Georg-August-Universität Göttingen **Module M.Agr.0005: Crop Production and Grassland Management**	6 C 4 WLH

Learning outcome, core skills: The students learn to analyze and discuss traditional and actual problems in crop and grassland science. In seminars, students critically review articles about on current agronomic research questions and discuss their evaluation report with other students.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Allgemeiner Pflanzenbau und Graslandwirtschaft (Lecture) *Contents*: Principles of sustainable agricultural land use, nutrient supply and soil conservation, crop rotations, plant growthand yield formation, phenological development, water and energy balances in crops and grassland, yield determining factors, crop and pasture management, resource use efficiency, analysis of agricultural systems, competition and symbiosis, quality of harvested productsReview: criteria for evaluating scientific articles, presentation of an own review of a research article and discussion of the reviewwith the other students and the lecturers.	4 WLH
Examination: Written exam (45 minutes; 65%) and term paper (max. 5 pages; 35%) **Examination requirements:** Advanced knowledge of plant development and growth processes, of resource use and resource use efficiencies in plant production systems and of the impacts of abiotic and biotic stress factors on plant canopies, basic knowledge in systems analysis, detailed knowledge of principles of the scientific practice and of criteria for scientificresearch, basic knowledge about article writing and article reviewing. The exam will be bi-lingual (German + English). The term paper can be prepared in either German or English.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Stefan Siebert
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 50	

Georg-August-Universität Göttingen **Module M.Agr.0013: Epidemiology of International and Tropical Animal Infectious Diseases**	6 C 4 WLH

Learning outcome, core skills: Auf der Basis eines zeitgemäßen wissenschaftlichen und praktischen Kenntnisstandes können die Studierenden moderne und effektive Tierhygiene und Agrarkonzepte beurteilen, entwickeln und in komplexe Qualitätsmanagementprogramme integrieren. Die Absolventen sind fähig ihr Wissen in multidisziplinäre berufsbezogene Arbeitsbereiche zu implementieren und zu kommunizieren.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Epidemiology of International and Tropical Animal Infectious Diseases (Lecture) *Contents*: Infektionserkrankungen spielen in der internationalen Tiergesundheitsüberwachung eine bedeutende Rolle. Nationale Gesundheits- und Veterinärbehörden, sowie internationale Organisationen (WHO, FAO) sind sehr stark in der Seuchenüberwachung engagiert und mit der Etablierung von Gesundheits- und Hygiene-Monitoring-Programmen beschäftigt. Diese Aufgaben werden sich in Zukunft auf Grund einer weiteren Globalisierung des internationalen Marktes noch steigern und es werden gut ausgebildete Experten für die weltweite Zusammenarbeit in diesem multidisziplinären Feld benötigt. Dieses Modul gibt einen Überblick über aktuelle Epidemien im Zusammenhang mit der Vermittlung eines spezialisierten Verständnisses über Infektionskrankheiten und Hygieneprogramme in den subtropischen und tropischen Ländern. Charakteristika von biologisch relevanten Infektionserregern wie Parasiten, Pilzen und Bakterien, deren Toxine sowie Viren und Prionen werden ausführlich dargestellt. Einige der Keime, die in diesem Modul behandelt werden, sind Ursache für schwere zoonotische Erkrankungen mit letaler Gefahr für den Menschen. Immunologische Abwehrmechanismen wilder und domestizierter Tiere gegen Pathogene werden zusammen mit modernen Strategien der aktiven und passiven Immunisierung diskutiert. Gegenwärtig erhältliche diagnostische Methoden und neue biotechnologische Ansätze in zukünftigen Testsystemen und in der Impfstoffentwicklung werden demonstriert. Die Adaptierung von praxisnahen Gesundheits- und Hygienemaßnahmen und von standardisierten Qualitätsmanagement-Regularien an die verschiedenen Tierproduktionssysteme (Wiederkäuer, Schweine, Geflügel) wie auch an die nachgelagerten Produktionsprozesse wird zusammen mit den entsprechenden Managementmethoden erklärt. Der Blick wird stark auf ökologische Belastungen (Wasser, Boden, Lufthygiene), Epizootiologie und moderne Werkzeuge in der epizootologischen Forschung gerichtet sein. Die Lehrinhalte werden die Biologie und die Ausrottung von Vektoren (Insekten, Zecken) aufzeigen, die Tierpathogene und zoonotische Erkrankungen übertragen, sowie biologische und chemische Methoden zur Vektorkontrolle. In einem Laborkurs werden in diesem Modul auch die bereits gut etablierten Techniken der mikrobiologischen und parasitologischen Diagnostik vermittelt. Die Studierenden werden praktische Übungen mit klassischen Methoden sowie mit modernen biochemischen, immunologischen, biotechnologischen und molekularbiologischen Techniken zur Analyse von Infektionserregern, Toxinen und gesundheitsschädlichen	4 WLH

Substanzen durchführen. Gewebskulturverfahren für die Entwicklung von Impfstoffen oder Antikörper werden zusätzlich angewendet.	
Examination: Written examination (90 minutes) **Examination requirements:** Überblick über die Biologie von pathogenen Mikroorganismen, Infektionskrankheiten; Immunologie von Nutztieren; Schutzimpfungen; Diagnose; Vektorausrottung; internationale freiwillige und staatlich verpflichtende Hygieneprogramme; Analyse der Hygiene in landwirtschaftlichen Tierproduktionssystemen.	6 C

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

Georg-August-Universität Göttingen **Module M.Agr.0020: Genome Analysis and Application of Markers in Plantbreeding**	6 C 4 WLH

Learning outcome, core skills: Studierende erlernen ihre Kenntnisse in klassischer Genetik auf Problemlösungen in züchterischen Situationen anzuwenden. Studierende erlernen selbständig sich Kenntnisse im Umgang mit großen Datensätzen anzueignen und sich in entsprechende Software einzuarbeiten.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Genome analysis and application of markers in plantbreeding (Lecture, Exercise) *Contents*: Überblick über verschiedene Typen von molekularen Markern. Schätzung von genetischen Distanzen. Grundlagen der klassischen Genetik zur Kopplungsanalyse. Konstruktion von Kopplungskarten. Markergestützte Rückkreuzung. Kartierung von QTL: Theorie und praktische Übungen mit großen Datensätzen aus früheren Experimenten. Grundlagen der Bioinformatik: Vergleich von DNA Sequenzen.	4 WLH
Examination: Written examination (90 minutes) **Examination prerequisites:** Abgabe der Lösung von Übungsaufgaben **Examination requirements:** Grundlagenkenntnisse in klassischen und molekularen Methoden der Kartierung von Genen. Basiskenntnisse im Einsatz molekularer Marker in der Pflanzenzüchtung.	6 C

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

Georg-August-Universität Göttingen **Module M.Agr.0023: Interactions between Plants and Pathogens**	6 C 4 WLH

Learning outcome, core skills: Understanding interactions between plants and pathogens from general concepts to selected examples on phenomenological, morphological, physiological and molecular levels. Critical appraisal of technical approaches, supported by own practical experiences from the laboratory.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Interaktionen zwischen Pflanzen und phytopathogenen Organismen sowie Viren (Internship, Lecture) *Contents*: The course deals with interactions between host plants on one side and plant-pathogenic fungi, bacteria and viruses on the other side. The following topics are covered: Categorizatoin of inter-specific interactions among organisms; general concepts of pathogenicity, virulence and avirulence including gene-for-gene hypothesis and its experimental proof. Example of known resistance genes. Resistance factors (preformed and induced); counteracting mechanisms including detoxification. Induced local and systemic resistance. Infection of plants by *Agrobacterium tumefaciens* and inter-kingdom gene transfer. Disease cyclus of plant pathogenic fungi including host recognition, spore germination, penetration of plant surface, colonization of plant tissue, acquisition of nutrient, building biomass and dissemination of the pathogen. In the practical part of the course, participants will exctract phytoalexins from oilseed rape plants and learn chromatographic techniques for their detection and test their biological activity (HPLC-UV and TLC with bioautography detection).	4 WLH
Examination: Written examination (90 minutes) **Examination prerequisites:** Participation on the laboratory course and approval of the protocol **Examination requirements:** Understanding theoretical concepts treated in the lecture; knowlege of specific examples of pathosystems illustrating these concepts.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Birger Koopmann
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 36	

Georg-August-Universität Göttingen **Module M.Agr.0058: Plant-Herbivore Interactions**	6 C 4 WLH

Learning outcome, core skills: Knowledge of complex interactions between plants and herbivorous insects. Preparation and critical reflection of methods applied in current research findings covering the lecture topics by a seminar presentation.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Plant herbivore interactions (Lecture, Seminar) *Contents*: The modul deals with the interactions between plants and herbivorous insects. The diversiy of the organisms involved and the biocenoses are discussed. With regard to plants different adaptations to damage by insects are presented and the role of resistance mechanisms is outlined. The sensory organs of herbivorous insects to discriminate between different plant species and the role of volatile and secondary compounds produced by the plants are demonstrated. Multiple Interactions between plants, their herbivores, and natural enemies and application strategies in plant protection are discussed. The interactions between flowering plants and pollinators are outlined and the importance of seed predation will be exemplified. During the seminar part of the module students will present recent research findings which will complement the content of the lectures.	4 WLH
Examination: Written exam (67%, 45 minutes) and presentation (33%, approx. 20 minutes) **Examination prerequisites:** regular attendance at seminar and preparation of a seminar talk and a handout **Examination requirements:** Profound knowledge of processes involved in plant selection by herbivorous insects; protection strategies evolved by plants; determinants of herbivorous communities on specific plants, multitrophic interactions between plants; herbivorous insects and their natural enemies; interactions between plants and their pollinators or seed predators.	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	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.Agr.0106: China Economic Development: From an Agricultural Economy to an Emerging Economy**	6 C 4 WLH

Learning outcome, core skills: The students learn more about the specificities of China's economic transformation as well as the underlying economic concepts.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: China Economic Development: From an agricultural economy to an emerging economy (Lecture, Seminar) *Contents*: The lecture is designed for master students enrolled at the University of Göttingen. The course covers experiences and lessons to be drawn from China's economic transformation, by explaining the root causes for a shift from an agriculturally dominated to an emerging economy.	4 WLH
Examination: Presentation (about 25 minutes, 50%) and homework (max 15 pages, 50%) **Examination requirements:** Presentation and critical discussion of a scientific aspect of China's economic transformation.	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: 25	

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:** an style="text-decoration: underline;">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. an style="text-decoration: underline;">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.Bio.141: General and applied microbiology**	3 C 3 WLH

Learning outcome, core skills: **Learning outcome:** Evolution and phylogenetic system; morphology and cell biology; communities and biocoenosis of bacteria and archaea; gene expression and molecular control (transcription, translation); posttranslational control, protein stability and proteomics; genetic networks; molecular switches and signal transduction; microbial developmental biology; mechanisms of pathogenicity of important pathogens; development of new antimicrobial agents; diversity of the metabolism in bacteria and archaea as basis for biotechnological applications; industrial microbiology. **Core skills:** Knowledge of microorganisms relevant for biotechnology and medicine, ability to identify these organisms and to analyse them with molecular methods.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: lecture: General and applied microbiology (Lecture)	3 WLH
Examination: Written examination (90 minutes)	3 C

Examination requirements: detailed knowledge in cell biology, biochemistry and genetics of procaryotic microorgansims	

Admission requirements: can't be combined with core module M.Bio.101	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Jörg Stülke
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 10	

Georg-August-Universität Göttingen **Module M.Bio.142: Molecular genetics and microbial cell biology**	3 C 3 WLH

Learning outcome, core skills: Advanced knowledge of Molecular Genetics and microbial cell biology through case studies of model systems of molecular mycology (yeasts and filamentous fungi). Acquisation of knowledge up to the "Review" level in one topic.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Molecular genetics and microbial cell biology (Lecture)	3 WLH
Examination: Written examination (90 minutes)	3 C

Examination requirements: detailed knowledge in cell biology, biochemistry and genetics of eucaryotic microorgansims	

Admission requirements: Can´t be combined with core module M.Bio.102 or key competence module M.Bio.172.	**Recommended previous knowledge:** • Watson, Molecular Biology of the Gene, Pearson, 7th Edition • Alberts, Molecular Biology of the Cell, Garland, 5th Edition
Language: English	**Person responsible for module:** Prof. Dr. Gerhard Braus
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 10	

Georg-August-Universität Göttingen **Module M.Bio.144: Cellular and molecular biology of plant-microbe interactions**	3 C 3 WLH

Learning outcome, core skills: Introduction into theory and methods for the analysis of plant-microbe interactions on the cell biological and molecular level.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: lecture: Plant-microbe-interactions (Lecture)	3 WLH
Examination: Written examination (54 minutes)	3 C

Examination requirements: knowledge of basic concepts in plant-microbe-interactions	

Admission requirements: Can´t be combined with core module M.Bio.104	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Christiane Gatz Prof. Dr. Volker Lipka
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 10	

Georg-August-Universität Göttingen **Module M.Bio.156: Structural biochemistry**	3 C 3 WLH

Learning outcome, core skills: Methods in Structural Biology,structure and function of biological macromolecules. Structure and folding of proteins, structure-function relationships, protein-protein and protein-nucleic acid complexes. Structure-based drug-design	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: lecture: Structural Biology (Lecture)	3 WLH
Examination: Written examination (90 minutes)	3 C

Examination requirements: The students show that they know the basics of structural biology. They are familiar with biochemical and analytical methods in protein and macromolecular complex- analysis. They have deepened knowledge about selected proteins and protein complexes. The students know the basics in structural resolution and structural characteristics of proteins.	

Admission requirements: can't be combined with M.Bio.105	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ralf Ficner
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 10	

Georg-August-Universität Göttingen **Module M.Bio.344: Neurobiology 1 (key competence module)**	3 C 2 WLH

Learning outcome, core skills: Profound knowledge of essential techniques in molecular, cellular and systemic neuroscience and their application.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: From gene to behavior (Lecture)	2 WLH
Examination: Written examination (60 minutes)	3 C

Examination requirements: Theoretical knowledge of the basic methods in neuroscience based on the contents of the lecture.	

Admission requirements: can't be combined with module M.Bio.304	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Martin Göpfert
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 27	

Georg-August-Universität Göttingen **Module M.Bio.369: Human genetics (key competence module)**	3 C 2 WLH

Learning outcome, core skills: Profound knowledge of specific human genetic aspects and principles of research in human genetics. Understanding of the methods to identify, analyze and manipulate genes and their function. Basic insights into the structure and function of the human genome.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Human genetics (Lecture)	2 WLH
Examination: Written examination (60 minutes)	3 C

Examination requirements: Profound knowledge of specific aspects and the basic principles in human genetic research.	

Admission requirements: can't be combined with key competence module M.Bio.348	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** PD Dr. rer. nat. Anja Uhmann
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 10	

Georg-August-Universität Göttingen **Module M.Bio.393: Current Developmental Biology**	3 C 3 WLH

Learning outcome, core skills: In depth knowledge of theoretical principles in developmental genetics, biochemistry, and biology as well as of practical methodology in analyzing morphogenetic and pattern formation processes. Understanding of methods to identify and analyze gene function as well as manipulate embryos.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Developmental biochemistry, genetics, and biology (Lecture)	2 WLH
Course: Exercises to and consolidation of lecture contents (tutorial)	1 WLH
Examination: Written examination (90 minutes)	3 C

Examination requirements: Advanced knowledge of principles in developmental genetics, biochemistry, and biology with emphasis on morphogenetic and pattern formation processes as well as focus on signal cascades and gene networks that control developmental processes. Understanding of techniques to identify, analyze, and manipulate the function of developmental genes as well as developmental processes. Knowledge of diverse model organisms with their strength and weaknesses. Application of this knowledge to new scientific questions.	

Admission requirements: cannot be combined with M.Bio.321 or M.Bio.392	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ernst A. Wimmer
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 5	

Georg-August-Universität Göttingen **Module M.Che.1111: Bioinorganic Chemistry**	3 C 3 WLH

Learning outcome, core skills: Absolventen/innen des Moduls... · sind mit dem Vorkommen, der Verfügbarkeit und der Bedeutung von Metallen in biologischen Systemen vertraut · kennen wichtige Metalloproteine und deren biologische Funktion sowie die Reaktionsmechanismen wichtiger Metalloenzyme · beherrschen die grundlegende Koordinationschemie, die für bioanorganische Aktivzentren von Bedeutung ist · sind mit wichtigen biomimetischen und bioinspirierten Koordinationsverbindungen sowie deren Synthese und Eigenschaften vertraut · kennen und verstehen die wichtigen Untersuchungsmethoden in der Bioanorganischen Chemie sind mit Fragestellungen der aktuellen Forschung in der Bioanorganischen Chemie vertraut	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Vorlesung Bioanorganische Chemie (Lecture)	2 WLH
Examination: Written examination (90 minutes)	3 C

Course: Übung Bioanorganische Chemie	1 WLH

Examination requirements: Kenntnisse zum Vorkommen, zur Verfügbarkeit und zur Bedeutung von Metallen in biologischen Systemen Überblick über die Struktur und biologische Funktion von Metalloproteinen und die Reaktionsmechanismen ausgewählter Metalloenzyme sowie Beherrschung der relevanten Koordinationschemie Kenntnisse zu Synthese und Eigenschaften biomimetischer und bioinspirierter Koordinationsverbindungen Grundkenntnisse zu Untersuchungsmethoden in der Bioanorganischen Chemie	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Franc Meyer
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students:	

100	

Georg-August-Universität Göttingen **Module M.Che.1114: Metalorganic Main Group Chemistry**	3 C 3 WLH

Learning outcome, core skills: Nach erfolgreicher Absolvierung des Moduls sollte die bzw. der Studierende ... • die Grundprinzipien der metallorganischen Chemie der Hauptgruppenmetalle erfasst und Reaktionsmechanismen verstanden haben; • über grundlegende Kenntnisse der Struktur-Reaktivitätsbeziehung verfügen; • neueste Ergebnisse im Gebiet nachvollziehen können; • selbstständig neue Komplexe erfassen und bewerten können; • moderne Methoden bei der Charakterisierung dieser Stoffklasse einschätzen können.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Vorlesung Hauptgruppenmetallorganische Chemie (Lecture)	2 WLH
Examination: Written examination (90 minutes)	3 C

Course: Übung Hauptgruppenmetallorganische Chemie	1 WLH

Examination requirements: Kenntnis der Grundprinzipien der metallorganischen Chemie der Hauptgruppenmetalle Verständnis der Reaktionsmechanismen Grundlegende Kenntnisse der Struktur-Reaktivitätsbeziehung Bewertung neuer Komplexe Einschätzung moderner Methoden bei der Charakterisierung dieser Stoffklasse	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Dietmar Stalke
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 80	

Georg-August-Universität Göttingen **Module M.Che.1115: Mechanistic Organometallic Chemistry**	3 C 3 WLH

Learning outcome, core skills: Absolvent*innen dieses Moduls haben vertiefte Kenntnisse in den folgenden Bereichen erworben: • elektronische Struktur und Dynamik übergangsmetallorganischer und verwandter Komplexverbindungen und experimentelle Methoden der Untersuchung • Mechanismen metallorganischer Elementarreaktionen und deren experimentelle Ermittlung • metallorganische Syntheseplanung • Mechanismen der homogenen Katalyse und deren experimentelle Ermittlung	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Vorlesung Mechanistic Organometallic Chemistry (Lecture)	2 WLH
Examination: Written examination (90 minutes)	3 C

Course: Übung Mechanistic Organometallic Chemistry	1 WLH

Examination requirements: chemische Bindung in ausgewählten übergangsmetallorganischen und verwandten Verbindungsklassen Synthese wichtiger Edukte, grundlegende Reaktivität und Struktur-Reaktivitätsbeziehungen metallorganischer Verbindungen Einsatz spektroskopischer Methoden zur Aufklärung von elektronischer Struktur und Dynamik, z.B. NMR-, EPR- und IR-Spektroskopie Methoden der mechanistischen Untersuchung, z.B. Reaktionskinetik, Isotopeneffekte	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Sven Schneider
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.Che.1116: Current Research Aspects in Inorganic Chemistry 1**	3 C 3 WLH

Learning outcome, core skills: Nach erfolgreichem Abschluss des Moduls können die Studierenden • vertiefte Kenntnisse über aktuelle Themen und Forschungsschwerpunkte der anorganischen Chemie vorweisen. • einen Bezug zu fachübergreifenden Fragestellungen herstellen	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Vorlesung Aktuelle Forschungsschwerpunkte der Anorganischen Chemie 1 (Lecture)	2 WLH
Examination: Written examination (90 minutes)	3 C

Course: Übung Aktuelle Forschungsschwerpunkte der Anorganischen Chemie 1 *Course frequency:* each winter semester	1 WLH

Examination requirements: Verständnis der aktuellen Forschungsgebiete der Anorganischen Chemie	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Franc Meyer
Course frequency: je nach Angebotslage	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.Che.1117: Current Research Aspects in Inorganic Chemistry 2**	3 C 3 WLH

Learning outcome, core skills: Nach erfolgreichem Abschluss des Moduls können die Studierenden • vertiefte Kenntnisse über aktuelle Themen und Forschungsschwerpunkte der anorganischen Chemie vorweisen • einen Bezug zu fachübergreifenden Fragestellungen herstellen	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Vorlesung Aktuelle Forschungsschwerpunkte der Anorganischen Chemie 2 (Lecture)	2 WLH
Examination: Written examination (90 minutes)	3 C

Course: Übung Aktuelle Forschungsschwerpunkte der Anorganischen Chemie 2	1 WLH

Examination requirements: Verständnis der aktuellen Forschungsgebiete der Anorganischen Chemie	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Franc Meyer
Course frequency: je nach Angebotslage	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.Che.1130: Modern Methods in Chemistry: Lecture and Tutorial in Diffraction**	3 C 3 WLH

Learning outcome, core skills: Nach erfolgreichem Abschluss des Moduls können die Studierenden · Kenntnisse der Grundlagen der Röntgenstrukturbestimmung, einschließlich der Symmetrie im realen und reziproken Raum, des Phasenproblems, der Kristallstrukturverfeinerung und der Interpretation der Ergebnisse vorweisen. · Röntgenbeugungs- und Neutronenbeugungs-Experimente an Pulvern und Einkristallen einschätzen. · Kenntnisse von Strukturdatenbanken vorweisen. · Ergebnisse der Beugungsmethoden in der aktuellen Literatur interpretieren und selbstständig einschätzen.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Vorlesung mit Übung (2+1 SWS): Moderne Methoden der Anorganischen Chemie - Beugungsmethoden	3 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** Regelmäßige Teilnahme; erfolgreiche Teilnahme an den Übungen; erfolgreiche Lösung der Übungsaufgaben	3 C

Examination requirements: fundierte Kenntnisse der Grundlagen der Röntgenstrukturbestimmung, einschließlich Symmetrie im realen und reziproken Raum, des Phasenproblems, der Kristallstrukturverfeinerung und der Probleme bei der Interpretation der Ergebnisse	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Dietmar Stalke
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.Che.1132: Modern Methods in Chemistry: Lecture and Tutorial in Spectroscopy and Magnetism**	3 C 2 WLH

Learning outcome, core skills: Nach erfolgreichem Abschluss des Moduls können die Studierenden • die elektronische Struktur von Atomen, Molekülen und Materialien beschreiben und Schlüsse daraus ziehen. • die Ligandenfeldtheorie auf fortgeschrittenem Niveau anwenden und Elektronentransferprozesse beschreiben. • fundierte Kenntnisse der ESR- und Mößbauer-Spektroskopie vorweisen und Spektren interpretieren. • magnetische Eigenschaften ungekoppelter und gekoppelter Systeme beschreiben und magnetische Kenngrößen interpretieren. • fundierte Kenntnisse über elektrochemische Methoden, insbesondere über die Cyclovoltammetrie und ihre Anwendung, vorweisen.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Vorlesung mit Übung Moderne Methoden der Anorganischen Chemie - Spektroskopie und Magnetismus (1.5+0.5)	2 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** Regelmäßige Teilnahme an den Übungen	3 C

Examination requirements: fundierte Kenntnisse in der Ligandenfeldtheorie, Verständnis und Interpretation von ESR- und Mößbauer-Spekten sowie elektrochemischen Messungen, Kenntnisse in der Beschreibung magnetischer Eigenschaften ungekoppelter und gekoppelter Systeme sowie in der Interpretation magnetischer Kenngrößen, Kenntnisse in der Beschreibung der elektronischen Struktur von Atomen und Molekülen auf der Basis experimenteller Befunde	

Admission requirements: none	**Recommended previous knowledge:** Kenntnisse entsprechend der Lernziele des Moduls B.Che.1004 (in der Regel im Rahmen des Bachelorstudiums erworben) werden dringend empfohlen
Language: German, English	**Person responsible for module:** Prof. Dr. Franc Meyer Dr. Serhiy Demeshko
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students:	

80	

Georg-August-Universität Göttingen **Module M.Che.1211: Chemistry of Natural Compounds**	3 C 3 WLH

Learning outcome, core skills: Studierende haben nach Abschluss dieses Moduls einen umfassenden Überblick über wesentliche Aspekte der Naturstoffchemie. Insbesondere können sie die verschiedenen Naturstoffklassen an Beispielen erläutern, sie verstehen die wichtigsten Biosynthesewege und können sie an Beispielen erklären, sie können die Bedeutung der Naturstoffe in den Anwendungsgebieten Medizin, Pharmakologie und Ökologischer Chemie im wissenschaftlichen und historischen Kontext diskutieren.Sie können ausgewählte Synthesewege und Syntheseprinzipien erklären.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Vorlesung Chemie der Naturstoffe (Lecture)	2 WLH
Examination: Written examination (120 minutes)	3 C

Course: Übung zur Vorlesung (Exercise)	1 WLH

Examination requirements: Kenntnisse über Stoffgruppen (Vorkommen, Eigenschaften/med. Wirkungen, historischer Hintergund z.B. von Terpenen, Steroiden, Alkaloiden, Antibiotica), Biosynthesen und Synthesen ausgewählter Beispiele	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Konrad Koszinowski
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.Che.1212: Methods of Synthesis in Organic Chemistry**	3 C 3 WLH

Learning outcome, core skills: Die bzw. der Studierende soll die komplexen Naturstoffsynthesen in Retrosynthese, Planung, Analyse von Reaktivitäten und den einzelnen stereoselektiven Syntheseschritten nachvollziehen können; den mechanistischen Verlauf pericyclischer Reaktionen beherrschen; die Varianten der diastereoselektiv geführten Aldol-Reaktion mechanistisch herleiten können; Mechanismen übergangsmetallkatalysierter C–C-Kupplungen beschreiben können; moderne Aspekte der Oxidation und Reduktion sowie Konzepte der Schutzgruppenchemie und Festphasensynthese erklären können.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Vorlesung: Synthesemethoden in der Organischen Chemie (Lecture)	2 WLH
Examination: Written examination (120 minutes)	3 C

Course: Übung zur Vorlesung (Exercise)	1 WLH

Examination requirements: Verständnis von klassischen Synthesemethoden und deren Reaktionsmechanismen	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Manuel Alcarazo Velasco
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.Che.1213: Heterocyclic Chemistry**	3 C 3 WLH

Learning outcome, core skills: Nach erfolgreicher Absolvierung des Moduls sollte die bzw. der Studierende Kenntnisse von folgenden Themenbereichen haben und deren Grundlagen beherrschen. Die bzw. der Studierende sollte die Heterocyclen-Nomenklatur beherrschen;die Reaktivität heterocyclischer Verbindungen beschreiben können;Synthesen komplexerer heterocyclischer Verbindungen planen können;Mechanismen enantioselektiver Reaktionen zur Heterocyclensynthese erklären können.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Vorlesung: Heterocyclenchemie (Lecture)	2 WLH
Course: Übungen zur Vorlesung	1 WLH
Examination: Written examination (120 minutes)	3 C

Examination requirements: Konzepte der Heterocyclenchemie	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Lutz Ackermann
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.Che.1214: NMR for Structural Chemistry and Biology I**	3 C 3 WLH

Learning outcome, core skills: Die bzw. der Studierende kann Mit ein- und zweidimensionalen NMR Spektren umgehen und ihren Informationsgehalt verstehenAm Computer Spektren interpretieren. Aus einem Satz von ein- und zweidimensionalen Spektren strukturchemische und strukturdynamisch Information von Molekülen der in organischen Chemie ableiten.Die Funktionsweise von ausgewählten ein- und zweidimensionalen NMR spektroskopischen Verfahren nachvollziehen. Vorschläge zur Durchführung von NMR Spektren zur Lösung von Problemen der Strukturchemie und strukturellen Dynamik machen.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Vorlesung: NMR für Strukturchemie und Strukturbiologie (Lecture)	2 WLH
Examination: Written examination (120 minutes)	3 C

Course: Übungen zur Vorlesung	1 WLH

Examination requirements: Grundlagen der 2D-NMR-Spektroskopie	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Christian Griesinger
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.Che.1215: NMR for Structural Chemistry and Biology II**	3 C 3 WLH

Learning outcome, core skills: Die bzw. der Studierende kann -Mit zwei- und dreidimensionalen NMR Spektren umgehen und ihren Informationsgehalt mit Computerunterstützung zur Visualisierung verstehen; -nachvollziehen, wie Strukturen von Molekülen und insbesondere repetitiven Makromolekülen wie Proteinen oder Oligonukleotiden aus NMR Daten ermittelt werden können; -nachvollziehen, wie diese Information für strukturbasierte Entwicklung von Pharmaka verwendet werden kann; -mit dem Produktoperatorformalismus nachvollziehen, wie die NMR spektroskopischen Methoden funktionieren, die die Information zur Ermittlung von Strukturen liefern: z.B. COSY; DQF-COSY, E.COSY, NOESY, ROESY, HMQC, HSQC, HMBC, INADEQUATE, HNCO, HNCA, CBCA(CO)NH, CBCANH etc.; -den Informationsgehalt der NMR Parameter in Bezug auf Struktur und Dynamik der Moleküle verstehen.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Vorlesung: NMR für Strukturchemie und Strukturbiologie II (Lecture)	2 WLH
Examination: Written examination (120 minutes)	3 C

Course: Übung zur Vorlesung (Exercise)	1 WLH

Examination requirements: Prinzipien und Anwendungen fortgeschrittener mehrdimensionaler NMR-Spektroskopie	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Christian Griesinger
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.Che.1217: Modern Mass Spectrometry and Gas Phase Chemistry**	3 C 3 WLH

Learning outcome, core skills: Nach erfolgreichem Abschluss des Moduls haben die Studierenden einen Überblick über die wichtigsten modernen Methoden der Massenspektrometrie (Ionisierungsverfahren, Massenanalysatoren, u.a.) und verstehen die Prinzipien u.a. von Fragmentierungsreaktionen, Ion-Molekül-Reaktionen, Ionenmobilitäts-Experimenten und Ionen-Spektroskopie in der Gasphase. Sie kennen darüber hinaus wichtige Anwendungsbeispiele für die vorgestellten Techniken, insbesondere aus den Bereichen der Biomolekularen, Organischen und Metallorganischen Chemie.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Moderne Massenspektrometrie und Gasphasenchemie (Lecture)	2 WLH
Examination: Written examination (120 minutes)	3 C

Course: Moderne Massenspektrometrie und Gasphasenchemie (Exercise)	1 WLH

Examination requirements: Moderne Ionisierungsverfahren, Funktionsweise moderner Massenanalysatoren, Unterschiede Reaktivität in Lösung und in der Gasphase, Stoßquerschnitte von Ionen, Energieumwandlung bei Stößen, typische Reaktionsprofile von Ion-Molekül-Reaktionen, Mikorsolvatisierung von Ionen und deren Einfluss auf die Reaktivität, Spektroskopie von Ionen in der Gasphase, Einsatz der Gasphasenchemie für analytische Zwecke	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Konrad Koszinowski
Course frequency: i.d.R. alle 2 Jahre	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.Che.1219: Physical Organic Chemistry**	3 C 3 WLH

Learning outcome, core skills: Nach erfolgreichem Abschluss des Moduls sollten die Studierenden mit • den Eigenschaften von Lösungsmitteln und Lösungsmitteleffekten • nicht-kovalenten Wechselwirkungen, • der Stabilität von Carbokationen und Radikalen, • der Temperaturabhängigkeit von Reaktionsgeschwindigkeiten, • linearen freie-Enthalpie-Beziehungen, • kinetischen Isotopeneffekten und Tunneleffekten und • der Reaktivität elektronisch angeregter Zustände vertraut sein.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Physikalische Organische Chemie (Lecture)	2 WLH
Course: Physikalische Organische Chemie (Exercise)	1 WLH
Examination: Written examination (120 minutes) **Examination requirements:** Kenntnis der Grundprinzipien von Potentialhyperflächen, inter- und intramolekularen Wechselwirkungen, Einflüssen auf die Reaktivität organischer Verbindungen, linearen freie-Enthalpie-Beziehungen	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Konrad Koszinowski
Course frequency: i.d.R. alle 2 Jahre	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 3
Maximum number of students: 80	

Georg-August-Universität Göttingen **Module M.Che.1311: Vibrational Spectroscopy and Intermolecular Dynamics**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Die Absolventen dieses Moduls haben vertiefte theoretische Kenntnisse zur Schwingungsspektroskopie und zwischenmolekularen Dynamik sowie deren Ausstrahlung auf andere Gebiete der Naturwissenschaften erworben und sind in der Lage, quantitative Fragestellungen dazu zu erfassen und zu lösen. Insbesondere verstehen sie harmonische und anharmonische Kopplungen, Intensitätseffekte, fortgeschrittene Symmetrieaspekte und experimentelle Techniken der Schwingungsspektroskopie. Sie können zwischenmolekulare Wechselwirkungen beschreiben, die sich daraus ergebenden Potentialhyperflächen, Aggregatstrukturen und dynamischen Phänomene analysieren und experimentelle Methoden der Spektroskopie von Molekülaggregaten vergleichen.	Attendance time: 56 h Self-study time: 124 h

Course: Vorlesung mit Übung: Schwingungsspektroskopie und zwischenmolekulare Dynamik	
Examination: Written examination (180 minutes)	6 C

Examination requirements: Erfassung und quantitative Lösung von exemplarischen Fragestellungen aus dem Forschungsgebiet mit begrenzten Hilfsmitteln in vorgegebener Zeit, mindestens 50% der Sollpunktzahl.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Martin Suhm
Course frequency: i.d.Regel alle zwei Jahre	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 2
Maximum number of students: 64	

Additional notes and regulations:
Die aktive Teilnahme an den angebotenen Übungsstunden wird dringend empfohlen.

Georg-August-Universität Göttingen **Module M.Che.1313: Electronic Spectroscopy and Reaction Dynamics**	6 C 4 WLH

Learning outcome, core skills: Die Absolventen dieses Moduls haben vertiefte theoretische Kenntnisse zur elektronischen Spektroskopie und Reaktionsdynamik sowie deren Ausstrahlung auf andere Gebiete der Naturwissenschaften erworben und sind in der Lage, quantitative Fragestellungen dazu zu erfassen und zu lösen.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Vorlesung mit Übung: Elektronische Spektroskopie und Reaktionsdynamik	
Examination: Written examination (180 minutes)	6 C

Examination requirements: Erfassung und quantitative Lösung von exemplarischen Fragestellungen aus dem Forschungsgebiet mit begrenzten Hilfsmitteln in vorgegebener Zeit, mindestens 50% der Sollpunktzahl.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Alec Wodtke
Course frequency: i.d.Regel alle 2 Jahre	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 2
Maximum number of students: 64	

Additional notes and regulations:
Die aktive Teilnahme an den angebotenen Übungsstunden wird dringend empfohlen.

Georg-August-Universität Göttingen **Module M.Che.1314: Biophysical Chemistry**	6 C 5 WLH

Learning outcome, core skills: Nach erfolgreichem Abschluss des Moduls ... -sollen die Studierenden in der Lage sein, die wesentlichen physikochemischen Zusammenhänge biologischer Materie zu verstehen -die generellen Triebkräfte biologischer Reaktionen kennen -Spektroskopische Methoden zur Strukturbestimmung biologischer Makromoleküle verstehen und anwenden können -die Grundzüge moderner optischer Mikroskopie sowie der Sondenmikroskopie verstanden haben -die Mechanik und Dynamik biologischer Systeme ausgehend vom Einzelmolekül bis zur einzelnen Zelle erörtern können	**Workload:** Attendance time: 70 h Self-study time: 110 h

Course: Vorlesung mit Übungen Biophysikalische Chemie	5 WLH
Examination: Written examination (180 minutes)	6 C

Examination requirements: • Strukturen biologischer Makromoleküle aus spektroskopischen und mikroskopischen Daten ableiten können • Übertragung genereller physikochemischer Prinzipien, wie zum Beispiel der Reaktionsdynamik, (statistischen) Thermodynamik und Quantentheorie auf die Beschreibung biologischer Phänomene • Kenntnisse der wesentlichen Methoden, wie z.B. Streumethoden, spektroskopische Methoden (UV-Vis, Fluoreszenz, Lumineszenz, Circulardichroismus ATR-IR, NMR, ESR, …), kalorimetrischen und kolligativen Methoden	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Andreas Janshoff
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 2
Maximum number of students: 64	

Georg-August-Universität Göttingen **Module M.Che.1315: Chemical Dynamics at Surfaces**	6 C 4 WLH

Learning outcome, core skills: The students of this module will achieve a deeper theoretical knowledge of chemical dynamics on surfaces as well as their influence on other fields in natural science, in order that they will be able to approach and solve problems regarding the quantitative questions in this field.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Lecture Combined with Tutorial: Chemical Dynamics at Surfaces	
Examination: Written examination (180 minutes)	6 C

Examination requirements: By Understanding and solving exemplary questions regarding this research field with the help of limited reference material in predetermined time will count as minimum 50 % of the required score	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Alec Wodtke
Course frequency: normally every 2 years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 2
Maximum number of students: 64	

Additional notes and regulations: Active participation in provided tutorial is recommanded.

Georg-August-Universität Göttingen **Module M.Che.1316: Current Topics in Physical Chemistry**	6 C 4 WLH

Learning outcome, core skills: Nach erfolgreichem Abschluss des Moduls können die Studierenden • vertiefte Kenntnisse über aktuelle Themen und Forschungsschwerpunkte der Physikalischen Chemie vorweisen • einen Bezug zu Fachübergreifenden Fragestellungen herstellen	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Vorlesung mit Übung: Aktuelle Themen der Physikalischen Chemie	
Examination: Written examination (180 minutes)	6 C

Examination requirements: Verständnis der aktuellen Forschungsschwerpunkte der Physikalischen Chemie	

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Direktor des Instituts für Physikalische Chemie
Course frequency: je nach Angebotslage	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.Che.2402: Quantum Chemistry**	6 C 5 WLH

Learning outcome, core skills: Die Absolventen dieses Moduls haben Kenntnisse über wichtige Näherungs-verfahren der Quantenchemie (Hartree-Fock, Dichtefunktionaltheorie, Störungstheorie nach Møller und Plesset, Configuration Interaction, Coupled Cluster, Multi-Referenz-Verfahren, Pseudopotential-Methoden, lokale Elektronenkorrelation) und können sie in Computeranwendungen einsetzen.	**Workload:** Attendance time: 70 h Self-study time: 110 h

Course: Quantenchemie (Lecture)	2 WLH
Examination: Oral examination (approx. 30 minutes) **Examination prerequisites:** Regelmäßige Teilnahme an den Übungen (70%)	6 C

Course: Quantenchemie (Exercise)	3 WLH

Examination requirements: Hartree-Fock-Theorie, Dichtefunktionaltheorie, wellenfunktionsbasierte Methoden zur Erfassung der Elektronenkorrelation (MPn, CI, CC, lokale und explizit korrelierte Methoden)	

Admission requirements: none	**Recommended previous knowledge:** Grundkenntnisse der Theoretischen Chemie entsprechend der Kompetenzen, die im Modul B.Che.1402 des Bachelor-Studiengangs Chemie erworben werden.
Language: German, English	**Person responsible for module:** Prof. Dr. Ricardo Mata
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 2
Maximum number of students: 24	

Georg-August-Universität Göttingen **Module M.Che.2602: Modern Trends in the Chemistry of Catalysis**	6 C 5 WLH

Learning outcome, core skills: Nach erfolgreicher Absolvierung des Moduls sollte die bzw. der Studierende · vertiefte Kenntnisse zur homogenen und heterogenen Katalyse in Labor und Technik haben; · moderne Methoden der Metall-, Organo- und Biokatalyse kennen; · Kenntnisse katalytischer Prozesse in modernen industriellen Anwendungen haben und mit aktuellen Forschungstrends der Katalysechemie vertraut sein.	**Workload:** Attendance time: 70 h Self-study time: 110 h

Course: Vorlesung Moderne Entwicklungen der Katalysechemie (Lecture)	2 WLH
Course: Übungen zur Vorlesung	1 WLH
Course: Seminar Aktuelle Entwicklungen der Katalysechemie (Seminar)	2 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** Referat im Seminar (ca. 20 min.) mit fünfseitiger schriftlicher Zusammenfassung	6 C

Examination requirements: Vertiefte Kenntnisse zur homogenen, heterogenen und Biokatalyse in Labor und Technik; Einblicke in aktuelle Forschungstrends und Entwicklungen; mechanistische Aufklärung katalytischer Reaktionen bzw. Prozesse sowie Kenntnisse zu modernen industriellen Anwendungen; Anwendung dieses Wissens im Praktikum und Kenntnisse der erforderlichen Methoden und Arbeitsweisen.	

Admission requirements: Grundkenntnisse der Katalysechemie entsprechend der Kompetenzen, die im Modul B.Che.3601 des Bachelor-Studiengangs Chemie erworben werden.	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Lutz Ackermann
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 50	

Georg-August-Universität Göttingen **Module M.Cp.0004: Plant diseases and pests in temperate climate zones**	6 C 4 WLH

Learning outcome, core skills: Students will be able to recognize and identify the main pests and diseases, understand the origin, distribution and dynamics of diseases and pests in the field as a basis for the development of control methods.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Plant Diseases and Pests in Temperate Climate Zones (Lecture, Excursion, Exercise) *Contents*: The main diseases and pests (fungi, viruses, bacteria, nematodes, mites, and insects) of crops (arable crops, vegetables, fruit crops) in temperate climate zones will be presented. The symptoms, diagnosis, biology and life cycles, economic importance, possible control methods will be studied in lectures, practicals and field trips. The economic damage, prognosis, possible control methods using economic thresholds will be presented.	4 WLH
Examination: Written examination (45 minutes) **Examination prerequisites:** regular attendance at field practical and excursion **Examination requirements:** Identification and diagnosis of plant pests and diseases of crops of the temperate climate zones, knowledge of the life cycle, distribution, and population dynamics.	6 C

Admission requirements: Only for students in the study programmes “Crop Protection”, EMJMD PlantHealth and “Sustainable international Agriculture”.	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Birger Koopmann
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 2
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module M.Cp.0005: Integrated management of pests and diseases**	6 C 4 WLH

Learning outcome, core skills: Students will be able to understand and develop plant protection strategies to control plant pathogens and insect pests while observing the sustainability of the whole crop production system.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Integrated Management of Pests and Diseases (Lecture) *Contents*: The integrated pest management concept and its main components are presented with regard to the management of fungal plant pathogens and insect pests in temperate zones: preventive methods, selective use pesticides, effect of cultural methods (sowing date, soil preparation, fertilization, crop rotation, varieties) on occurrence, distribution and damage of plant pathogens and insect pests.The diagnostics and quantification of damage symptoms; prognosis systems are discussed.	4 WLH
Examination: Oral examination (approx. 20 minutes) **Examination requirements:** Knowledge of the relationship between crop production methods and the occurrence of plant diseases and insect pests in temperate zones, concept of integrated pest management.	6 C

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

Georg-August-Universität Göttingen **Module M.Cp.0011: Agricultural entomology seminar**	3 C 2 WLH

Learning outcome, core skills: Students will learn, to present, discuss and defend their own individual research project. They will be able to critically discuss scientific results and provide suggestions for improvement.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Agricultural Entomology Seminar (Seminar) *Contents*: In this seminar scientific projects, targets of research and results of research projects in Agricultural Entomology will be presented and discussed by the MSc students. Techniques of presentation and the ability to critically review and discuss research results will be practiced which will suggest and lead to new thoughts for further research projects.	2 WLH
Examination: Presentation (ca. 20 minutes) **Examination prerequisites:** Participation in 12 seminars **Examination requirements:** Very good knowledge of own area of research and good ways of presentation of own results. Participation in discussion.	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Michael Georg Rostás
Course frequency: each semester	**Duration:** 2 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module M.Cp.0012: Weed biology and weed management**	6 C 4 WLH

Learning outcome, core skills: Understanding the biology and control of local and globally important weeds, their taxonomy, life-forms and habitat requirements, as well as their evolution, 30 h distribution, ecology, population dynamics and genetics. Endangered, as well as invasive species, the interactions of weeds and crops (allelopathy and competition) and weed control with direct and indirect measures will be taught.	**Workload:** Attendance time: 30 h Self-study time: 150 h

Course: Weed Biology and Weed Management (Lecture, Excursion, Seminar) *Contents*: The module consists of a lecture, the visit of a field trial and the creation of a herbarium in own work according to instructions. In the lecuture knowledge about sustainable weed control and the biology of plant species and their potential as weeds is imparted. Direct and indirect control strategies to regulate weeds, considering economic and ecological aspects, are presented. The lecture deals with solutions for individual production systems and their transferability discussed. Advantages and disadvantages of weed control for health, economy, society and ecology are covered. For the herbarium 30 plant species that occur in the agricultural landscape are to be collected in bloom (20-25 dicots and 5-10 monocot species). The plants must be identified correctly. Information about their relevance in the agricultural landscape should also be provided in short form (ecological values, aspects of crop competition and peculiarities).	4 WLH
Examination: Written exam (60%; 60 minutes) and a herbarium prepared in home work (40%) **Examination requirements:** Basic knowledge on the biology and ecology of arable weeds and knowledge about direct and indirect measures of weed control as well as the ability to identify key weed species.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Jean Wagner
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.Cp.0014: Plant Nutrition and Plant Health**	3 C 2 WLH

Learning outcome, core skills: Understanding the relationship between plant nutrition and plant health and its significance in the value-added food chain.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Plant Nutrition and Plant Health (Lecture, Seminar) *Contents*: Nutrient uptake and transport in the plant; function of different nutrients in the plant especially with respect to plant health (susceptibility, tolerance, resistance); mechanisms to increase the efficiency of nutrient availability, uptake and use; characteristics of plant health, effect of nutrient imbalances on plant metabolism and development of plant harvest products, the nutrient concentrations and processing quality.	2 WLH
Examination: Written exam (90 minutes) **Examination requirements:** Knowledge of and ability to present the presented topics in their context: development of nutritional and processing quality in different crop plants; quality requirements and ways of realization by crop production methods.	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Klaus Dittert
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

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

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

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

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

Georg-August-Universität Göttingen **Module M.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: Kenntnis der beschriebenen Lehrinhalte, Erreichung der festgelegten Lernziele und Nachweis der angestrebten Kompetenzen.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. 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.322: Project planning and evaluation**	6 C 4 WLH

Learning outcome, core skills: **Political evaluation** Insights into the political framework of evaluation and the power and information based processes which drive any procedure of evaluation and application of the results in practice. The students conduct a case study in political evaluation based on literature and an interactive game. **Evaluation of rural development projects and policies** In cooperation with the chair of „International Food Economics and Rural Development" this submodule teaches and trains the economic and financial assessment of rural development projects (in particular cost-benefit analysis). The methods are illustrated with examples and students learn to apply these methods in different exercises. **Project planning and management** Understanding theoretical concepts and practical considerations for planning and management of international forestry projects with a focus on international cooperation. A deeper understanding of the subject-matter is achieved by examples presented by guest lecturers and practitioners.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Political evaluation (Lecture)	1 WLH
Course: Evaluation of rural development projects and policies (Lecture, Seminar)	2 WLH
Course: Project planning and management (Lecture, Seminar)	1 WLH
Examination: Written examination (90 minutes, 50%) and term paper (max. 5 pages, 50%)	6 C

Examination requirements:

- Ability to describe and explain international policy frameworks in development policy
- Capability to independently analyse policy case studies
- Have a good command of basic impact assessment and cost-benefit analysis in the context of international project evaluation
- Apply aspects of environmental and welfare economics to project case studies
- Understanding of key aspects of Sustainable Development, Capacity Development, Change management and international coordination and cooperation for successful implementation of forestry projects
- Critically analyse and develop a forestry project case study

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Carola Paul

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.323: Biometrical research methods**	6 C 4 WLH

Learning outcome, core skills: Introduction in basics of statistical data analysis: Probability distribution, estimation, hypotheses testing. Understanding and application of basic techniques of descriptive and confirmative statistics: Confidence intervals, t-test, ANOVA, correlation and regression analyses. Understanding assumptions of statistical tests. Analysis of experimental data sets via the statistical program “R”. Interpretation of analysis results. Skills in describing and estimating forest stand parameters, forest structure and tree shape, and modeling of forest growth and development.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Biometric data analysis and experimental design (Lecture, Exercise)	2 WLH
Course: Forest dynamics (Lecture, Exercise)	2 WLH
Examination: PC based written exam (120 minutes)	6 C

Examination requirements: Understanding and application of basic techniques of descriptive and confirmative statistics. Analysis of given experimental data sets via the statistical program “R”, interpretation of analysis results to answer the examination questions. Knowledge of quantitative methods to describe forest density, forest structure and tree morphology. Modeling tree growth, calculating sustainable harvests for even-aged and continuous cover forests and understanding of the biological role of insects in forest ecosystems.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Irina Kuzyakova
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: cf. examination regulations	**Recommended semester:**
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module M.FES.715: Dryland Forestry and Methods in Silviculture**	6 C 4 WLH

Learning outcome, core skills: Understanding the specifics of dryland forestry as well as principles and applications of plant ecological and silvicultural methods.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Dryland forestry and methods in silviculture (Lecture, Exercise, Seminar) *Contents*: The lecture focuses on land-use options emphasising the management of dry forests on a global scale. Covering approximately 30% of the global land surface, drylands pose important ecological and economic impacts, and therefore require specific approaches in management. The second focus of this module is on recent topics in silviculture and the familiarization of relevant plant ecological and silvicultural methods. This includes discussion of study designs, airborne and ground-based assessments as well as options of data analysis and presentation. Selected case studies from literature will also be analysed.	4 WLH
Examination: Oral presentation (approx. 15 minutes, 50%) with written outline (max. 10 pages, 50%)	6 C

Examination requirements: Knowledge on ecological and economic aspects of dryland forestry; tree ecological characteristics and management options. Analysis, presentation and discussion of case studies.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Dirk Hölscher
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.719: Remote sensing image processing with open source software**	6 C 4 WLH

Learning outcome, core skills: This combined lecture and lab makes the student familiar with basic principles, techniques and applications of remote sensing. The students learn skills in digital image processing and information extraction using open source software on own laptops.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Remote sensing image processing with open source software (Lecture, Exercise) *Contents*: The course introduces the theories (via lectures and literature) and applications (including computer exercises) of remote sensing workflows. Remote sensing data from different sensors (cameras, LiDAR scanners, RADAR) and platforms (satellites, aircrafts and unmanned aerial systems (UAS)) are used to develop analysis workflows for forestry and environmental monitoring applications. Common steps and methods of remote sensing analysis such as preprocessing, image enhancement, sampling of reference data, automated classification and estimation and map validation are presented. In the practical labs, students deepen their knowledge and skills with small projects such as land cover classification, individual tree detection, biomass estimation and change detection using open source technologies.	4 WLH
Examination: Oral exam (approx. 15 minutes, 80%) and practical exam (approx. 15 minutes, 20%)	6 C

Examination requirements: The students should know and manage and understand and have insights into all topics that are covered in the module that consists of lectures and predominantly on labs where the students learn image analysis on their own notebooks: the exam requirements include: • Bases of electromagnetic radiation and its interactions with the atmosphere and terrestrial land cover types; • Basic techniques of remote sensing image acquisition, pre-processing, enhancement and classification – as covered in the lectures and labs; • Knowledge and skills regarding application of the software as used in the practical labs; • Options of remote sensing integration into forest monitoring regarding both mapping and estimation; • Assessing quality of remote sensing products, including accuracy analysis.	

Admission requirements: none	**Recommended previous knowledge:** Good command of forest mensuration and forest inventory, including calculation skills regarding analyses of inventory data.

Language: English	**Person responsible for module:** Prof. Dr. Christoph Kleinn
Course frequency: each winter 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.728: Tropical dendrology**	3 C 2 WLH

Learning outcome, core skills: Tropical Dendrology objectives: Assessment of ecological characteristics and management of major tree species. Students will learn how to give an oral presentation.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Tropical dendrology (Lecture, Exercise) *Contents*: In the tropical rainforest 50-60.000 tree species occur. Of course, it is not possible to know all of them including their ecological characteristics. However, in the course on Tropical dendrology we will present important families to which tropical trees belong. Furthermore, we will elaborate physiological principles with respect to water, carbon and nutrient turnover by trees, and focus on the possibilities of a functional classification of trees. For selected tree species we will analyse the ecological characteristics, management options and the use in more detail. *Course frequency:* each winter semester	2 WLH
Examination: Oral presentation (approx. 15 minutes)	3 C

Examination requirements: Knowledge of ecological aspects and management options for tropical tree species. Analysis, presentation and discussion of specific species (groups).	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ralph Mitlöhner
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: cf. examination regulations	**Recommended semester:**
Maximum number of students: 24	

Georg-August-Universität Göttingen **Module M.MM.101.1: Biomolecules and Pathogens**	12 C 8 WLH

Learning outcome, core skills: In the course of the module the students will aquire deepened molecular knowledge of the interplay between pathogens and the host defense, immunological diseases and pharmacological approaches to interfere with various disorders. The graduates know current immunological questions and methods, and are able to explain the mechanism and therapy of related diseases. They know the function and regulation of microbial virulence factors and understand their role in the pathogenesis of infectious diseases. In addition, they have extensive insight into the taxonomy and structure of viruses. The graduates know the principles of pharmacological research and current therapeutic strategies. They can apply concepts of pharmacology to practical examples and name effects of selected toxic substances. The graduates have the ability to work under supervision on a small defined scientific project using experimental methods, and to analyze and interpret the obtained data. They are able to present their results in a seminar, and to discuss and document them in written form similar to a scientific publication.	**Workload:** Attendance time: 112 h Self-study time: 248 h

Course: "Biomolecules and Pathogens" (Lecture, Seminar)	8 WLH
Examination: Written examination (180 minutes) **Examination prerequisites:** Active participation in the seminar. **Examination requirements:** Deepened knowledge of clinically relevant pathogens and their mechanisms, basic concepts of immune responses and their failure, and current principles of pharmacological therapy of selected diseases.	12 C

Admission requirements: Bachelor’s degree in a related study program or successfully passed first exam in human medicine	**Recommended previous knowledge:** Basic lectures in microbiology, virology, immunology and pharmacology.
Language: English	**Person responsible for module:** Prof. Dr. rer. nat. Holger Reichardt
Course frequency: once a year	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 2
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module M.WIWI-BWL.0157: Resourcing in Entrepreneurship**	6 C 2 WLH

Learning outcome, core skills: After completing this seminar, students will have an overview of diverse theoretical perspectives on resourcing in entrepreneurship based on scientific research papers. Students gain an analytical understanding of typical challenges entrepreneurs face throughout the founding process, focusing on resource acquisition. The strong research focus does not only enable students to identify, understand and see through common challenges, conflicts, and troubles throughout the entrepreneurship process, but also to discuss, evaluate, and question research findings and scientific debates.	**Workload:** Attendance time: 28 h Self-study time: 152 h

Course: Resourcing in Entrepreneurship (Seminar) *Contents*: No doubt, Silicon Valley is one of the world's leading hubs for technological innovation. Pioneering companies like Google, Facebook or PayPal were founded by visionary entrepreneurs with growth ambition. Yet, despite the myth of a solitary genius tinkering in her garage, such entrepreneurial activities and innovations are only possible if diverse actors work together in manifold ways. Here, a *major challenge* becomes apparent: Although such entrepreneurial activities require manifold, comprehensive resources to work on innovative ideas, develop new products and grow an organization, in most cases, entrepreneurs do not possess all necessary resources. Hence, resourcing becomes an outstandingly important challenge for entrepreneurs. In this course, we discuss diverse approaches to resource acquisition from a research-based perspective. For example, the respective environment, e.g. the entrepreneurial ecosystem, might provide critical resources for the founding process. Not only entrepreneurs cluster in regions like Silicon Valley, London or Paris, but also investors, research universities, skilled work forces, mentors, and co-working spaces, creating a dynamic setting for technological innovation and high growth entrepreneurship. How do entrepreneurial ecosystems in different regions look like? How do they promote entrepreneurial activities? Leveraging resources from such external actors and environments becomes central. Thus, this course discusses questions like: What kind of relationships do new ventures need? How do entrepreneurs form such network ties to acquire funding or first customers? How do their networks evolve throughout the founding process? What does resourcing mean in a digital age? Which role do entrepreneurial teams play?	2 WLH
Examination: Portfolio (40% paper presentation, 60% take-home-exams) **Examination requirements:** Regular attendance.	6 C

Examination requirements: Students have to show that they are able to apply the theoretical concepts discussed in the seminar, reflect them critically, and develop practical implications rooted in a strong theoretical foundation. Students have to read and critically discuss scientific papers.	

Admission requirements: none	**Recommended previous knowledge:** Experience with discussing scientific papers or willingness to learn it.
Language: English	**Person responsible for module:** Prof. Dr. Katharina Scheidgen
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 4
Maximum number of students: 20	

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: Expose students to macroeconomic issues in economic development, including how economic growth, trade, inequality, aid, capital flows, and population issues affect economic development. They understand historical roots of underdevelopment and acquire knowledge of current economic models and empirical approaches in these topic areas.	**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 Exam **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 demonstrate a good understanding of key theories and models of economic development. They are able to critically present these theories and models, are able to interpret empirical results that relate to these models, and are able to crucially draw relevant policy conclusions coming out of these models and empirical assessments.	

Admission requirements: None	**Recommended previous knowledge:** Knowledge of macroeconomics and econometrics at BA level is highly desirable.
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.0010: Development Economics III: Regional Perspectives in Development Economics**	6 C 3 WLH

Learning outcome, core skills: By the end of this course the students will be able to understand the theoretical and empirical concepts in development economics. They'll be also understand the differences in regional economic development. The main focus due to differences of the development experience in East Asia, South Asia, Latin America, and Sub Saharan Africa, including the most important determinants of these differences.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Development Economics III (Lecture) *Contents*: The Lecture will discuss regional perspectives in economic development of the past decades. The regions considered will be South and East Asia, Sub-Saharan Africa, and Latin America.	2 WLH
Course: Development Economics III (Tutorial) *Contents*: The Tutorial is the place to discuss the learned differences of the economic development from a theoretical and empirical perspective.	1 WLH
Examination: Term Paper (max. 10 pages)	3 C
Examination: Written examination (90 minutes)	3 C

Examination requirements: In the term paper, students demonstrate their ability to develop a coherent argument on a particular regional or comparative issue in economic development. In the exam, students demonstrate their ability to apply their knowledge of development economics theory and empirical assessments to interpret and explain key issues affecting regional economic development.	

Admission requirements: none	**Recommended previous knowledge:** Knowledge of macroeconomics and econometrics at BA level is highly desirable. Knowledge of development economics (at least at BA level, but preferably at MA level) also recommended (e.g. taking Development Economics I or II concurrently)
Language: English	**Person responsible for module:** Prof. Dr. Andreas Fuchs
Course frequency: irregular	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2 - 3
Maximum number of students: 25	

Georg-August-Universität Göttingen **Module M.WIWI-VWL.0101: Theory and Politics of International Taxation**	6 C 4 WLH

Learning outcome, core skills: After successful completion of the course students will have the following competencies: • knowledge of the basic institutional rules governing the taxation of international income flows, • understanding how these rules affect the efficient international allocation of capital and savings, • knowledge of some instruments used by multinational corporations for shifting profits, and assess the policy measures proposed by the OECD and the EU to limit erosion of tax bases, • understanding the possibilities and limitations of intergovernmental co-ordination of tax policies, • participants will learn to explain the impact of international taxation on economic decisions verbally and graphically, • they will be able to analyze problems in international taxation by solving simple theoretical models, • they will learn how to discuss international co-ordination of tax policy from a scientific background.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Theory and Politics of International Taxation (Lecture) *Contents*: 1. Basics of international taxation Introduction into the principles of international taxation and the methods to avoid double taxation. Description of EU directives concerning taxation of cross-border income flows. 2. Worldwide efficiency of capital income taxation Analytical derivation of efficiency conditions for capital and savings (capital export and capital import neutrality) with reference to the methods to avoid double taxation. 3. Optimal taxes in a small open economy Analysis of capital income taxation in source and residence countries. Examination of other tax bases and empirical studies on taxation effects. 4. Profit shifting Introduction into the basics of profit shifting by multinational corporations induced by international differences in taxation and analysis of transfer prices from the firm's and the state's perspective. Analysis of debt finance and intangible assets as means to shift profits. Measures by the OECD and the EU to counter base erosion by profit shifting. 5. Co-ordination of profit taxation in the European Union Introduction into the proposals of the European Commission regarding a Common Consolidated Corporate Tax Base and analysis of CCCTB's effects on companies' decisions, tax revenues and tax competition.	2 WLH

Basic literature Gordon, R. and J. Hines (2002): International Taxation. In: A. Auerbach and M. Feldstein (eds.), Handbook of Public Economics, Amsterdam, Vol. 4, ch. 28, 1935-1995. Hindriks, J. and G. Myles: Intermediate Public Economics, Cambridge, Mass. Homburg, S. (1999): Competition and Co-ordination in International Capital Income Taxation, Finanzarchiv N.F. 56, 1-17. Homburg, S.: Allgemeine Steuerlehre, München: Vahlen. Keuschnigg, C.: Öffentliche Finanzen: Einnahmenpolitik, Tübingen: Mohr-Siebeck. Schreiber, U.: International Company Taxation: An Introduction to the Legal and Economic Principles, Berlin, Heidelberg. (current issues in case of text books)	
Course: Theory and Politics of International Taxation (Exercise) *Contents*: The tutorial accompanies the lecture with exercises and revision.	2 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements: Participants are required to show their understanding of the principles of international taxation, the allocation and incidence effects of taxation of internationally mobile factors and goods, the causes and effects of tax motivated profit shifting as well as the co-ordination of tax policies in the European Union.	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of theory of taxation and institutions of international taxation
Language: English	**Person responsible for module:** Prof. Dr. Robert Schwager
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 4

Georg-August-Universität Göttingen **Module M.WIWI-VWL.0147: Empirical Political Economy**	6 C 4 WLH

Learning outcome, core skills: In this course, students learn about relevant issues of political economy by reading and discussing empirical papers that address the interlinkages between economics and politics. After completing the course students should: • Be familiar with a range of currently relevant issues in political economy: know about the role of elections, political participation and accountability, the role of various political institutions, the role of media and individual politicians as well as the connections between economics and politics. • Be able to read and assess new empirical papers on the topic. More specifically: • Be able to discuss the research questions of new papers in the light of the existing literature. • Be able to assess the pros and cons of various causal identification strategies and assess the strength (and potential problems) of identification strategies of new empirical papers. • Be able to interpret the results of new empirical studies and discuss the strengths and potential limitations of the study designs.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Empirical political economy (Lecture) *Contents*: The lecture is organized as a weekly reading course and discusses recent empirical papers on various issues of political economy. It addresses the role of elections and voting, political participation and franchise, electoral rules, gender representation in politics, the role of media and propaganda, the role of individual politicians and political connections, the role of media, as well as political accountability and institutions. Each course participant is expected to read the papers in advance and to be willing to participate in classroom discussion based on the papers. The required readings will consist of one empirical paper per week, recently published in well-known (top-tier) economic journals. Course outline: 1. Voting in democracies 2. Political representation 3. Media and information 4. Private returns to politics 5. Political accountability 6. Further selected topics	2 WLH
Course: Empirical political economy (Exercise) *Contents*: In the practical part, each student is required to present one additional empirical paper on the topic of the lecture and to discuss their identification strategies and results. In the	2 WLH

first few practical sessions a short introduction into reading empirical papers and dealing with issues of causal identification will be given. The papers assigned for presentation will also be empirical papers that have been recently published in well-known economic journals. **Suggested background literature:** Angrist, J.D. and Pischke, J., 2010, Mostly Harmless Econometrics: An Empiricist's Companion, Princeton, N.J.: Princeton University Press.	
Examination: Written examination (180 minutes) **Examination prerequisites:** Presentation of one paper (approx. 20 minutes); active participation; presentation can also take place in groups.	6 C

Examination requirements: In the exam students are expected to read a short empirical paper that has not yet been discussed in the course and answer questions related to the paper. The exam is open-book.	

Admission requirements: none	**Recommended previous knowledge:** M.WIWI-QMW.0004 Econometrics I M.WIWI-QMW.0005 Econometrics II
Language: English	**Person responsible for module:** Prof. Dr. Krisztina Kis-Katos
Course frequency: irregular	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2 - 4
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module M.WIWI-VWL.0163: Tax and Fiscal Competition**	6 C 2 WLH

Learning outcome, core skills: By the end of the module, students will have formed a reasoned view on whether, and under which conditions, competition among governments is beneficial or detrimental. They will know the main theoretical approaches to analyze strategic interaction among countries or subnational jurisdictions. They will be able to explain the meaning of, and the mathematics underlying, ideas such as “voting with the feet” and “race to the bottom”. They will be aware of the importance of the available government instruments (public goods and/or taxes) for the impact of fiscal competition on efficiency. Participants will be able to understand the possibilities and limitations of intergovernmental co-ordination of tax and spending policies. Participants will learn to explain the mechanisms driving key results in fiscal competition. They will acquire a certain proficiency in solving simple theoretical models, will be trained in providing intuitive explanations, and will evaluate empirical results.	**Workload:** Attendance time: 28 h Self-study time: 152 h

Course: Tax and Fiscal Competition (Lecture) *Contents*: **1. Local public goods** Optimal size of a jurisdiction. Locational efficiency. Efficient provision of public goods. Segregation along income and preferences. **2. Mobility and fiscal competition** Tax instruments of local jurisdictions. Efficient fiscal competition: the Tiebout model. Preference revelation through mobility. Fiscal competition in higher education. **3. Population size and the cost of providing public goods** Cost disadvantages of large, densely populated or of small, sparsely populated regions. Problems of empirically observing cost disadvantages. Justification for granting higher revenues to cities in fiscal equalization. **4. International tax competition and mobile capital** Capital mobility and strategic choice of tax rates. Fiscal externalities. Inefficient tax competition: the Zodrow/Mieszkowski model. Under-taxation and the supply of public goods. Tax competition and intergovernmental grants. **5. Tax competition and profit shifting** Transfer pricing regulation as an instrument in tax competition. Transfer pricing and strategic trade policy. Benefits and costs of international tax co-ordination.	2 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements: Participants are required to show their understanding of the impact of mobility on tax bases and tax policy decisions. They shall demonstrate that they understand the theoretical assumptions which yield efficient or inefficient fiscal competition. To do this,	

they must be able to solve simple microeconomic models, explain the intuition behind theoretical results, and form a judgement about the plausibility and relevance of different models.	

Admission requirements: none	**Recommended previous knowledge:** B.WIWI-OPH.0007 Microeconomics I, basic knowledge of public finance and taxation is useful, students should be able and willing to work with simple mathematical economic models
Language: English	**Person responsible for module:** Prof. Dr. Robert Schwager
Course frequency: irregular	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 4
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module SK.IKG-ISZ.03: From Reading to Writing Academic Texts for Graduate Students**	4 C 1 WLH

Learning outcome, core skills: Nach Abschluss des Moduls sind die Studierenden in der Lage, unterschiedliche Lesestrategien zielgerichtet für verschiedene Zwecke einzusetzen und somit wissenschaftliche Literatur effizient zu rezipieren, gelesene Literatur in angemessener Weise aufzubereiten und diese funktional in eigenen komplexen akademischen Texten einzubringen und daraus eigenständige akademische Argumentationen zu entwickeln.	**Workload:** Attendance time: 14 h Self-study time: 106 h

Course: Workshop: Vom Lesen zum Schreiben akademischer Texte/From Reading to Writing Academic Texts - MultiConText (Block course) *Course frequency:* irregular	1 WLH
Examination: Portfolio/E-Portfolio (max. 20 pages) **Examination prerequisites:** Lese-Schreibaufgaben (max. 15 Seiten), regelmäßige Teilnahme **Examination requirements:** Kompetenzen in akademischen Lesestrategien, Textartenkenntnisse zur Vorbereitung komplexerer akademischer Texte, Kompetenzen im Umsetzen von gelesener wissenschaftlicher Literatur in eigene akademische Teiltexte.	4 C

Admission requirements: Deutsch und/oder Englisch auf GER-Niveau mind. C1	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Dr. Melanie Brinkschulte
Course frequency: unregelmäßig	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Georg-August-Universität Göttingen **Module SK.IKG-ISZ.49: Academic writing and presentation in the natural sciences: German, English, Multilingual... (for graduate students)**	6 C 2 WLH

Learning outcome, core skills: Nach Abschluss dieses Moduls kennen Master-Studierende naturwissenschaftlicher Fächer das akademische Schreiben und Präsentieren in verschiedenen Schreibtraditionen. Sie verfügen über Textsortenkompetenzen zu verschiedenen Textarten des wissenschaftlichen Kontexts der Publikation (z.B. wissenschaftliche Paper, Abstracts und Reviews). Sie können unterschiedliche Textarten selbst verfassen sowie akademische Teiltexte (z.B. Einleitung – Introduction, Results) in verschiedenen Schreibtraditionen und aus den Norm-orientierten Fachzeitschriften exzerpieren und für die eigenen Projekte einsetzen. Außerdem können Studierende selbst Texte aus den unterschiedlichen Wissenskulturen differenzieren und über die Vielfalt verschiedener Wissenskulturen reflektieren. Zudem können sie akademische Präsentationen in verschiedenen akademischen Traditionen effizient halten. Die erworbenen Kenntnisse während des Workshops befähigen die Studierenden, erfolgreich an Tagungen mit Präsentationen teilzunehmen und ein Manuskript dem jeweiligen Forschungskontext gemäß zu verfassen.	**Workload:** Attendance time: 28 h Self-study time: 152 h

Course: Akademisches Schreiben und Präsentieren in den Naturwissenschaften: deutsch, englisch, mehrsprachig... (für Master-Studierende) (Block course) *Course frequency:* irregular	2 WLH
Examination: Portfolio (max. 20 pages) **Examination prerequisites:** regelmäßige Teilnahme; konzipierende Schreibaufgaben (max. 15 Seiten) **Examination requirements:** Kompetenzen in der Vorbereitung von naturwissenschaftlichen Publikationen, reflektiertes Wissen über akademische Schreibprozesse, der schriftlich konzipierten Mündlichkeit, der funktionalen Medienerstellung und –nutzung für einen akademischen Vortrag, Kompetenzen zur Reflexion akademischer Präsentationen.	6 C

Admission requirements: Deutsch und/oder Englisch auf GER-Niveau mind. C1	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Dr. Melanie Brinkschulte
Course frequency: unregelmäßig	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Additional notes and regulations:

Dieses Modul wird für Studierende in international orientierten Studiengängen empfohlen.

This module is recommended to students in international study programs.