Faculty of Agriculture and Horticulture

Study Regulations

of the International Master Course
Arid Land Studies (ATLANTIS)
(„Double Degree-Programme")

Stand: 23.09.10

Study regulations

of the International Master course Arid Land Studies (ATLANTIS) („Double Degree- Programme")

According to § 17 par. 1, No.1 of the constitution of the Humboldt-Universität zu Berlin (Amtliches Mitteilungsblatt of the Humboldt-Universität zu Berlin No. 28/2006) the Board of the Faculty of Agriculture and Horticulture has decreed the following study regulations for the International Master programme „Arid Land Studies" on July 14th 2010 *

§ 1 Bounds of validity

(1) These study regulations regulate objectives, extent and content of the International Masters Course *Arid Land Studies* at the Humboldt-Universität zu Berlin. They are valid in conjunction with the examination regulations for the international Masters Arid Land Studies and the General Articles for study and examination affairs (ASSP) according to the currently valid versions.

(2) The International Master of Science (M.Sc.) in Arid Land Studies forms part of the transatlantic study programme ATLANTIS and is jointly offered by the Texas Tech University (USA) and the two European partners, the University of Sheffield (UK) and the Humboldt-Universität zu Berlin (Germany).

§ 2 Beginning of studies, full-time programme, part-time programme

(1) Studies of the International Master in Arid Land Studies are exclusively to begin by the winter term in a 2-years-rhythm.

(2) The degree programme *Arid Land Studies* is a full-time Master programme. As the second academic year, which is funded, takes place at the Texas Tech University (US), the programme can not be regarded as a part-time-programme.

§ 3 Aims of the Master programme, Internationality

(1) In accordance with the objectives of the ATLANTIS-programme, this study programme will help to strengthen the transatlantic mobility and the knowledge of foreign languages, and it will offer the opportunity to gain intercultural experiences.

(2) The International Masters Course *Arid Land Studies* prepare students for their future career responsibilities and lays the foundation for further study (PhD).

(3) The successful completion of the International Master in Arid Land Studies generates competences for a career in resource- and nature conservation, national and international agencies and organisations, which deal with environmental law. Other career prospects lie in areas of eco-tourism, national park administration and research institutes as well as in natural history museums.

(4) The International Master in Arid Land Studies provides an opportunity for students to participate in Research- and Development projects.

(5) As modules will take place abroad, this master programme supports internationality.

§ 4 Learning and teaching

Acquired skills of students within the International Master Arid Land Studies will be imparted using different forms of learning and teaching. Forms of learning and teaching are in particular:

- Lectures (LE): Lectures are course offerings to mediate far-ranging knowledge to students at a glance.
- Seminar (SE); as a main seminar or a research seminar: seminars are course offerings in which students should acquire in depth-knowledge and develop competences to independently apply this knowledge or to

* The Senatsverwaltung für Bildung, Wissenschaft und Forschung has confirmed the study regulations on ___ .

analyse and evaluate upcoming challenging issues.

- Language Course(LC): Language courses are lectures for the acquisition of new language skills.
- Excursion (EX): Excursions are course offerings which usually take place as a block of several days at another locality and which should help students to familiarize with topics of their studies from their own experience.
- Colloquia (CO): Colloquia aim at an active reflection of advanced research-related questions and may complement the stage of writing the Master thesis and completing the programme.
- Internship (INT): Internships and related course offerings enable students to get insights into various professional fields and to practically apply the skills learned on a trial basis. The Internship will take place at various research groups at the University of Sheffield (UK).

§ 5 Modules and Credit Systems

(1) The International Masters Course *Arid Land Studies* is built up on modules that include course offerings, which are tightly linked in content and timing. The modules are listed in § 7 and are described in appendix 1. Modules are generally completed by study attending exams according to the examination regulations. Adhering to the requirements of the study and examination regulations the Board of Faculty can refine modules in order to account for the scientific development of the programme and the career opportunities of the students. This refinement is announced at the web pages of the Faculty.

(2) Based on the workload associated with the modules, Credit Points ("Studienpunkte"= SP) are designated. One Credit Point (SP) is equivalent to an averaged workload of 30 working hours. The workload is calculated from teaching, virtual teaching and independent studies, including the preparation for specific performances according to par.3 and other preparation and revision of the courses (course achievements) as well as the expenditure of work for the preparation and the passing of an exam. The designated Credit Points for each module (SP) are assigned if the course performances are achieved resp. the exam is passed.

(3) Specific performances may be required within the course achievements insofar this is regulated in appendix 1. If there are alternative forms provided in appendix 1, this is announced by the teacher at the beginning of the term. If the course achievements are sufficient to the requirements, the teacher certifies the performances. Grading will only take place if this is specified in appendix 1; the grades are not considered regarding the final grade.

§ 6 Amount of course offerings

Within the international Masters Course *Arid Land Studies* 120 Credit Points (SP) have to be acquired by the students. 100 Credit Points (SP) are allocated for professional studies and 20 Credit Points (SP) are allocated to the Master thesis.

§7 Curriculum

(1) The International Masters Course *Arid Land Studies* comprises the following modules:

Elective modules (WP):
During their first academic year at the Humboldt-Universität zu Berlin, students will participate in modules totalling at least 50 credits (SP).

1. WP 1 Mammalogy 9SP
2. WP 2 Vertebrate Adaptation to Xeric Environments 9SP
3. WP3 Functional Biodiversity of arid and semi-arid Ecosystems 9SP
4. WP 4 Agriculture and Horticulture of Conurbations 9SP
5. WP 5 Evolutionary Morphology of Vertebrates 9SP
6. WP 6 Organic Farming 6SP
7. WP 7 Special Aspects of Organic Farming 6SP
8. WP 8 Plants with Active Ingredients 6SP
9. WP 9 Hydroponical Systems in Horticulture 6SP
10. WP 10 Plant Nutrition in Different Natural Areas 6SP
11. WP 11 Pasture Management 6SP
12. WP 12 Quality Assurance of Plant Products 6SP
13. WP 13 Land use systems for horticultural crops 6 SP
14. WP 14 Cultivation of vegetables in tropics and subtropics 6SP
15. WP 15 Effects of plant nutrition and other environmental factors on composition and quality of vegetable and ornamental plants 6SP
16. WP 16 Plant nutrition and nutrient supply in environmentally-friendly horticultural systems 6SP
17. WP 17 Tropical Fish Communities 6SP

18. WP 18 Gender and Globalization 6SP

Studium generale

Additional, students have to join courses of other master programmes to get 10 credits (SP) (studium generale). Alternatively, these credits (SP) can be obtained in elective subjects of the master Arid Land Studies. The subjects can be chosen arbitrary. Students do not need to take an exam in this subject. If students would like to take an exam, the grade will not be considered for the formation of the overall grade.

Modules at the Texas Tech University:

Students will spend their second academic year at Texas Tech University, where they will take additional modules (30 SP) and conduct the Master thesis (20 SP)

1. WP 19 Water Resources Management
2. WP 20 Seminar in Geography of Arid Lands
3. WP 21 Watershed Management
4. WP 22 Environmental Economics and Policy Analysis
5. WP 23 Ecology of Grazing Lands Systems
6. WP 24 Weather, Climate, and Applications
7. WP 25 Advanced Landscape Ecology
8. WP 26 Surface Water Hydrology
9. WP 27 Groundwater Hydrology
10. WP 28 Groundwater Transport Phenomena
11. WP 29 Natural Systems for Wastewater Treatment
12. WP 30 Environmental and Wildlife Toxicology
13. WP 31 Procedure & Techniques in Ecological Risk Assessment
14. WP 32 Geographic Information Systems
15. WP 33 Remote Sensing of the Environment
16. WP 34 Advanced Geographic Information Systems
17. WP 35 Seminar in Regional Analysis
18. WP 36 Digital Imagery in Geosciences
19. WP 37 Spatial Data Analysis and Modeling in Geosciences
20. WP 38 Advanced Range Ecology
21. WP 39 Advance Nongame Ecology and Management
22. WP 40 Aerial Terrain Analysis
23. WP 41 Imagery Interpretation for NRM
24. WP 42 Geospatial Technologies in NRM
25. WP 43 Precision Agriculture
26. WP 44 Soil and Plant Relationships
27. WP 45 Soils and Crops in Arid Lands

Modules at the Texas Tech University will be valued with 3 credits, being equivalent to 10 SP at the Humboldt-Universität zu Berlin.

(2) At the end of their second academic year, students will participate in an eight-week Internship at the University of Sheffield, where students acquire 10 SP.

(3) The International Masters Course *Arid Land Studies* is successfully completed if all study performances are completed, if all examinations are passed and if all Credit Points are yielded.

§ 8 Further regulations

The quality assurance of teaching, the course guidance, deadlines and their appointment, the approval of study performances, the equation of disadvantages in the provision of performances and the compatibility of family and studies conform with the ASSP.
Within the provision of performances the rules of deceit in examinations of the ASSP apply accordingly.

§ 9 Coming into force

These regulations come into force the day after their publication in the paper of curatorial disclosure (Amtliches Mitteilungsblatt) of the Humboldt-Universität zu Berlin.

Appendix 1: Module descriptions

Following modules will take place at the Humboldt-Universität zu Berlin:

<table>
<tr><td colspan="4">WP1 Mammalogy</td><td>Credit points: 9</td></tr>
<tr><td colspan="5">Learning objectives:
In this modul students gain knowledge about comparative anatomy of mammals and the evolution of Mammalia. Participants aquire skills in techniques of taxidermy, methods of fieldwork and working in museums.</td></tr>
<tr><td colspan="5">preconditions: none</td></tr>
<tr><td>Learning and teaching</td><td>Contact hours per week</td><td>Workload (hours)</td><td>Credit Points and requirements for assignation</td><td>Topics and contents</td></tr>
<tr><td>LE</td><td>2</td><td><u>90 hours</u>
30 contact hours,
60 hours Self-study according to § 5Par. 2</td><td>3 SP</td><td>Deepening of knowledge in the morphology of the mammal cranium and the postcranial skeleton, the systematics and evolution of mammals, tecniques of trapping and taxidermy of mammals, introduction in museological aspects.</td></tr>
<tr><td>SE</td><td>1</td><td><u>45 hours</u>
15 contact hours,
30 hours Self-study according to § 5Par. 2</td><td>1,5 SP, presentation (30 minutes)</td><td>Deepening of contents of the lecture and the practical training.
Presentations about the biology of small mammals/ or selected ecosystems related to occuring mammals.</td></tr>
<tr><td>Practical training</td><td>3</td><td><u>135 hours</u>
45 contact hours,
90 hours Self-study according to § 5Par. 2</td><td>4,5 SP</td><td>Knowledge of the determination of mammalspecies, documentation of attributes of the mammal cranium , techniques of taxidermy, excursion to Brandenburg (fieldwork, trapping)
Excursion: Introduction in mammalogical methods in the field and lab</td></tr>
<tr><td colspan="2">Module final examination</td><td></td><td>passing</td><td>Written exam (60-90 minutes) or oral exam (20 minutes)</td></tr>
<tr><td colspan="2">Duration of module</td><td colspan="3">☒ 1 Semester ☐ 2 Semester</td></tr>
<tr><td colspan="2">Beginning of module</td><td colspan="3">☐ WS ☒ SS</td></tr>
<tr><td colspan="2">lecturers</td><td colspan="3">Prof. Dr. Ulrich Zeller Ulrich.Zeller@mfn-berlin.de
Dipl.-Biol. Th. Göttert, Dipl.-Biol. S. Siniza, Dipl.-Biol. M. Wicke, Dr. K. Ferner</td></tr>
</table>

WP 2 Vertebrate Adaption to Xeric Environments				Credit points: 9
Learning objectives Students gain knowledge with regard to ecological plasticity of vertebrates in adaption to the complexity of arid and semiarid areas. Students aquire skills in classifying adaptions (organs, physiology, behaviour, reproduction) of vertebrates in this ecosystems and have the expertise of methods to solve scientific questions independently.				
preconditions: *none*				
Learning and teaching	Contact hours per week	Workload (hours)	Credit Points and requirements for assignation	Topics and contents
LE	2	*<u>90 hours</u> 30 contact hours, 60 hours Self-study according to § 5Par. 2*	3 SP	-introduction and characteristics of arid environments -Systematics of themajor vertebrate groups in arid ecosystems - adaptions (anatomy, food, organs, physiology, behaviour, reproduction) of vertebrates in desert ecosystems -examples of selected vertebrates and their adaptions -Biodiversity of arid areas -evolutionary aspects of vertebrate adaptions to arid ecosystems
Practical training	3	*<u>135 hours</u> 45 contact hours, 90 hours Self-study according to § 5Par. 2*	4,5 SP protocol	Approach of selected vertebrates of arid ecosystems with practical training and demonstrations: distribution, functional morphology, lifestyle… based on museum materials of the natural history museum Berlin Excursion to the Zoo Berlin or Tierpark Berlin focused on the physiognomy and behaviour of vertebrates.
SE	1	*<u>45 hours</u> 15 contact hours, 30 hours Self-study according to § 5Par. 2*	1,5 SP presentation 30 minutes	Deepening of lecture contents by studiy of original literature: presentations and discussions of selected aspects with regard to vertebrate adaptions in arid areas
Module final examination			passing	Written exam (90 minutes, 100%) or oral exam (20 minutes, 100%)
lecturers		Prof. Dr. Ulrich Zeller Ulrich.Zeller@mfn-berlin.de Dipl.-Biol. Th. Göttert		
Duration of module		☒ 1 Semester ☐ 2 Semester		
Beginning of module		☒ WS ☒ SS		

<table>
<tr><td colspan="4">WP3 Functional Biodiversity of arid and semiarid ecosystems</td><td>Credit Points: 9</td></tr>
<tr><td colspan="5">Learning objectives:
In this module the participants gain in-depth knowledge with regard to desertification and management of natural resources with reference to the conservation of biodiversity.
The participants acquire the following knowledge and skills:

- understanding of the dynamics of natural resources for organisms in arid regions
- in-depth knowledge of eco-physiological conditions and processes
- special knowledge in ecology of arid ecosystems
- ability to explain natural processes effecting patterns of biodiversity
- background knowledge of the particularities for the management of natural resources by humans
- ability to discuss the possibilities for the sustainable development in arid regions</td></tr>
<tr><td colspan="5">preconditions: none</td></tr>
<tr><td>Learning and teaching</td><td>Contact hours per week</td><td>Workload (hours)</td><td>Credit Points and requirements for assignation</td><td>Topics and contents</td></tr>
<tr><td>LE</td><td>2</td><td><u>90 hours</u>
30 contact hours,
60 hours Self-study according to § 5Par. 2</td><td>3 SP, written examination</td><td>- Introduction to Hot Arid Lands of the World and Namibia, geographic & climatological background, with emphasis on Namib
- Ecophysiology in conditions of water limitation, food limitation, and heat: sources, limitations, time-space windows
- Desert ecology and biodiversity in deserts
- Management of natural resources in desert habitats
- Desertification</td></tr>
<tr><td>SE</td><td>2</td><td><u>90 hours</u>
30 contact hours,
60 hours Self-study according to § 5Par.2</td><td>3 SP, Homework with oral presentation</td><td>Optional integration of a 2-days-seminar with emphasis on the specific problems of another arid region (e.g. Land Degradation and Desertification in the Sahel)</td></tr>
<tr><td>EX</td><td>2</td><td><u>90 hours</u>
30 contact hours,
60 hours Self-study according to § 5Par.2</td><td>3 SP, Attendance, written report</td><td>-Visit the Gobabeb Research Station</td></tr>
<tr><td colspan="2">Module final examination</td><td></td><td>Passing</td><td>Written examination (180 Min) = 60 %
Homework with oral presentation = 30 %
Report excursion = 10%
Requirement: Attendance of all lectures and seminars as well as the excursion</td></tr>
<tr><td colspan="2">Duration of module</td><td colspan="3">☒ 1 Semester ☐ 2 Semester</td></tr>
<tr><td colspan="2">Beginning of module</td><td colspan="3">☐ WS ☒ SS</td></tr>
<tr><td colspan="2">lecturers</td><td colspan="3">Dr. J. Henschel gobabeb@gobabeb.org</td></tr>
</table>

<table>
<tr><td colspan="4">WP 4 Agriculture and Horticulture of Conurbations</td><td>Credit points: 6</td></tr>
<tr><td colspan="5">Learning objectives:
-gain knowledge about the specialiity of urban agriculture and horticulture.
-students can classify specific differences of urban agriculture and horticulture regarded to varying climatic areas and social conditions.
-gain knowledge of plant physiological reactions to urban stressors in respect to production- and quality management.</td></tr>
<tr><td colspan="5">preconditions: none, recommended: plant cultivation, physiology of plants</td></tr>
<tr><td>Learning and teaching</td><td>Contact hours per week</td><td>Workload (hours)</td><td>Credit Points and requirements for assignation</td><td>Topics and contents</td></tr>
<tr><td>LE</td><td>2</td><td><u>90 hours</u>
30 contact hours,
60 hours
Self-study according to § 5Par. 2</td><td>3 SP</td><td>- description of coherence between production processes and the use of ressources in conurbations
- urban ecology parameters and their influence on process and quality management in urbane agriculture and horticulture
-production depending on climate zone specific characteristics and the social context (developing countries, industrialized countries)</td></tr>
<tr><td>EX</td><td>1</td><td><u>45 hours</u>
15 contact hours,
30 hours
Self-study according to § 5Par. 2</td><td>1,5 SP</td><td></td></tr>
<tr><td>SE</td><td>1</td><td><u>45 hours</u>
15 contact hours,
30 hours
Self-study according to § 5Par. 2</td><td>1,5 SP</td><td></td></tr>
<tr><td colspan="2">Module final examination</td><td></td><td>passing</td><td>Project report 10 pages (50%) and oral defence 15 minutes (50%)</td></tr>
<tr><td colspan="2">Duration of module</td><td colspan="3">☒ 1 Semester ☐ 2 Semester</td></tr>
<tr><td colspan="2">Beginning of module</td><td colspan="3">☒ WS ☐ SS</td></tr>
<tr><td colspan="2">lecturers</td><td colspan="3">Prof. Ch. Ulrichs, christian.ulrichs@agrar.hu-berlin.de
PD Dr. H. Hoffmann,</td></tr>
</table>

WP 5 Evolutionary Morphology of Vertebrates				Credits points: 9
Learning objectives: -Students have knowledge in the fields of comparative anatomy, morphology, ecology, paleontology and evolution of vertebrates. Excursions and the working on recent and fossil biological material impart skills in comparative observation and analysis.				
preconditions: *none*				
Learning and teaching	Contact hours per week	Workload (hours)	Credit Points and requirements for assignation	Topics and contents
LE	2	*<u>90 hours</u> 30 contact hours, 60 hours Self-study according to § 5Par. 2*	3 SP	Systematic and evolution of vertebrates, Description of major vertebrate groups from an evolutionary point of view, Phylogeny, Anatomy, Ontogeny, functional morphology, lifestyle, fossil record,
SE	1	*<u>45 hours</u> 15 contact hours, 30 hours Self-study according to § 5Par. 2*	1,5 SP, Referat im Umfang von 30 Minuten	Deepening of lecture contents by study of original literature: presentations and discussions of selected aspects with regard to classical and modern problems in evolutionary biology of vertebrates
practical training	3	*<u>135 hours</u> 45 contact hours, 90 hours Self-study according to § 5Par. 2*	4,5 SP Anfertigung des Protokoll	Construction plan of Vertebrates, Approach of selected recent and fossil vertebrates with practical excercises and demonstrations, Chordates, paleozoic Gnathostomata, Anatomy and Evolution of Pisces, comparative Osteology of tetrapods, human anatomy from an evolutionary point of view, introduction to animal husbandry, Excursion to the Zoo Berlin or Tierpark Friedrichsfelde , functional morphology of terrestrial and aquatic vertebrates
Module final examination			passing	Written exam (90 minutes, 100%) or oral exam (20 minutes, 100%)
Duration of module		☒ 1 Semester	☐ 2 Semester	
Beginning of module		☒ WS	☐ SS	
lecturers		Prof. Dr. Ulrich Zeller ulrich.Zeller@mfn-berlin.de Dipl.-Biol. Th. Göttert, Dipl.-Biol. S. Siniza, Dr. K. Ferner		

WP 6 Organic Farming	Credit points: 6

<table>
<tr><td colspan="5">Learning objectives:
Knowledge and skills in the development of production processes in organic enterprises</td></tr>
<tr><td colspan="5">preconditions: none</td></tr>
<tr><td>Learning and teaching</td><td>Contact hours per week</td><td>Workload (hours)</td><td>Credit Points and requirements for assignation</td><td>Topics and contents</td></tr>
<tr><td>LE</td><td>3,5</td><td><u>150 hours</u>
50 contact hours,
100 hours
Self-study according to § 5Par. 2</td><td>5 SP</td><td>- characteristics of management systems including different model principles of organic farming
- legal and organisational framework of organic farming in Germany and europe
- nutrient management, soil tillage,
- rotation of crops, weed management and pest control in organic livestock farms and non livestock farms
- cultivation techniques of selected crop species
- inclusion of landscape-ecological aspects in production</td></tr>
<tr><td>EX</td><td>0,5</td><td>3<u>0 hours</u>
10 contact hours,
20 hours
Self-study according to § 5Par. 2</td><td>1 SP</td><td></td></tr>
<tr><td colspan="2">Module final examination</td><td></td><td>passing</td><td>Written exam 90 minutes or homework (10 pages, 50%) and presentation (15 minutes, 50%)</td></tr>
<tr><td colspan="2">Duration of module</td><td colspan="3">☒ 1 Semester ☐ 2 Semester</td></tr>
<tr><td colspan="2">Beginning of module</td><td colspan="3">☐ WS ☒ SS</td></tr>
<tr><td colspan="2">lecturers</td><td colspan="3">PD Dr. H. Hoffmann, heide.hoffmann@agrar.hu-berlin.de</td></tr>
</table>

WP 7 Special Aspects of Organic Farming	Credit points: 6
Learning objectives:	

Knowledge and skills in the development of production processes in organic enterprises				
preconditions: *none*, recommended: Module Crop and Plant Production, Site Ecology, plant nutrition, pest control, Agricultural Engineering				
Learning and teaching	Contact hours per week	Workload (hours)	Credit Points and requirements for assignation	Topics and contents
LE	2	*<u>90 hours</u>* *30 contact hours,* *60 hours Self-study according to § 5Par. 2*	3 SP	- Characteristics as well as legal and organisational framework of organic farming in an international context - nutrient management in organic farming - weed management and pest control
Practical training	2	*<u>90 hours</u>* *30 contact hours,* *60 hours Self-study according to § 5Par. 2*	3 SP	
EX	-	-	-	Participation optional
Module final examination			passing	Oral exam 30 minutes or homework (10 pages, 50%) and presentation (15 minutes, 50%)
Duration of module		☒ 1 Semester ☐ 2 Semester		
Beginning of module		☒ WS ☐ SS		
lecturers		PD Dr. H. Hoffmann, heide.hoffmann@agrar.hu-berlin.de, PD Dr. St. Kühne(BBA Kleinmachnow), Prof. Ch. Engels		

WP 8 Plants with Active Ingredients	Credit points: 6
Learning objectives: students	

<table>
<tr><td colspan="5">- are able to asses the development and the economic importance of the cultivation of medicinal and spice plants, aromatic plants, dyeing plants
- know secondary groups of ingredients
- have knowledge of the most important medicinal, spice plants and dyeing plants cultivated in Germany
- have knowledge about the quality evaluation of drugs
- know process design for quality assurance
- know about state-of-the-art research and developments</td></tr>
<tr><td colspan="5">preconditions: none, recommended: Module Crop and Plant Production, soil science, Fertilization</td></tr>
<tr><td>Learning and teaching</td><td>Contact hours per week</td><td>Workload (hours)</td><td>Credit Points and requirements for assignation</td><td>Topics and contents</td></tr>
<tr><td>LE</td><td>3</td><td><u>135 hours</u>
45 contact hours,
90 hours Self-study according to § 5Par. 2;</td><td>4,5 SP</td><td>- economic development and the impotance of medicinal and spice plants, aromatic plants, dyeing plants
- groups of ingredients / active agents, current development in research
- Occurence, distribution, botany, effects and fields of application
- specialtis of cultivation, harvest and preparatiion of medicinal and spice plants, dyeing plants
- quality features, quality assurance

literature:
- module in „MOODLE“ Crop and Plant Production
- module in „MOODLE“ Medicinal and Spice plant</td></tr>
<tr><td>SE</td><td>1</td><td><u>45 hours</u>
15 contact hours,
30 hours Self-study according to § 5Par. 2</td><td>1,5 SP, Seminar presentation</td><td></td></tr>
<tr><td colspan="2">Module final examination</td><td></td><td>passing</td><td>Written exam 90 minutes (100%), advanced work: Seminar presentation</td></tr>
<tr><td colspan="2">Duration of module</td><td colspan="3">☒ 1 Semester ☐ 2 Semester</td></tr>
<tr><td colspan="2">Beginning of module</td><td colspan="3">☐ WS ☒ SS</td></tr>
<tr><td colspan="2">lecturers</td><td colspan="3">PD Dr. R. Schenk regina.schenk@agrar.hu-berlin.de</td></tr>
</table>

<table>
<tr><td colspan="4">WP 9 Hydroponical Systems in Horticulture</td><td>Credit points: 6</td></tr>
<tr><td colspan="5">Learning Objectives:
- have a clear understanding of different hydroponical systems and are able to plan such systems for differ-</td></tr>
</table>

<table>
<tr><td colspan="5">ent crops
- are able to evaluate different substrates by use of modern physical and chemical methods
- are able to calculate the amount of water and the composition of nutrient solutions for hydroponics
- to know methods for regulating of processes in hydroponics and analysing growth factors in the rhico-sphere and biomass production</td></tr>
<tr><td colspan="5">preconditions: none recommended: Horticultural crops</td></tr>
<tr><td>Learn-ing and teachin g</td><td>Contact hours per week</td><td>Workload (hours)</td><td>Credit Points and requirements for assignation</td><td>Topics and contents</td></tr>
<tr><td>LE</td><td>3</td><td><u>135 hours</u>
45 contact hours, 90 hours
Self-study ac-cording to § 5Par. 2</td><td>4,5 SP</td><td>Contents:
- Definition and principle of von hydroponical (soil less)
systems for horticultural crops,
- Technical characteristics and technological systems in
hydroponics (substrate culture, water culture, aeroponics,
- Substrates, their characteristics, evaluation and
standardisation
- Calculation of water and nutrient supply for different
hydroponical systems
- Cultivation methods of selected horticultural crops in
hydroponics</td></tr>
<tr><td>Practi-cal training</td><td>1</td><td><u>45 hours</u>
15 contact hours, 30 hours
Self-study ac-cording to § 5Par. 2</td><td>1,5 SP,
Protocols</td><td></td></tr>
<tr><td colspan="2">Module final exa-mination</td><td></td><td>passing</td><td>Oral exam 30 minutes (100%), protocols</td></tr>
<tr><td colspan="2">Duration of mo-dule</td><td colspan="3">☒ 1 Semester ☐ 2 Semester</td></tr>
<tr><td colspan="2">Beginning of mo-dule</td><td colspan="3">☒ WS ☐ SS</td></tr>
<tr><td colspan="2">lecturers</td><td colspan="3">Doz. Dr. Dr. Böhme, Michael michael.boehme@rz.hu-berlin.de</td></tr>
</table>

<table>
<tr><td colspan="5">WP 10 Plant Nutrition in Different Natural Areas</td><td>Credit points: 6</td></tr>
<tr><td colspan="6">Learning Objectives:
Building on the understanding of mechanisms for the acquirement and the utilization of minerals, students are able to recognize a limitation of plant growth caused of nutritions, water or other environmental factors under specific location conditions. Students can develop measures for avoiding growth disorders and thereby contribute to mitigation of climate changes.</td></tr>
<tr><td colspan="6">preconditions: none recommended: soil science, cultivation systems, Plant Nutrition and Fertilisation</td></tr>
<tr><td>Learning and teaching</td><td>Contact hours per week</td><td>Workload (hours)</td><td>Credit Points and requirements for assignation</td><td colspan="2">Topics and contents</td></tr>
<tr><td>LE</td><td>3</td><td><u>135 hours</u>
45 contact hours, 90 hours Self-study according to § 5Par. 2</td><td>4,5 SP</td><td colspan="2">- turn over of minerals in the soil/plant cycle under different location conditions(climate, soil, cultivation systems)
- Limitation of nutrients under different location conditions and adaption reactions of plants (uptake and utilization efficiency of minerals)
- Influence of changing enviromental conditions (airborne pollutants, temperature, rain) on growth and the nutrition of plants</td></tr>
<tr><td>Practical training</td><td>1</td><td><u>45 hours</u>
15 contact hours, 30 hours Self-study according to § 5Par. 2</td><td>1,5 SP</td><td colspan="2"></td></tr>
<tr><td colspan="2">Module final examination</td><td></td><td>passing</td><td colspan="2">Written exam 30 minutes or written homework 20 pages</td></tr>
<tr><td colspan="2">Duration of module</td><td colspan="4">☒ 1 Semester ☐ 2 Semester</td></tr>
<tr><td colspan="2">Beginning of module</td><td colspan="4">☐ WS ☒ SS</td></tr>
<tr><td colspan="2">lecturers</td><td colspan="4">Prof. E. George george@igzev.de, Prof. Ch. Engels, Dr. E. Neumann</td></tr>
</table>

WP 11 Pasture Management	Credit points: 6

<table>
<tr><td colspan="5">Learning Objectives:
Students
- are able to asses pastures as a special grassland utilization (production and landscape conservation)
- know the interactions between greenland and their animals
- have special knowledge about herd management of different productive livestock species
- can perform the organisation and technical realization of grazing processes with different animal species</td></tr>
<tr><td colspan="5">preconditions: none recommended: module grassland and forage crop management</td></tr>
<tr><td>Learning and teaching</td><td>Contact hours per week</td><td>Workload (hours)</td><td>Credit Points and require-ments for as-signation</td><td>Topics and contents</td></tr>
<tr><td>LE</td><td>2</td><td><u>90 hours</u>
30 contact hours,
60 hours Self-study ac-cording to § 5Par. 2</td><td>3 SP</td><td>-basics characterizations of grazing locations and their earnings potential
-relationship between location, cultivation and pasture,
interactions between grazing animal and pasture (influence of footsteps, browsing, animal behaviour, nutrient cycles)
- Herd management depending on animal specie and cultivation intensity
- pasture establishment and equipment
- model calculation of grazed grassland sup-ply
Literature:
- Grünlandlehre. (W. Opitz v. Boberfeld, Ulmer Verlag, 1994)
- Zeitgemäße Grünlandbewirtschaftung. (K. Buchgraber, G. Grindl, L. Stocker Verlag, 2. Aufl. 2004)</td></tr>
<tr><td>Practical training</td><td>1</td><td><u>45 hours</u>
15 contact hours,
30 hours Self-study ac-cording to § 5Par. 2</td><td>1,5 SP</td><td></td></tr>
<tr><td>EX</td><td>1</td><td><u>45 hours</u>
15 contact hours,
30 hours Self-study ac-cording to § 5Par. 2</td><td>1,5 SP</td><td></td></tr>
<tr><td colspan="2">Module final examinati-on</td><td></td><td>passing</td><td>Oral exam (30 minutes)</td></tr>
<tr><td colspan="2">Duration of module</td><td colspan="3">☒ 1 Semester ☐ 2 Semester</td></tr>
<tr><td colspan="2">Beginning of module</td><td colspan="3">☐ WS ☒ SS</td></tr>
<tr><td colspan="2">lecturers</td><td colspan="3">Dr. H. Giebelhausen hermann.giebelhausen@agrar.hu-berlin.de
Dr. M. Krocker manfred.krocker@agrar.hu-berlin.de</td></tr>
</table>

WP 12 Quality Assurance of Plant Products	Credit points: 6

<table>
<tr><td colspan="5">Learning Objectives:
students
- have knowledge about important parameters of quality and be able to evaluate the quality of plant products regarding their use
- have knowledge about methods of determining quality and quality evaluation of plant products
- have knowledge about important processing techniques and industrial processing methods of plant raw materials and their quality requirements
- are able to assess critically quality management systems in agriculture
- are able to assess critically cultivation techniques of agricultural crops with regard to quality parameters and quality requirements</td></tr>
<tr><td colspan="5">preconditions: none recommended: Module Prozessführung im Pflanzenbau</td></tr>
<tr><td>Learning and teaching</td><td>Contact hours per week</td><td>Workload (hours)</td><td>Credit Points and requirements for assignation</td><td>Topics and contents</td></tr>
<tr><td>LE</td><td>1</td><td><u>45 hours</u>
15 contact hours,
30 hours Self-study according to § 5Par. 2</td><td>1,5 SP</td><td rowspan="3">-special quality characteristics of important agricultural crops (grain, sugar beets, sweet corn, potatoes, selected specialty crops) for industrial processing methods
-Assessing of cultivation techniques of product quality generation for industrial processing
- Quality-relevant legal regulations on national and international level
- storage damage caused by diseases and pests and measures of prophylaxis and combats
- Toxicological aspects of plant disease</td></tr>
<tr><td>SE</td><td>2</td><td><u>90 hours</u>
30 contact hours,
60 hours Self-study according to § 5Par. 2</td><td>3 SP</td></tr>
<tr><td>Practical training</td><td>1</td><td><u>45 hours</u>
15 contact hours,
30 hours Self-study according to § 5Par. 2</td><td>1,5 SP</td></tr>
<tr><td colspan="2">Module final examination</td><td></td><td>passing</td><td>homework 20 pages (100%), advanced work: Protocol 10 pages</td></tr>
<tr><td colspan="2">Duration of module</td><td colspan="3">☒ 1 Semester ☐ 2 Semester</td></tr>
<tr><td colspan="2">Beginning of module</td><td colspan="3">☐ WS ☒ SS</td></tr>
<tr><td colspan="2">lecturers</td><td colspan="3">PD Dr. R. Schenk, regina.schenk@agrar.hu-berlin.de
Prof. F. Ellmer, Dr. M.Goßmann, Dr. K. Weiß</td></tr>
</table>

WP 13 Land use systems for horticultural crops	Credit points: 6

Learning objectives: -have a clear understanding of land use systems for horticultural crops - are able to plan crop rotation and land use programs annual and perennial horticultural crops - to know methods for appropriate configuration of technological processes to cultivate different crops - are able to analyse influences on the yield potential and to plan necessary activities				
preconditions: *none*				
Learning and teaching	Contact hours per week	Workload (hours)	Credit Points and requirements for assignation	Topics and contents
LE	2	*<u>90 hours</u> 30 contact hours, 60 hours Self-study according to § 5Par. 2*	3 SP	Contents: - Systems of land use and production of fruit and vegetable - Methods of integrated and ecological production of fruits and vegetables - Crop rotation and cultivation programs for annual and perennial horticultural crops - Configuration of technological outlets and processes - Measures for quality insurance (land preparation, fertilization, use of composts, cultivation technology, harvesting) - Regulation of growth factors during the cultivation of horticultural crops - Analyse of factors and regulation of growth systems to use the yield potential of horticultural crops
SE	1	*<u>45 hours</u> 15 contact hours, 30 hours Self-study according to § 5Par. 2*	1,5 SP	
Practical training	1	*<u>45 hours</u> 15 contact hours, 30 hours Self-study according to § 5Par. 2*	1,5 SP	
Module final examination			passing	seminar presentation 10 minutes (40 %) Oral exam 20 minutes (60 %)
Duration of module		☒ 1 Semester ☐ 2 Semester		
Beginning of module		☐ WS ☒ SS		
lecturers		Doz. Dr. Dr. Böhme, Michael michael.boehme@rz.hu-berlin.de		

WP 14 Cultivation of vegetables in tropics and subtropics	Credit points: 6

Learning Objectives:

– To know the growing conditions for vegetables in tropics and sub tropics
– Are able to develop production systems for different locations
– To know the most important vegetables of the tropics and sub tropics
– Are able to establish technological algorithm of production cycles and adequate quality measurements

preconditions: Moodle Learnmanagementsystem

Learning and teaching	Contact hours per week	Workload (hours)	Credit Points and requirements for assignation	Topics and contents
LE	2	*90 hours* *30 contact hours, 60 hours Self-study according to § 5Par. 2*	3 SP	Contents: – Geographical and climatically description of the tropics and subtropics – Edaphic and climatic growing conditions for vegetables in different regions – Land use and production systems for vegetables in tropic and sub tropic regions – Dietary and economical value of the most important sub tropic and tropic vegetables – Evaluation of growth of tropical and subtropical vegetables – Basics of propagation and breeding of sub tropic and tropic vegetables including biotechnological methods
SE	1	*45 hours* *15 contact hours, 30 hours Self-study according to § 5Par. 2*	1,5 SP	
Practical training	1	*45 hours* *15 contact hours, 30 hours Self-study according to § 5Par. 2*	1,5 SP	
Module final examination			passing	Protocols 10 pages (20 %) Oral exam 20 minutes (80 %)
Duration of module		☒ 1 Semester ☐ 2 Semester		
Beginning of module		☐ WS ☒ SS		
lecturers		Doz. Dr. Dr. Böhme, Michael, Dr. I. Pinker michael.boehme@rz.hu-berlin.de		

WP 15 Effects of plant nutrition and other environmental factors on composition and quality of vegetable and ornamental plants	Credit points: 6

Learning Objectives:

- Participants have a clear understanding of the plant physiological role of mineral elements
- Participants have a clear understanding of the effect of environmental factors on plant composition and quality
- Participants are able to design new horticultural systems with the potential to grow high-quality horticultural products

preconditions: *none*

Learning and teaching	Contact hours per week	Workload (hours)	Credit Points and requirements for assignation	Topics and contents
LE	2	*<u>90 hours</u> 30 contact hours, 60 hours Self-study according to § 5Par. 2*	3 SP	Contents: - Functions of mineral elements in the primary and secondary metabolism of plants - Effects of plant nutrition and other environmental factors on plant composition, taste, and quality
practical	1	*<u>45 hours</u> 15 contact hours, 30 hours Self-study according to § 5Par. 2*	1,5 SP	excursion
SE	1	*<u>45 hours</u> 15 contact hours, 30 hours Self-study according to § 5Par. 2*	1,5 SP	
Module final examination			passing	Oral exam 20 minutes or Seminar presentation 20 minutes
Duration of module	☒ 1 Semester ☐ 2 Semester			
Beginning of module	☐ WS ☒ SS			
lecturers	Prof. Dr. Eckhard George, Prof. Dr. Christof Engels, Dr. Bernhard Brückner (IGZ) Dr. Angelika Krumbein (IGZ), Dr. Uwe Drüge (IGZ), Dr. Elke Neumann (IGZ) george@igzev.de			

WP 16 Plant nutrition and nutrient supply in environmentally-friendly horticultural systems	Credit points: 6
Learning Objectives: - Participants have a clear understanding of environmental effects of fertilization and horticultural production systems - Participants have a clear understanding of mineral element cycles and energy production and consumption in horticultural systems	

<table>
<tr><td colspan="5">- Participants are able to design new horticultural systems with low nutrient and energy requirements</td></tr>
<tr><td colspan="5">preconditions: none</td></tr>
<tr><td>Learning and teaching</td><td>Contact hours per week</td><td>Workload (hours)</td><td>Credit Points and requirements for assignation</td><td>Topics and contents</td></tr>
<tr><td>LE</td><td>2</td><td><u>90 hours</u>
30 contact hours,
60 hours
Self-study according to § 5Par. 2</td><td>4,5 SP</td><td>Contents:
- Environmental benefits and costs of fertilization in horticultural systems
- Interactions of fertilization with plant CO_2 fixation
- Low-energy horticultural production and intelligent nutrient supply systems
- Plant nutrition in biological horticultural production systems</td></tr>
<tr><td>SE</td><td>1</td><td><u>45 hours</u>
15 contact hours,
30 hours
Self-study according to § 5Par. 2</td><td>1,5 SP</td><td></td></tr>
<tr><td>Practical training</td><td>1</td><td><u>45 hours</u>
15 contact hours,
30 hours
Self-study according to § 5Par. 2</td><td>1,5 SP</td><td>excursion</td></tr>
<tr><td colspan="2">Module final examination</td><td></td><td>passing</td><td>Oral exam 20 minutes or Seminar presentation 20 minutes</td></tr>
<tr><td colspan="2">Duration of module</td><td colspan="3">☒ 1 Semester ☐ 2 Semester</td></tr>
<tr><td colspan="2">Beginning of module</td><td colspan="3">☐ WS ☒ SS</td></tr>
<tr><td colspan="2">lecturers</td><td colspan="3">Prof. Dr. Eckhard George,
Prof. Dr. Christof Engels,
Dr. Bernhard Brückner (IGZ)
Dr. Angelika Krumbein (IGZ),
Dr. Uwe Drüge (IGZ),
Dr. Elke Neumann (IGZ)
george@igzev.de</td></tr>
</table>

WP 17 Tropical Fish Communities	Credit points: 6
Learning Objectives: The students learn about - ecology and zoogeography of tropical freshwater fish - systematics of primary and secondary fishes - characteristics of tropical fish communities - periodicity of life cycles in the tropics - overviews about aquaculture systems in the tropics and subtropics - resources for tropical and subtropical aquaculture - sustainability of tropical and subtropical aquaculture systems - socioeconomy of tropical and subtropical aquaculture	

preconditions: none, recommended: modules Limnology, Biology, Ecology				
Learning and teaching	Contact hours per week	Workload (hours)	Credit Points and requirements for assignation	Topics and contents
LE	2	*<u>90 hours</u>* *30 contact hours, 60 hours Self-study according to § 5Par. 2*	3 SP	- ecology and zoogeographic of tropical fish species - systematic of primary and secondary tropical fish species - characteristics of tropical fish communities - periodicity of life cycles in the tropics - overview about aquaculture systems in the tropics and subtropics - resources for tropical and subtropical aquaculture - sustainability of tropical and subtropical aquaculture systems - - socioeconomy of tropical and subtropical aquaculture
SE	2	*<u>90 hours</u>* *30 contact hours, 60 hours Self-study according to § 5Par. 2*	3 SP	
Module final examination			passing	Oral Exam 30 minutes (100%)
Duration of module		☒ 1 Semester ☐ 2 Semester		
Beginning of module		☒ WS ☐ SS 4 semester rotation		
lecturers		Prof. Dr. F. Kirschbaum <u>frank.kirschbaum@staff.hu-berlin.de</u> Dr. A. Müller-Belecke <u>andreas.mueller-belecke@ifb-potsdam.de</u>		

WP 18 Gender and Globalization	Credit points: 6
Learning Objectives: - Knowledge on gender analysis - Knowledge on concepts of political economy, state theory and global governance - Ability to reflect these concepts from a gender perspective - Ability to analyze the gendered effects of economic globalization - Ability to identify the intersectionality between gender, class and ethnicity in globalization processes	
preconditions: Courses on the basics of gender analysis	

Learning and teaching	Contact hours per week	Workload (hours)	Credit Points and requirements for assignation	Topics and contents
SE and presentations	4	*<u>180 hours</u> 60 contact hours, 120 hours Self-study according to § 5Par. 2*	6 SP Presentation and seminar paper writing	- Introduction to feminist theories of globalization and political economy - Conceptual underpinnings of global economic restructuring - Impacts of globalization on migration and natural resources - Transformation of gender orders in the course of globalization - The role of the state and of International Organizations in globalization processes - Transnational feminist activism and women's economic and social rights
Module final examination				Oral presentation and discussion; seminar paper
Duration of module	☒ 1 Semester		☐ 2 Semester	
Beginning of module	☐ WS		☒ SS	
lecturers	Prof. Dr. Christine Bauhardt christine.bauhardt@gender.hu-berlin.de Dr. Gülay Caglar guelay.caglar@gender.hu-berlin.de			

Following elective modules will take place at the Texas Tech University:

1. WP 19 Water Resources Management
2. WP 20 Seminar in Geography of Arid Lands
3. WP 21 Watershed Management
4. WP 22 Environmental Economics and Policy Analysis
5. WP 23 Ecology of Grazing Lands Systems
6. WP 24 Weather, Climate, and Applications
7. WP 25 Advanced Landscape Ecology

8. WP 26 Surface Water Hydrology
9. WP 27 Groundwater Hydrology
10. WP 28 Groundwater Transport Phenomena
11. WP 29 Natural Systems for Wastewater Treatment
12. WP 30 Environmental and Wildlife Toxicology
13. WP 31 Procedure & Techniques in Ecological Risk Assessment
14. WP 32 Geographic Information Systems
15. WP 33 Remote Sensing of the Environment
16. WP 34 Advanced Geographic Information Systems
17. WP 35 Seminar in Regional Analysis
18. WP 36 Digital Imagery in Geosciences
19. WP 37 Spatial Data Analysis and Modeling in Geosciences
20. WP 38 Advanced Range Ecology
21. WP 39 Advance Nongame Ecology and Management
22. WP 40 Aerial Terrain Analysis
23. WP 41 Imagery Interpretation for NRM
24. WP 42 Geospatial Technologies in NRM
25. WP 43 Precision Agriculture
26. WP 44 Soil and Plant Relationships
27. WP 45 Soils and Crops in Arid Lands

A complete module Index with descriptions of modules at the Texas Tech University can be found using the following link:

http://www.agrar.hu-berlin.de/studium/studierende/studgang/mals/

Appendix 2: Programme plan

Here you can find the offered courses for the respective modules and an overview of the Credit Points in the respective term for an ideal, but not obligating course of study.

Module	Name of modul	1. Semester	2. Semester	3. Semester	4. Semester
Elective modules (Humboldt-Universität zu Berlin in the winter semester)	See Appendix 1	Courses in an extent of 30 SP (4-5 modules)			
Elective modules (Humboldt-Universität zu Berlin in the summer semester)	See Appendix 1		Courses in an extent of 20 SP (3-4 modules) *Studium generale* (10 SP)		
Elective modules (Texas Tech University)	See Appendix 1			Courses in an extent of 20 SP (2 modules)	
Elective modules (Texas Tech University)	See Appendix 1				Courses in an extent of 10 SP (1 modul), Master Thesis
Internship (University of Sheffield)					10 SP
Master Thesis (Texas Tech University)				20 SP	
Hours per week (SWS) and SP per semester		20 SWS, 30 SP	20 SWS, 30 SP	20 SWS, 30 SP	20 SWS, 30 SP