaten. Springer Vieweg, 2016

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P32M: Soil-Plant interactions**	6 C 4 WLH

Learning outcome, core skills: Students will conduct a small research project related to an agricultural topic and learn the relevant involved steps of the process. Students proof that they are capable of • Identifying a research question and developing a testable hypothesis • Collaborate in groups to brainstorm, guide the discussion towards a practically implementable outcome, and implement the experiment • Analyse, interpret and discuss the experimental results	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Soil-Plant interactions (Lecture, Practical course, Seminar) *Contents*: Introduction to and application of relevant up-to-date methods in plant-soil interactions in response to abiotic stress The complete operational sequence of a research project is simulated: • sampling • sample preparation, • measurements and data collection (application of methods) • data processing • statistics and • drafting a manuscript. Up-to-date literature is presented and discussed by the students.	4 WLH
Examination: Work report (approx. 15 pages) 50%, Project presentation (app. 20 min.) 50% **Examination requirements:** Short paper describing the set-up (incl. justification) and execution of the experiment as well as discussion of the results. Presentation of the approach, results and limitations/ lessons learned.	6 C

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

15	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P33M: Water in the Soil Plant system**	6 C 4 WLH

Learning outcome, core skills: Students will be able to understand and model energy, water and nutrient flows in the soil-plant-atmosphere system. The main focus is on methods for working with models	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Water in the Soil Plant system (Lecture) *Contents*: The course focuses on the basic methods for working with process models. physical processes in the soil-plant-atmosphere system. The course consists of roughly equal parts lecture content and computer-based exercises. In the lecture part, the most important concepts for modeling the relevant soil and plant growth processes are explained, and in a second part, a detailed introduction to the agroecosystem simulation model Expert-N is given. Computer exercises are carried out in which students perform simulations on the following topics: - Water flow in agroecosystems - Water extraction and distribution, surface irrigation, sprinkler irrigation, drip irrigation - Carbon and nitrogen turnover in soils - Plant growth and crop yield - Climate change and crop production	4 WLH
Examination: Oral examination (approx. 25 minutes) **Examination requirements:** Knowledge of processes on the land surface, evapotranspiration, water flows in the soil	6 C

Admission requirements: none	**Recommended previous knowledge:** Modul Soil and plant science or equivalent
Language: English	**Person responsible for module:** Prof. Dr. Tobias Weber
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P34: Nutrient acquisition by plants**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Students obtain more detailed knowledge on how nutrients, especially nitrogen and phosphorus, are acquired by plants. Students know how to conduct scientific literature research and how to write a scientific mini-review on a specific topic.	Attendance time: 60 h Self-study time: 120 h

Course: Nutrient acquisition by plants (Lecture) *Contents*: Topics include e.g. different mechanisms of plants to acquire nitrogen, phosphorus (e.g. prior/after mineralisation processes, via support of bacteria & fungi), and also micronutrients, competition for nutrients between plants and soil microbes, rhizodeposition, dependence on abiotic factors, influence of invasive species. Other skills: Conducting scientific literature research Citing correctly Presenting a short lecture on a specific topic Moderating a discussion Scientific writing of a mini-review Some literature will be provided in the framework of the course, e.g. Näsholm et al. 2009: Uptake of organic nitrogen by plants. New Phytologist 182, 31-48.. For the specific oral presentations, literature search is conducted by the students.	4 WLH
Examination: 55% oral presentation (20 min) plus leading the following discussion, 45% mini-review (c. 15-20 pages) **Examination requirements:** Knowledge on how nutrients, especially nitrogen and phosphorus, are acquired by plants	6 C

Admission requirements:	**Recommended previous knowledge:**
English at B2 level	none
Language:	**Person responsible for module:**
English	Prof. Dr. Judy Simon
Course frequency:	**Duration:**
each summer semester; Witzenhausen	1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**
twice	
Maximum number of students:	

24	

Georg-August-Universität Göttingen **Module M.WIWI-QMW.0004: Econometrics I**	6 C 6 WLH

Learning outcome, core skills: This course enables students to approach empirical research problems within the framework of the linear regression model, including model specification and selection, estimation, inference and detection of heteroscedasticity and autocorrelation. Moreover, the students can apply the methods discussed to real economic data and problems using the statistical software package R and they are able to assess estimator properties (finite sample and asymptotic). This course enables students to access more advanced topics in econometrics.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Econometrics I (Lecture) *Contents*: The lecture covers the following topics: 1. Introduction to the basic multiple regression model, model specification, OLS estimation, prediction and model selection, Multicollinearity and partial regression. 2. The normal linear model, including maximum likelihood and interval estimation, hypothesis testing. 3. Asymptotic properties of the OLS and (E)GLS estimators. 4. Generalized linear model: GLS and EGLS estimators, properties of these, heteroskedastic and autocorrelated models, testing for heteroscedasticity and autocorrelation.	2 WLH
Course: Econometrics I (Exercise) *Contents*: The practical deepens the understanding of the lecture topics by applying the methods from the lecture to economic problems and data, and reviewing and intensify theoretical concepts.	2 WLH
Course: Econometrics I (Tutorial) *Contents*: The tutorials are small classes with max. 20 students, which give room for applying the concepts to specific problem sets and discussing questions, that students might encounter regarding the concepts addressed in the lecture and practical. A part of the tutorial are hands-on computer exercises using the software R. This enables students to conduct regression analysis in practice and prepares them for others (applied) courses.	2 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements: The students demonstrate their understanding of basic econometric concepts. They show that they can apply these concepts to real economic problems.	

Admission requirements: none	**Recommended previous knowledge:** Basic knowlegde in statistics and mathematics
Language: English	**Person responsible for module:** Prof. Dr. Helmut Herwartz

Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 2
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module M.WIWI-VWL.0008: Development Economics I: Macro Issues in Economic Development**	6 C 4 WLH

Learning outcome, core skills: After successful completion, students will be able to understand why countries in the world are at different stages of economic development and how such development can be measured using different metrics. They can explain how historical income differences between countries developed, they can use theories of growth and trade to evaluate the constraints faced by developing countries. They can critically evaluate the role of population growth as well as aid and debt in affecting development, and they will be able to analyze regressions to evaluate determinants of economic development.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Development Economics I (Lecture) *Contents*: Overview of macroeconomic issues and approaches to analyzing problems of developing countries. Topics include measurement of development, historical evolution of income differences, growth theory, and linkages between globalization, aid, debt, population, the environment, and inequality and economic development.	2 WLH
Course: Development Economics I (Exercise) *Contents*: The exercise session is used to deepen understanding of concepts used in the lecture, discuss relevant literature, and apply concepts and methods developed in the lecture.	2 WLH
Examination: Written examination (90 minutes) **Examination prerequisites:** Submission of 6 exercise sheets (of sufficient quality). The exercises deepen the understanding of concepts and empirical methods taught in the lecture and apply it to specific cases.	6 C

Examination requirements: The students are able to explain concepts of economic development, their measurement, and the historical evolution of the development of countries. They demonstrate a good understanding of key theories and models of economic development, including growth and trade models. They are able to critically present these theories and models, are able to interpret empirical results from regression analyses that relate to these models, and are able to draw relevant policy conclusions coming out of these models and empirical assessments.	

Admission requirements: none	**Recommended previous knowledge:** Advanced knowledge in macroeconomics and basic knowledge in econometrics
Language: English	**Person responsible for module:** Prof. Dr. Andreas Fuchs
Course frequency: each winter semester	**Duration:** 1 semester[s]

Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 3
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module M.WIWI-VWL.0096: Essentials of Global Health**	6 C 3 WLH

Learning outcome, core skills: The goal of this course is to provide students with a comprehensive understanding of global health. By the end of the course, students will be able to: • explain main concepts of global health, • describe linkages between health and economic development, • describe determinants of health, • describe different components of health systems, • demonstrate familiarity with the concept of burden of disease and risk factors and how health status is measured, • describe key measures to address the burden of disease in cost-effective ways, • read, discuss and present recent scientific literature in the global health field, • write a clear and concise policy brief tailored to a specific audience.	**Workload:** Attendance time: 42 h Self-study time: 138 h

Course: Essentials of Global Health (Seminar) *Contents*: The course will introduce students to the main concepts of the public health field and critical links between global health and economic development. Students will get an overview of the determinants of health and learn how health status is measured. The course will be global in coverage, but with a focus on low- and middle-income countries and on the health of the poor. The course will cover: • Global health concepts • Linkages between health and development • Global burden of disease, measurement and global trends • Determinants of health and social network effects • Health disparities • Health systems • Global health efforts • Health behaviour in developing countries	2 WLH
Course: Essentials of Global Health (Exercise) *Contents*: Practical exercises related to the topics discussed in the seminar give students the opportunity to deepen and enhance their understanding of the seminar's content.	1 WLH
Examination: Portfolio* (max. 15 pages) **Examination requirements:** In their portfolio, students should demonstrate their familiarity with key concepts and topics discussed in the lecture as well as an ability to critically discuss these topics by completing various assignments related to particular seminar contents. In addition, students will be expected to have read the background literature mentioned in the course.	3 C
Examination: Oral Presentation (approx. 60 minutes)	3 C

Examination requirements: Students will present current research articles in global health and demonstrate an understanding of the main concepts of global health and their linkages with economic development. Students will be further required to demonstrate skills to critically discuss scientific articles.	

Admission requirements: none	**Recommended previous knowledge:** Basics in microeconomics and macroeconomics, understanding of econometrics, ability to read scientific articles
Language: English	**Person responsible for module:** Prof. Dr. Sebastian Vollmer
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 3 - 4
Maximum number of students: 18	

Additional notes and regulations:
* A portfolio is a collection of the following assignments related to particular seminar contents: summaries of a text, response papers, reading reports and comments on presentations (max. 15 pages).

Georg-August-Universität Göttingen **Module M.iPAB.0002: Breeding schemes and programs in plant and animal breeding**	6 C 4 WLH

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

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

Admission requirements:	**Recommended previous knowledge:**
none	none
Language: English	**Person responsible for module:** Dr. Birgit Jutta Zumbach
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 1
Maximum number of students: 30	

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