As decided by of the Board of the Faculty of Agricultural Sciences on DD.MM.YYY and after agreement of the University Senate on DD.MM.YYY, the Executive Board of the Georg-August University in Göttingen on DD.MM.YYY, approved the study regulations for the "International Ph.D. Program for Agricultural Sciences in Göttingen (IPAG)“ [see Lower Saxony University Law (*Niedersächsische Hochschulgesetz*; NHG) § 9 Section 3 Sentence 1, § 44 Section 1 Sentence 2, § 41 Section 2 Sentence 2 and § 37 Section 1 Sentence 3] in the version announced on 24 June, 2002 [see the publication *Niedersächsisches Gesetze und Verordnungsblatt* (Nds. GVBl). p. 286], last amended through Article 2 of the Lower Saxony University Law of 21 June, 2006 (Nds. GVBl. p. 239).

Study regulations

for the "International Ph.D. Program for

Agricultural Sciences in Göttingen (IPAG)"

Faculty of Agricultural Sciences at the

Georg-August University in Göttingen, Germany

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§ 1 Scope

Based on the IPAG PhD Examination Regulations and the regulations on the determination of a student's suitability for taking part in the "International PhD Program for Agricultural Sciences in Göttingen (IPAG)“ of the Faculty of Agricultural Sciences at the University of Göttingen (according to their respective legal amendments), the IPAG study regulations regulate the program's targets, contents and development of the studies.

§ 2 IPAG Aims

(1) The IPAG program qualifies the student to undertake independent scientific work at universities and other scientific and research institutes in the various fields of agricultural science.

(2) In the course of the IPAG studies the students have demonstrated a systematically understanding of their research field and the governing of the skills and methods, which are implicated in the research areas of agricultural sciences.

(3) They possess a comprehensive knowledge of the scientific literature in their research field and have executed through their scientific task an autonomous contribution to the research field, which has enlarged the knowledge and compares favourably an international review by the scientific community. By this the students have provided evidence that they are able to identify scientific questions, to carry out a critical analysis, to develop and synthesize new and complex ideas and to design and conduct by themselves essential research projects with a scientific integrity.

(4) The holders of a PhD of the IPAG in Göttingen possess the capability to drive further development in the society, in the cultural sector and in the scientific world, in an academic and non-academic occupation. They will be able to present scientific expertise in their field of interest to an academic as well as a non-academic audience and discuss it with their scientific colleagues.

§ 3 Duties and occupational field

(1) The institutes involved in the IPAG are such institutes which supervise dissertations within the IPAG program or provide courses.

(2) The institutes involved in IPAG all work on the natural scientific basics of agriculture, production techniques, the economic and social structures of agriculture as well as the present-day and future situation of agricultural production and its effects on society, economy and the environment. These institutes provide the scientific basis for analysing development in the agrarian sector and therefore accomplish a decisive contribution to

food security and the development of rural areas on the basis of sustainable production systems.

(3) The alumni of IPAG are mostly engaged in the sectors of science and management and fulfil managerial functions as follows:

- in universities and research institutions
- in international organizations
- in the public sector as in boards of agricultural organizations and ministries
- in special advisory companies as economics or production technologies
- in the phases preceding and following the agricultural production, as the feed -, the plant protection -, the fertilizer - or the agricultural machinery industry.
- the food industry,
- in any other service industries, as consultants etc.

§ 4 Regulations concerning the determination of student suitability - PhD Examination Regulations - Regulations for the Course of Study

(1) The prerequisites for admission to IPAG are regulated in the regulations about the determining a student's particular suitability for being accepted in the "International Ph.D. Program for Agricultural Sciences in Göttingen (IPAG)" [see *Feststellung der besonderen Eignung für den Promotionsstudiengang*].

(2) The IPAG PhD Examination Regulations regulate the provisions for the attainment of ECTS credits from the different type of courses, the requirements for doing the dissertation, the admission to the disputation, the repetition of individual examinations, the completion of the doctorate and any possible examination requirements.

(3) The regulations for the course of study describe the scope, contents and temporal arrangement of the doctoral studies.

§ 5 Guidance of the Students - Organisation of the IPAG Program – IPAG Advisory Board

(1) The doctoral students must be continually advised during their studies, thereby enabling each student to arrange his/her studies so that they are targeted at the finals and can be finished within the standard studying time. These duties are the responsibility of the student's supervisor.

(2) The doctoral students are to be introduced to their studies and the IPAG program within the framework of an orientation unit. In addition to this orientation unit, continual guidance and advice is to be offered. This is undertaken by the Student Advisory Service of this course of study.

(3) Duties of the Student Advisory Service are:
    a. advice and help in enrolment, health insurance and other administrative problems,
    b. reception of suggestions relating to an improvement in the organisation and teaching of the program,
    c. university marketing, providing information to students interested in IPAG,
    d. advice about approval, admission and other administrative processes,

(4) An Advisory Board (see § 4 of the PhD Examination Regulations) is responsible for the administration of the IPAG program and the organisation and undertaking of the examinations. This commission sets up an examination file for each doctoral student upon registration of their dissertation.

§ 6 Supervision of the Dissertation, Examination Committee

(1) The scientific supervision of the doctoral students is undertaken by one supervisor and one co-supervisor. The primary supervisor provides the subject of the dissertation. Those individuals who are eligible to supervise a dissertation are lecturers from the institutions which are actively involved in the education of doctoral students in the PhD program (see § 6 section 3 of the Examination Regulations; whereby lecturers are defined as habilitated persons working at the participating institutions, people of a similar level who have been subjected to a university appointment or an equivalent process, and junior professors.

(2) With dissertations undertaken at institutions outside of the University of Göttingen, the supervision of such cooperation is regulated (see §§ 18, 19, 20 and 21 of the IPAG PhD Examination Regulations). The co-supervision of such a dissertation by an employee[1] of the Faculty of Agricultural is mandatory.

(3) The nomination of the supervisor and co-supervisor occurs when the dissertation is registered with the IPAG Advisory Board, no later than 6 months after the commencement of the student's doctoral studies.

(4) A Board of Examiners is set up for assessing each doctoral student's achievements (see § 5 of the PhD Examination Regulations).

§ 7 Program Length

(1) The "International Ph.D. Program for Agricultural Sciences in Göttingen (IPAG)“ encompasses a total of 180 credits (1 credit = 30 hours workload). The preparation of the dissertation equals a workload of 150 credits. As a rule, each course lasts for 6 semesters.

1 main employer must be the Faculty

(2) If this period of time needs to be exceeded, then both the supervisor and the doctoral student are responsible for reporting this fact to the Dean of the Faculty of Agricultural Sciences. On application to the IPAG Advisory Board (see § 4 of the PhD Examination Regulations), the time limit can in justified exceptions be extended twice, each time by a period of 6 months. The standard length of time for the doctoral program ends after 4 years at the latest.

§ 8 Registration of the Doctoral student

(1) The IPAG Advisory Board (see § 4 of the IPAG Examination Regulations) starts an examination file for each doctoral student at the beginning of their doctoral studies. The doctoral student must register themselves with the required documentation at the faculty's Examination Office. A list of the required documents can be obtained from the Examination Office.

§ 9 Registration of the Dissertation

(1) With the registration of the dissertation (see § 8 of the IPAG Examination Regulations, section 4) the following must be stipulated at the examination Office:
   a. the subject and chosen language of the dissertation,
   b. the names of the supervisor and the co-supervisor (referee and co-referee) of the dissertation,
   c. the names of the other members of the Examination Committee.

§ 10 Structure of the IPAG Program

(1) The "International Ph.D. Program for Agricultural Science in Göttingen (IPAG)" is mainly modular in construction and includes the participation in various types of courses, the writing of the dissertation and the disputation.

(2) The types of courses of 6 credits must be chosen out of the following four sections:

<u>Compulsory courses</u>

Area “progress report” (6 credits)

Area “key qualification” (6 credits)

Area “methodology” (6 credits)

Area “deepening of expert knowledge” (6 credits)

(3) The acceptability of modules taken outside the Faculty of agricultural Sciences or the University of Göttingen is decided by the IPAG Advisory Board.

(4) The preparation of the dissertation equals a workload of 150 credits.

(5) The prerequisites for admittance to the disputation are the required ECTS credits from the courses and the acceptance of the dissertation. Six credits are given for a successful disputation.

(6) Successful completion of the PhD studies leads to 180 credits.

§ 11 Modules and Courses

i. All the program's courses are offered as modules.

(2) Modules can be composed of different forms of teaching: lectures, seminars, exercises, practical, colloquia as well as project work or combinations of these different forms. Additional courses may be offered to provide more in-depth knowledge.

(3) The modules presented in § 10 Section 2 are obligatory for all participating students. In addition, other courses with a more in-depth character may be offered. Attendance at the latter type of courses is voluntary.

(4) Certain modules have a limited number of participants. For example:

a) workshops,

b) exercises, practical and seminars.

The person responsible for the module will inform the students about the specified number of participants.

(5) In modules with a limited number of participants, priority is given to those doctoral students who need to attend the module in order to register for their disputation. Within this group of students, priority is given to those doctoral students who are in the later semesters of their studies and can prove that they have studied properly or that a delay of their doctoral studies cannot be justified. The choice between students with equivalent situations is to be decided by lottery. A deferment due to a lack of proof according to Sentence 2 is only allowed twice.

§ 12 Dissertation

(1) A problem from the fields of agricultural science is to be independently worked upon and discussed using scientific methods. In-depth scientific questions and methods should be developed independently by the student and the thereby acquired knowledge should be implemented in the respective field(s) of work.

(2) The dissertation should be so developed that it can be completed within the six-semester IPAG program.

(3) The dissertation might be written in English or German. Other official languages in the EU can be accepted by the IPAG Advisory Board on the basis of an application giving suitable justification.

§ 13 Disputation

(1) In the disputation, the candidate has to prove that he or she has worked independently using scientific methods on an interdisciplinary and problem-related question in his/her field of work in his/her dissertation. The disputation consists of a lecture on the dissertation with a subsequent discussion.
(2) The duration of the disputation should be at least 60 minutes and at the most 90 minutes.
(3) The disputation should be undertaken within six weeks after the written version of the dissertation has been accepted.

§ 14 Completion of the IPAG Program

(1) In order to successfully complete the IPAG program, the doctoral student must have acquired at least 180 credits. The IPAG program is completed at the end of the semester in which the doctoral certificate has been presented.
(2) An examination certificate will be presented with the results of the doctoral examinations including the results of the modules (§ 7, section 1 of the IPAG Examination Regulations), the dissertation and the disputation (Appendix 2a and 2b of the IPAG Examination Regulations).
(3) In addition, the successful candidate will receive a doctoral certificate (Appendices 1a and 1b, PhD Examination Regulations).

§ 15 Coming into Effect, Temporary Regulations

(1) These regulations come into effect after their official announcement in the publication "Amtlichen Mitteilungen" of the Georg-August University in Göttingen.
(2) The previous regulations governing the IPAG program (Official Announcement of the 26. 10. 2006 in the *Amtliche Mitteilungen 32/2006 S. 4899*) are no longer valid. Though without damaging the rule laid out in the Section 1 of this paragraph, students of IPAG who have started their studies before these Study Regulations came into effect and have carried out their studies uninterrupted might continue their studies according the IPAG study regulation of the 26. 10. 2006; for the last time an examination will be undertaken in the summer term 2011.

Annexe 1: Course of studies (modules) for IPAG

180 credits must be accomplished successfully.

A. Professional Studies

Modules with a workload of 18 credits must be fulfilled successfully.

I. "Progress Reports"

One module with 6 credits must be fulfilled successfully:

PAG 0001 PhD Colloquium Plants and Soils in Agriculture (6 C/3 SWS)

PAG 0002 Carl-Sprengel-Colloquium (6 C/3 SWS)

PAG 0003 Doctoral Seminar in agricultural economics and rural development (6 C/3 SWS)

PAG 0004 Ecology Seminar (6 C/3 SWS)

PAG 0005 Colloquium of Animal sciences (6 C/3 SWS)

PAG 0006 Colloquium of Phytomedicine (6 C/3 SWS)

PAG 0007 Plant Pathology and Plant Protection Seminar (6 C/3 SWS)

PAG 0008 Progress in Plant Breeding Research (6 C/3 SWS)

II. Courses in the area "Methodology"

One out of the following modules amounting to 6 credits must be fulfilled successfully. After having been registered for the chosen module a registration for another module is not allowed until the candidate has definitively failed the first chosen module or the examination in this modules has been counted "failed".

PAG 0040 Chosen Aspects of the Benefit- and Welfare Theory (6 C/4 SWS)

PAG 0041 Chosen Methodological Problems of the Economical Analysis of the Environment and Natural Resource (6 C/4 SWS)

PAG 0042 Bio analytical techniques in environmental and plant sciences (6 C/4 SWS)

PAG 0043 Efficiency and Productivity Analysis: Stochastic Approaches (6 C/3 SWS)

PAG 0044 Molecular Genetics: Fundamental techniques in Plant Pathology and Entomology (6 C/4 SWS)

PAG 0045 New Methods and Developments in Animal Sciences (6 C/4 SWS)

PAG 0046 Special Methods of Quality Evaluation (6 C/4 SWS)

III. Courses in the area of "expert knowledge"

One out of the following modules amounting to 6 credits must be fulfilled successfully. After having been registered for the chosen module a registration for another module is not allowed until the candidate has definitively failed the first chosen module or the examination in this modules has been counted "failed".

PAG 0060 Advanced methods in animal breeding and statistical genetics (6 C/4 SWS)
PAG 0061 Advances methods and developments in livestock and bio-engineering (6 C/4 SWS)
PAG 0062 Bacteriology (6 C/5 SWS)
PAG 0063 Empirical Methods in Agribusiness (6 C/3 SWS)
PAG 0064 Genomic analysis of farm animals (6 C/4 SWS)
PAG 0065 Market Integration and Price Transmission (6 C/4 SWS)
PAG 0066 Molecular biological/immunological Methods in Animal Science, English (6 C/4 SWS)
PAG 0067 Molecular biological/immunological Methods in Animal Science, Deutsch (6 C/4 SWS)
PAG 0068 New Areas in Plant Breeding (6 C/2 SWS)
PAG 0069 Plant production and the preceding and following sector in the Centre of Europe (6 C/6 SWS)
PAG 0070 Risk Analysis and Risk Management in Agriculture (6 C/5 SWS)
PAG 0071 Value Creation Chain and Healthy Nutrition (6 C/4 SWS)

B. Key Qualifications Studies

One out of the following modules amounting to 6 credits must be fulfilled successfully. After having been registered for the chosen module a registration for another module is not allowed until the candidate has definitively failed the first chosen module or the examination in this modules has been counted “failed”.

PAG 0020 Scientific Writing and Publishing in Crop Sciences (6 C/3 SWS)
PAG 0021 Scientific Writing for Agricultural Economists (6 C/4 SWS)
PAG 0022 Scientific Writing and Presentation for PhD Students (6 C/4 SWS)

C. Dissertation

The successful completion of the dissertation counts for 150 credits.

D. Colloquium of the PhD thesis

The successful completion of the colloquium of the PhD thesis 6 credits will be awarded.

Annexe 2: Study Program of the International Ph.D. Program for Agricultural Sciences in Göttingen (IPAG)

<table>
<tr><th></th><th>Module 1</th><th>Module 2</th><th>Module 3</th><th>Module 4</th><th>Module 5</th></tr>
<tr><td>1. Sem.</td><td>compulsory (Methods)

6 C</td><td>compulsory (expert knowledge)

6 C</td><td colspan="2">Preparation of the thesis

16 C</td><td>Progress report
2 C</td></tr>
<tr><td>2. Sem.</td><td>compulsory (key qualifications)

6 C</td><td colspan="4">Preparation of the thesis

24 C</td></tr>
<tr><td>3. Sem.</td><td colspan="4">Preparation of the thesis

28 C</td><td>Progress report
2 C</td></tr>
<tr><td>4. Sem.</td><td colspan="5">Preparation of the thesis

30 C</td></tr>
<tr><td>5. Sem.</td><td colspan="4">Preparation of the thesis

28 C</td><td>Progress report
2 C</td></tr>
<tr><td>6. Sem.</td><td colspan="3">Preparation of the thesis

24 C</td><td colspan="2">colloquium

6 C</td></tr>
</table>

Annexe 3: Module description for the module catalogue of the Program of Study International Ph.D. Program for Agricultural Sciences in Göttingen (IPAG)

Area Progress Reports

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0001

"PhD Colloquium Plants and Soils in Agriculture"

<table>
<tr><td>Learning Targets, Skills, Examination requirements

Learning targets: The research projects, the actual state and results of the dissertations in the area of agricultural pedology, grassland, agronomy, plant nutrition and quality of plant products will be presented and discussed.
Skills: The PhD students train to present of their scientific projects, to discuss the results and to deal critically with their own dissertation thoroughly. In addition they expand their knowledge about actual research in the area of crop sciences.
Examination requirements: very good knowledge of their own research area and the relevant techniques to present them</td><td>Number of ECTS credits / total semester periods per week

6 / 3</td></tr>
<tr><td colspan="2">Courses and Examinations

1. Type of course: seminar
2. Examination: report of 20 min
Examiner: the supervisor of the dissertation</td><td>Workload:

180 hrs
42 hrs seminar
138 hrs study time by oneself</td></tr>
<tr><td>Choices

Compulsory</td><td colspan="2">Application requirements

none</td></tr>
<tr><td>Number of times the course can be repeated:

Twice</td><td colspan="2">Applicability

IPAG, progress report</td></tr>
<tr><td>Course frequency
Winter semester</td><td colspan="2">Duration
The module can be completed in one semester.</td></tr>
<tr><td>Language

English</td><td colspan="2">Maximum number of students
30</td></tr>
<tr><td colspan="3">Coordinator: Dr. N. Wrage
Institution: Dep. of Crop Sciences, Chair of Grassland Sciences</td></tr>
</table>

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0002

"Carl-Sprengel-Colloquium"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: The colloquium will be carry out by scientist coming from outside of the university and by the staff of the institutes and chairs engaged in this module. The students gain an overview about the actual scientific themes of their own discipline and of those nearby. In the framework of this colloquium the students present relevant results of their own research work to discuss it interdisciplinary. Skills: The students gain the competence to edit and purify their results, to present them and to defend them in an interdisciplinary discussion. Examination requirements: very good knowledge of their own research areas and the relevant presentation requirements. The results presented in a report will be comment by the supervisor of the dissertation.	6 / 3
Courses and Examinations 1. Type of course: seminar 2. Examination: report of 20 min Examiner: the supervisor of the dissertation	**Workload:** 180 hrs 42 hrs of seminar 138 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** IPAG, progress report
Course frequency Winter and summer semester	**Duration** The module can be completed in two semesters.
Language German or English	**Maximum number of students** 60

Coordinator: Dr. B. Steingrobe

Institution: Dep. of Crop Sciences, Chair of Plant Nutrition

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0003

"PhD Colloquium Agricultural Economics and Rural Development"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: In this colloquium each PhD student of the Department will present at least three times their thesis (conception, empirical results). The seminar will be once per week. Skills: In this module the participants present their research results to the academic discussion. The participants train their rhetoric skills and their competences in presentation techniques. The PhD students gain in addition an overview on the actual research themes in agricultural economics. Examination requirements: very good knowledge of their own research areas and the relevant presentation requirements. The presented results will commented by an internal and external referee. No grades will be given, but presentation "failed" have to be repeated and will be discussed intensively with the supervisor.	6 / 3
Courses and Examinations 1. Type of course: seminar 2. Examination: report of 20 min Examiner: the supervisor of the dissertation	**Workload:** 180 hrs 42 hrs seminar 138 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated:	**Applicability** IPAG, progress report
Course frequency Winter and summer semester	**Duration** The module can be completed in two semesters.
Language German or English	**Maximum number of students** 60

Coordinator: Prof. Dr. B. Brümmer

Instituition: Dep. of Agricultural Economics and Rural Development, Chair of Agricultural Markets

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0004

"Ecology Seminar"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning skills: The colloquium will be carry out by scientist coming from outside of the university and by the staff of the institutes and chairs engaged in this module. The students will gain an overview about actual scientific themes in their own research area and those nearby. International designated referees present ecological themes of conservation biology, plant ecology, animal ecology, agro ecology, landscape ecology, global change biology. In the framework of this colloquium the students present important results of their own research work with an additional interdisciplinary discussion. Skills: The students gain the competence to compile research results and the relevant presentation techniques. Examination requirements: very good knowledge of their own research areas and the relevant presentation requirements. They work on questions of common and special ecology issues independently and gain background knowledge, they prepare especially their report and the subsequent discussion.	6 / 3
Courses and Examinations 1. Type of course: seminar 2. Examination: report of 20 min Examiner: the supervisor of the dissertation Prerequisites for the examination: participation on 18 seminar themes	**Workload:** 180 hrs workload 42 hrs of seminar 138 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** IPAG, progress report
Course frequency Winter or summer semester	**Duration** The module can be completed in one semester.
Language German or English	**Maximum number of students** 35

Coordinator: Prof. Dr. T. Tscharntke

Institution: Dep. of Crop Sciences, Chair of Agro ecology

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0005

"Colloquium Animal Sciences"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: In the framework of this colloquium the students present relevant results of their own research work to discuss it critically. Skills: creative involvement with the presented scientific data and conduction of new scientific research questions. Presentation and discussion of scientific results in front of an academic audience. Examination requirements: very good knowledge of their own research areas and the relevant presentation requirements. Successful presentation and discussion of scientific results	6 / 4
Courses and Examinations 1. Type of course: seminar 2. Examination: report of 20 min Examiner: the supervisor of the dissertation Prerequisites for the examination: participation on 18 seminar themes	**Workload:**

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** IPAG, progress report
Course frequency Winter or summer semester	**Duration** The module can be completed in two semesters.
Language German or English	**Maximum number of students** 35

Coordinator: Prof. Dr. Dr. M. Gauly

Institution: Dep. of Animal Sciences, Institute of Animal Breeding and Genetics

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0006

"Colloquium Phytomedicine"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: In the framework of this course scientists present special selected subjects, belonging to the science of phytomedicine and plant production, for all students of the Department of plant production. And the PhD students from the section of phytopathology and plant production present their research results and put them up for a critical discussion. Skills: Critical debate on the presented scientific data and deduction of new scientific questions. Presentation and discussion of scientific results in front of an academic audience. Examination requirements: Very good knowledge of the own field of research and the relevant requirements to present them. The PhD students present and discuss the results of their research findings once per year in face of an academic audience.	6 / 4
Courses and Examinations 1. Type of course: Seminar 2. Examination: Presentation, report, 20 min Examiner: the supervisor of the dissertation	**Workload:** 180 h 42 hrs Seminar and 138 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** PAG, progress report
Course frequency Winter and summer semester	**Duration** The module can be completed in two semesters.
Language German	**Maximum number of students** 36

Coordinator: Prof. Dr. A. von Tiedemann

Institution: Dep. of Crop Sciences, Sect. of Plant pathology and Plant protection

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0007

"Plant Pathology and Plant Protection Seminar"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: In the framework of this course projects, project goals and project results will be presented in English to a critical scientific audience and be discussed with between the PhD students and the staff members. Hereby not only the techniques of presentation and capability of discussion should be trained, but also helpful suggestions for further work should be offered. Skills: Presentation of the own scientific project and the appropriate presentation techniques. PC – presentation of own results in English language, participation and discussion of other scientific presentations. Examination requirements: Very good knowledge of the own field of research and the relevant requirements to present them. PC – presentation of own results in English, participation and discussion of other scientific presentations.	6 / 3
Courses and Examinations 1. Type of course: Seminar 2. Examination: Presentation, report, 20 min Examiner: the supervisor of the dissertation	**Workload:** 42 hrs Seminar and 138 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated:	**Applicability** IPAG, progress report
Course frequency Winter and summer semester	**Duration** The module can be completed in two semesters.
Language English	**Maximum number of students** 30

Coordinator: Prof. Dr. A. von Tiedemann

Institution: Dep. of Crop Sciences, Sect. of Plant pathology and Plant protection

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0008

"Progress in Plant Breeding Research"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: Up-to-date topics of the plant breeding sector which are under research in the section of plant breeding of the Dep. of Crop sciences Skills: The PhD – students learn to present scientific research projects on the basis of their own research project. They discuss it critically; present the progress of their work on the actual scientific level. The results, the conclusion and the relevance should be arranged critically. In addition the PhD students learn by the same process from their colleagues to be active as auditor and to support them. Examination requirements: Very good knowledge of the own field of research and the relevant requirements to present them. Presentation, participation and discussion of other scientific presentations.	6 / 4
Courses and Examinations 1. Type of course: Seminar 2. Examination: Presentation, report, 20 min Examiner: the supervisor of the dissertation	**Workload:** 42 hrs Seminar and 138 hrs study time by oneself

Choices	**Application requirements**
Compulsory	None
Number of times the course can be repeated: twice	**Applicability** IPAG, progress report
Course frequency Winter semester	**Duration** The module can be completed in two semesters.
Language English	**Maximum number of students** 25

Coordinator: Dr. Christian Möllers,

Institution: Dep. of Crop Sciences, Sect. of Plant Breeding

Area "Key Qualifications"

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0020

"Scientific Writing and Publishing in Crop Sciences"

Learning Targets, Skills, Examination requirements

Learning targets: The course consists of a preparatory seminar with the following particular subjects:

- good scientific practice
- scientific writing
- submitting and publishing of a paper
- reviewing of a scientific manuscript
- communication skills

Subsequent the PhD students prepare – by individual support through their tutor – a publication for a scientific journal and review another manuscript submitted for publication and written by a third party.

Skills: The module should impart knowledge and key qualifications as follows:

- structuring and writing of scientific papers in English
- design of graphs and tables
- presentation of chemical structures and molecular sequences
- literature investigation and citation
- creating of presentations as posters and reports
- reviewing of manuscripts of third parties

The PhD students learn the whole chain of processing a publication from the writing, submitting and reviewing a manuscript.

Examination requirements: Special and decided skills to prepare a manuscript for publication in a scientific journal; review of an article.

Number of ECTS credits / total semester periods per week

6 / 3

Courses and Examinations

1. Type of course: Seminar
2. Examination: homework, max. 15 pp.

Examiner: the supervisor of the dissertation

Workload:

180 hrs
15 hrs lectures
5 hrs exercise
20 hrs seminar
140 hrs study time by oneself

Choices

Compulsory

Application requirements

none

Number of times the course can be repeated: twice

Applicability

IPAG, key qualifications

Course frequency

Winter semester

Duration

The module can be completed in one semester.

Language

German or English

Maximum number of students

20

Coordinator: Dr. Sabine von Witzke-Ehbrecht

Institution: Dep. of Crop Sciences, Sect. of Plant Breeding

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0021

"Scientific Writing for Agricultural Economists"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: Introduction to compose papers for scientific journals with a peer-review process in agricultural economy Skills: PhD students have knowledge about the journals in the national and international agricultural economy. They are familiar and accustomed with the steps of the peer-review process from the viewpoint other author and reviewer. They are proficient in handling literature data basis and search engines, which are used in the (agricultural) economy. They know how an article for a journal is structured. Therefore they are capable to produce a manuscript with their own results, to identify suitable journals to hand in their manuscript. They are familiar with the whole steps of the reviewing process until the publication of an article. *Examination requirements:* Very good knowledge about the peer-review journals of the agricultural economy, the literature data basis which are used frequently in the agricultural economy and how to use them. Very good knowledge about the impact factor and how to interpret the impact factor, how the peer-review process is functioning and what will be expected from authors and peer-reviewers in the different steps of this process.	6 / 4

Courses and Examinations	**Workload:**
1. Type of course: Lectures with exercises 2. Examination: Project work Examiner: Prof. Dr. S. von Cramon-Taubadel Dep. of Agricultural Economy and Rural development, Sect. Agricultural Policy	180 hrs 28 hrs lectures 28 hrs exercise 124 hrs study time by oneself

Choices	**Application requirements**
Compulsory	Solid knowledge of applied econometrics
Number of times the course can be repeated: twice	**Applicability** IPAG, key qualifications
Course frequency Winter or summer semester	**Duration** The module can be completed in one semester.
Language English	**Maximum number of students** 25

Coordinator: Prof. Dr. S. von Cramon-Taubadel
Institution: Dep. of Agricultural Economy and Rural Development, Sect. Agricultural Policy

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0022

"Scientific Writing and Presenting for PhD – Students"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: Writing of scientific papers and monographs, designing of graphs and tables, correct citation, preparing of presentations, structuring and rhetorical composition to give a paper Skills: The PhD students acquire knowledge as said under "learning targets" and could implement these capabilities in practical exercises in the course of their PhD project. Examination requirements: Intensive knowledge and successful implementation of the course content, design of tables, design presentations and oral reports, submission of a seminar report of a visited seminar, design of a PowerPoint presentation for an oral report, Design of a scientific publication	6 / 4

Courses and Examinations	**Workload:**
1. Type of course: Lecture with exercise 2. Examination: Presentation, report, 20 min, project work. Weighting: 50 % report, 50 % project work Examiner: Prof. Dr. H. Simianer, Institute of Animal Breeding and Genetics Prerequisites to be admitted to the examination: 10 seminars visited in the course of two semesters	180 hrs lectures: 24 hrs exercise: 32 hrs 124 hrs study time by oneself

Choices	**Application requirements**
Compulsory	
Number of times the course can be repeated: twice	**Applicability** IPAG, key qualifications
Course frequency Winter and summer semester	**Duration** The module can be completed in one semester.
Language German or English	**Maximum number of students** 25

Coordinator: Prof. Dr. H. Simianer
Institution: Institute of Animal Breeding and Genetics, Section Animal Breeding

Area "Methodology"

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0040

"Chosen Aspects of the Benefit- and Welfare Theory"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: The subjects of this module will change from year to year. The broad spectrum of the benefit- and welfare theory should be covered. The course commence with topics of the applied ethics resp. the history of utility theory, then some current developments of this theory will be presented and at the end some application-oriented themes will be discussed. Skills: The students - are qualified to assess and optimize economical and fiscal programmes and politics - are capable to participate in discussions of problems in the field of the actual welfare economics Examination requirements: Detailed knowledge of the whole spectrum of the benefit- and welfare theory, especially in the applied ethics resp. the history of the utility theory and the actual development of the theory. The oral examination refers to the complete matter of the semester. In the oral report a chosen aspect has be elaborated in detail.	6 / 4
Courses and Examinations 1. Type of course: seminar 2. Examination: oral exams, report of 20 min Weighting: 50 % report, 50 % oral exams Examiner: Prof. Dr. R. Marggraf, Agricultural Economy and Rural Development, Chair of Environmental and Resource Economics	**Workload:** 180 hrs 56 hrs seminar 124 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** IPAG, methods
Course frequency Winter semester	**Duration** The module can be completed in one semester.
Language German or English	**Maximum number of students** 20

Coordinator: Prof. Dr. R. Marggraf, Agricultural Economy and Rural Development, Chair of Environmental and Resource Economics

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0041

"Chosen Methodological Problems of the Economical Analysis of the Environment and Natural Resource"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: Changing thematically subjects of modelling and statistical operations, which are used in the analysis of positive and normative resource economics. Skills: The PhD students - are able to develop solution of common methodological problems - have deep knowledge in the relevant modelling and statistical operations, their evaluation and usage for analysis of natural and resource economics and their application for the description of politics recommendations. Examination requirements: Very good knowledge of the subjects of the modelling and statistical operations, which are used in the analysis of positive and normative resource economics. The oral examination will advert to the whole matter of the semester. The report should deal with a sub problem in detail.	6 / 4
Courses and Examinations 1. Type of course: seminar 2. Examination: oral exams, report of 20 min Weighting: 50 % report, 50 % oral exams Examiner: Prof. Dr. R. Marggraf, Agricultural Economy and Rural Development, Chair of Environmental and Resource Economics	**Workload:** 180 hrs 56 hrs seminar 124 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** IPAG, methodologies
Course frequency summer semester	**Duration** The module can be completed in one semester.
Language German or English	**Maximum number of students** 20

Coordinator: Prof. Dr. R. Marggraf

Institution: Department of Agricultural Economy and Rural Development, Chair of Environmental and Resource Economics

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0042

"Bio analytical techniques in environmental and plant sciences"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: In numerous areas of the environmental and life sciences state-of-the-art analytical knowledge is of elementary relevance. The theoretical basics, which are taught in this module, should support the PhD student to choose and apply the appropriate analytical method. In the lab the methods will be trained. Skills: The PhD student will learn and understand the physics and chemistry of basics analytical methods. They can train the methods practically in the lab. 1. Mass spectrometry and techniques of ionization 2. Chromatography and electrophoresis separation and analysis of peptides and proteins 3. Bio phonetic 4. Molecular-genetically methods Examination requirements: Very good knowledge in mass spectrographic and techniques of ionization, of chromatography and electrophoresis separation to separate and analyze peptides and proteins, of the bio photonic, of the immune-chemical operations and of molecular-genetically verification procedures.	6 / 4
Courses and Examinations 1. Type of course: lectures and exercise 2. Examination: oral exams Examiner: Prof. Dr. P. Karlovsky, Dep. of Crop Sciences, Chair of Molecular Phytopathology and Mycotoxin Research PD Dr. J. Niemeyer, Institute of Applied Biotechnology in the Tropics e.V. PD Dr. F. Gessler, Institute of Applied Biotechnology in the Tropics e.V.	**Workload:** 180 hrs lectures: 20 hrs exercise: 40 hrs 120 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** IPAG, methodologies
Course frequency summer semester	**Duration** The module can be completed in one semester.
Language English	**Maximum number of students** 10

Coordinator: PD Dr. J. Niemeyer

Institution: Dep. of Crop Sciences, Chair of Plant Nutrition

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0043

"Efficiency and Productivity Analysis: Stochastic Approaches"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: In this module econometrical methods are in the focus of the efficiency and productivity analysis of enterprises of the agrarian economy and food industry. Especially it will be made the point on the explanation of efficiency differences. Skills: The PhD students will gain the essential methods by themselves to carry and to design analysis in the productivity and efficiency sector in the econometrics. They will learn to handle different software packages in this specific area. They are able to test the empirical results on their economical implications and assumptions. They understand to present professional the results, tests and policy implications written and verbally. Examination requirements: Profound knowledge of the econometric basics of the stochastic frontier analysis, the Maximum-Likelihood-approximation: asymptotic, tests, numerical particularities; models with combined error terms, approximation of the production frontier and the efficiency of single enterprise; enhancement on customer-based approaches (cost- and profit function); distance functions; productivity segmentation	6 / 3
Courses and Examinations 1. Type of course: lecture and exercise 2. Examination: oral exams and project work Weighting: 50 % report, 50 % oral exams Examiner: Prof. Dr. B. Brümmer, Dep. of Agricultural Economics and Rural Development, Chair of Agricultural Markets	**Workload:** 180 hrs 21 hrs lectures 21 hrs exercises 136 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** PAG, methodologies
Course frequency summer semester	**Duration** The module can be completed in one semester.
Language English	**Maximum number of students** 15

Coordinator: Prof. Dr. B. Brümmer

Institution: Dep. of Agricultural Economics and Rural Development, Chair of Agricultural Markets

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0044

"Molecular Genetics: Fundamental techniques in Plant Pathology and Entomology"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: This course shall impart knowledge to the PhD students of phytomedicine in the area of molecular-biological studies. For this, the following techniques will be presented in theory and in practical experiments: isolation of nuclei acids (total DNA, plasmids, fragments of DNA out of gels), amplification of plasmids by transformation to E.coli, analysis of restrictions, typing of DNA, southern hybridization by using non-radioactive markers, real-time PCR for the diagnoses of pathogens of cereals, cloning of DNA Skills: The PhD students will learn basic and advanced techniques to analyze and to manipulate the DNA, which are applied in phytopathology. Examination requirements: very good knowledge in basic and advanced techniques to analyze and to manipulate the DNA, which are applied in phytopathology. A protocol and an analysis of the lab experiments have to be prepared. In this report the success of the experiments carried out and the understanding of the concepts used should be documented.	6 / 4
Courses and Examinations 1. Type of course: lectures and exercises 2. Examination: house work 10 pages Examiner: Prof. Dr. P. Karlovsky, Dep. of Crop Sciences, Chair of Molecular Phytopathology and Mycotoxin Research	**Workload:** 180 hrs 10 hrs lectures 10 hrs practical lab work 124 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** PAG, methodologies
Course frequency Winter semester	**Duration** The module can be completed in one semester.
Language English	**Maximum number of students** 12

Coordinator: : Prof. Dr. P. Karlovsky

Institution: Dep. of Crop Sciences, Chair of Molecular Phytopathology and Mycotoxin Research

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0045

"New Methods and Developments in Animal Sciences"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: Learning and applying the latest techniques and methods in animal sciences 1. Advanced techniques in breeding and statistical genetics (12 hrs) 2. Advanced techniques in animal nutrition and animal feed science (12 hrs) 3. Theoretical and practical behaviour observation and there specific methods of evaluation (12 hrs) 4. Methods to assess production systems (6 hrs) 5. Specific techniques in fish farming – breeding (4 hrs) 6. Ultrasonic application in fish – breeding (4 hrs) 7. Classification of carcase and meat quality assessment (6 hrs) Skills: The PhD students learn the latest methods and techniques in the areas described in "learning targets". They are able to apply and to transpose their theoretical and scientific based knowledge into practical exercises. Upcoming problems will be detected and solution developed and displayed by themselves. Examination requirements: very good knowledge of and the capability to apply new methods in animal breeding, population genetics, animal nutrition, ethology and their specific methods of evaluation. They learn to assess production systems, specific breeding techniques for fishes, to apply ultrasound technologies in animal breeding and to use systems of classification of carcase and meat quality assessment.	6 / 4
Courses and Examinations 1. Type of course: Lectures with exercises 2. Examination: written exams Examiner: Prof. Dr. Dr. Matthias Gauly, : Institute of Animal Breeding and Genetics	**Workload:** 180 hrs 28 hrs lectures 28 hrs exercises 124 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** PAG, methodologies
Course frequency summer semester	**Duration** The module can be completed in one semester.
Language German	**Maximum number of students** 15

Coordinator: Prof. Dr. Dr. Matthias Gauly

Institution: Institute of Animal Breeding and Genetics

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0046

"Special Methods of Quality Evaluation"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: The course shall offer the PhD students special methods of the analysis of quality in raw plant material and products (FAEN-Project (research network of agriculture and nutrition science in Lower-Saxony)). Theoretical and experimental basics should achieved as: - analysis of ingredients of plants via HPLC techniques, thermal properties of starch via RVA, enzyme kinetics - quality assessment of sugar beet - special methods of mycotoxine analysis Skills: The PhD students learn analytical methods and their theoretical background, which is going far behind their own research work. They will be able to asses their own research work in a broader scientific environment. Team-work will be trained and an exchange of information, problems and solutions will be perfected. Examination requirements: total command of theoretical and instrumental basics of methods to determine ingredients in plant products, the quality assessment of sugar beets as well as the methods in mycotoxine analysis. Scientific assessment of gained data sets via statistical methods, Presentation of results in comparison to literature.	6 / 4
Courses and Examinations 1. Type of course: lecture with exercises 2. Examination: report of 20 min Examiner: Prof. Dr. E. Pawelzik, Dep. of Crop Sciences, chair of quality of plant products Dr. Ch. Hoffmann, Institute of Sugar beet Research Prof. Dr. P. Karlovsky, Dep. of Crop Sciences, Chair of Molecular Phytopathology and Mycotoxin Research Prof. Dr. H.-M. Poehling, Institute of Plant Diseases and Plant protection, Hannover	**Workload:** 180 hrs 12 hrs lectures 48 hrs exercises 120 hrs study time by oneself

Choices	**Application requirements**
Compulsory	None
Number of times the course can be repeated: twice	**Applicability** IPAG, methodologies
Course frequency summer semester	**Duration** The module can be completed in one semester.
Language German or English	**Maximum number of students** 12

Coordinator: Prof. Dr. E. Pawelzik

Institution: Dep. of Crop Sciences, chair of Quality of Plant Products

Area: Expert Knowledge

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0060

"Advanced methods in animal breeding and statistical genetics"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: knowledge of state-of-the-art developments in the field of quantitative-genetically animal breeding and the statistical genetics, including the scientific areas of estimation of breeding values and parameter estimation for linear and non-linear criteria, breeding design, description and management of genetically diversity inside and between of populations, statistical methods of the analysis of genomes, haplotypicisation, interconnection – and association analysis, population-genomics Skills: The PhD students gain deep knowledge of the methods described in "learning targets" and can apply these methods with the relevant software on real and simulated datasets. Examination requirements: very good knowledge of methodical aspects of their own project. The participants will present the methodical aspects of their own project in a compulsory seminar report, including the theoretical basics of the methods; they also hand in a written report. The participants complete practical exercise, which will be evaluated.	6 / 4
Courses and Examinations 1. Type of course: lecture with exercise and seminar 2. Examination: homework 20 pp., report of 20 min., practical exercise Weighting: each ⅓ Examiner: Prof. Dr. H. Simianer, Institute of Animal Breeding and Genetics, Section Animal Breeding	**Workload:** 180 hrs lectures 20 hrs exercise 10 hrs seminar 30 hrs 120 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** IPAG, expert knowledge
Course frequency Winter and summer semester	**Duration** The module can be completed in two semesters.
Language English	**Maximum number of students** 25

Coordinator: Prof. Dr. H. Simianer
Institution: Institute of Animal Breeding and Genetics, Section Animal Breeding

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0061

"Advances methods and developments in livestock and bio-engineering"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: 1. modelling of processes in the following areas: formation and spreading of gaseous and particle emissions; nitrification and denitrification of N-containing liquid media, regulation and steering of air-climatic constructions 2. neuronal networks and fuzzy-logic models and their application in the framework of precision livestock farming 3. radio frequency identification (RFID) in processes of production of livestock farming Skills: basics of physics and of biology, animal sciences, applied mathematics, basics of agricultural engineering, basics of process engineering (mixing, separation, heating, cooling etc.) Examination requirements: profound knowledge in the areas of emissions, handling of climate control units, neuronal networks and the application of RFID technologies in animal sciences	6 / 4
Courses and Examinations 1. Type of course: lectures with excursions and seminar 2. Examination: oral examination and report of 20 min Weighting: 50 % report, 50 % oral exams Examiner: Prof. Dr. Ir. H. van den Weghe, Dep. of Animal Sciences, chair of process engineering in livestock farming	**Workload:** 180 hrs 10 hrs lectures 10 hrs excursion 36 hrs seminar 124 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** IPAG, expert knowledge
Course frequency Winter semester	**Duration** The module can be completed in one semester.
Language German	**Maximum number of students** 25

Coordinator: Prof. Dr. Ir. H. van den Weghe

Institution: Dep. of Animal Sciences, Chair of Process Engineering in Livestock farming

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0062

"Bacteriology"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: demonstration of the most important bacteria derived diseases of plants inoculated and description of typical criteria for the diagnosis; common handling of phytopathogenic bacteria, isolation methods, cultivation, characterisation and identification of phytopathogenic bacteria, physiological typing of phytopathogenic bacteria, usage of different serological verification procedures, testing of resistance to bacteria Skills: PhD students are capable by themselves to identify phytopathogenic bacteria on their systematic, by recording of important phenotypical physiological-biochemical features with the assistance of modern serological verification procedures. Experiments will be carried out in teamwork and the results will be presented and discussed in the group. Examination requirements: very good knowledge of the taxonomy of phytopathogenic bacteria, identification of the most important bacteriosis, governing of isolation and cultivation techniques of bacterial pathogens. Identification of bacteria acc. their phenotypical physiological-biochemical features. Knowledge of serological verification procedures. Possibilities to combat phytopathogenic bacteria.	6 / 5
Courses and Examinations 1. Type of course: practical training with lectures 2. Examination: oral exams Examiner: Dr. A. Marvridis, Dep. of Crop Sciences, Chair of Phytopathology and Plant protection. Prerequisites for the examination: protocol and presentation of results	**Workload:** 180 hrs 20 hrs lectures 50 hrs practical exercises 110 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** IPAG, expert knowledge Others: subsidiary subject "Phytomedicine" for students of biology
Course frequency Winter semester	**Duration** The module can be completed in one semester.
Language German	**Maximum number of students** 12

Coordinator: Dr. A. Marvridis

Instituition: Dep. of Crop Sciences, Chair of Phytopathology and Plant protection

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0063

"Empirical Methods in Agribusiness"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: The course is designed for PhD students who are doing a questionnaire (primary data collection) for their research project. It contains the steps of the right choice of the methodology, the specific advantages and disadvantages of qualitative and quantitative methods, interview techniques and different methods to analyze datasets. Especially in depth the methods of the preference research (conjoint-analysis, discrete-choice-analysis) and the regression- as the causally determined analysis will be taught. Skills: The course imparts knowledge for empirical dissertations using tools of qualitative and especially quantitative empirical social research. These skills are also useful to support possible occupation in the market research and marketing sector. Examination requirements: very good knowledge of the usage of multivariate methods verified through a homework and processed datasets (e.g. using the datasets of the own project). The choice of the appropriate method will be determined in a preliminary discussion. The homework should be compiled that it could be hand in to a peer-review journal, later.	6 / 3
Courses and Examinations 1. Type of course: seminar with exercise 2. Examination: homework, ma. 15 pp Examiner: Prof. Dr. A. Spiller, Dep. of Agricultural Economics and Rural Development, Chair of Food Marketing and Agricultural Products	**Workload:** 180 hrs 40 hrs seminar 140 hrs study time by oneself as: 40 hrs preparation and follow-up work 40 hrs literature study 60 hrs examination preparation

Choices	**Application requirements**
Compulsory	
Number of times the course can be repeated: twice	**Applicability** IPAG, expert knowledge
Course frequency summer semester	**Duration** The module can be completed in one semester.
Language German	**Maximum number of students** 15

Coordinator: Prof. Dr. A. Spiller
Institution: Dep. of Agricultural Economics and Rural Development, Chair of Food Marketing and Agricultural Products

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0064

"Genomic analysis of farm animals"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: acquisition of off-the-shelf technology in molecular-biological methods (RNA-, DNA- isolation, DNA - sequencing, composition of gene banks, electrophoresis, cloning), usage of molecular-biological methods to analyse genes. Skills: The PhD students will gain in the framework of project studies the capability to use molecular-biological methods to analyse genes, to isolate and characterize genes and to handle the gene analyse target oriented. The PhD students should be trained by the use of the molecular-biological techniques to self-dependency in molecular-biological workings. Examination requirements: profound knowledge in molecular-biological techniques (RNA-, DNA- isolation, DNA - sequencing, composition of gene banks, electrophoresis, cloning), usage of molecular-biological methods to analyse genes, preparation of a scientific paper based on a specific project.	6 / 4
Courses and Examinations 1. Type of course: Exercise with a written journal 2. Examination: project work Examiner: Prof. Dr. Dr. B. Brenig, Institute of Veterinary Science	**Workload:** 180 hrs 60 hrs practical work 120 hrs study time by oneself

Choices	**Application requirements**
Compulsory	Knowledge of molecular biology and biotechnology in animal sciences
Number of times the course can be repeated: twice	**Applicability** IPAG, expert knowledge
Course frequency Winter or summer semester	**Duration** The module can be completed in one semester.
Language German or English	**Maximum number of students** 4

Coordinator: Prof. Dr. Dr. B. Brenig

Institution: Institute of Veterinary Science

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0065

"Market Integration and Price Transmission"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning skills: theory and empiricism of agricultural market – reading course for advanced students Skills: PhD students have to read relevant articles in scientific journals referred to market integration and price transmission. They understand the presented methods and results. They are able to identify open questions and research demand and to steer appropriate research projects. They can report to their colleagues this special scientific matter and discuss it with an academic audience. Examination requirements: good knowledge of the determinants of the coherence between prices in spatial differentiated markets, between prices of varying agricultural goods and between prices on different of processing-steps. Advanced econometrical methods to analyse the processes of price transmission (threshold- and other non-linear co integration-models, Markov-switching-methods, parity bound-models).	6 / 4
Courses and Examinations 1. Type of course: lectures with exercises 2. Examination: oral exams, report of 20 min Examiner: Prof. Dr. S. von Cramon-Taubadel, Dep. of Agricultural Economics and Rural Development, Chair of Agricultural Policy	**Workload:** 180 hrs 30 hrs lectures 30 hrs exercises 120 hrs study time by oneself

Choices	**Application requirements**
optional	none
Number of times the course can be repeated: twice	**Applicability** IPAG
Course frequency summer semester	**Duration** The module can be completed in one semester.
Language English	**Maximum number of students** 25

Coordinator: Prof. Dr. S. von Cramon-Taubadel

Institution: Dep. of Agricultural Economics and Rural Development, Chair of Agricultural Policy

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)
Module PAG 0066
"Molecular biological/immunological Methods in Animal Science"

Learning Targets, Skills, Examination requirements

Learning targets: molecular-biological and immunological techniques are important tools to plan biotechnological scientific experiments. Particularly this course is directed to students with a specialisation on international animal sciences, who use these techniques and therefore want to gain advanced knowledge and skills. The theory of these key technologies will be moderated in small lab groups and manageable projects.
Advanced knowledge about modern molecular-biological / immunological lab technologies:

1. molecular-biological techniques to analyse pro- and eukaryotic genes; virus-genetics (12 hrs)
2. construction and analysis of gene banks (4 hrs)
3. protein-biochemical and immunological techniques (12 hrs)
4. basic techniques in the preparation of samples and their cultivation
5. molecular-biological techniques to analyse infection pathogens and toxins (6 hrs)
6. analysis of cellular receptors and ligand - / receptor interaction
7. immunology of B- and T – cells; antibody – technologies (8hrs)
8. cytokines, signal transduction and immune-regulation (8 hrs)

Skills: The students command the certain use with the molecular-biological and immunological techniques in theory and practical experience. The students are able to transfer these techniques and the requirements on the needs of specific biotechnological projects.
Examination requirements: advanced knowledge of molecular-biological techniques to analyse pro- and eukaryotic genes; virus-genetics; the construction and analysis of gene banks, protein-biochemical and immunological techniques, basic techniques in the preparation of samples and their cultivation; molecular-biological techniques to analyse infection pathogens and toxins, the analysis of cellular receptors and ligand - / receptor – interaction, the immunology of B – and T – cells; antibodies – techniques of cytokines; signal transduction and immune-regulation.

Number of ECTS credits / total semester periods per week

6 / 4

Courses and Examinations

1. Type of course: lectures with exercises
2. Examination: oral exams

Examiner: PD Dr. F. Gessler, Institute of Veterinary Science, sect. of hygiene of tropical animals

Workload:

180 hrs
15 hrs lectures
40 hrs exercises
125 hrs study time by oneself

Choices Compulsory

Application requirements none

Number of times the course can be repeated: twice

Applicability

IPAG expert knowledge

Course frequency

Winter semester

Duration

The module can be completed in one semester.

Language English

Maximum number of students 5

Coordinator: Prof. Dr. Dr. Claus-Peter Czerny
Institution: Institute of Veterinary Science, sect. of Hygiene of Animals and the Veterinary Lab and the poultry clinic

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0068

"New Areas in Plant Breeding"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: new methodical approaches and selected results in the actual breeding research. In this seminar, each PhD students presents per term a report dealing with the project of their dissertation. Skills: The PhD students learn to compile actual problems or an actual technology of the area of the applied genetics and plant breeding sector. Examination requirements: comprehensive knowledge of new methodical approaches in the actual breeding sector as the governing of the relevant methods.	6 / 2

Courses and Examinations	**Workload:**
1. Type of course: seminar 2. Examination: report Examiner: Prof. Dr. W. Link, Dep. of Crop Sciences, Chair of Plant Breeding	180 hrs 24 hrs seminar 156 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** IPAG, expert knowledge
Course frequency summer semester	**Duration** The module can be completed in one semester.
Language English	**Maximum number of students** 25

Coordinator: Prof. Dr. W. Link

Institution: Dep. of Crop Sciences, Chair of Plant Breeding

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0069

"Plant Production and the preceding and following sector in the Centre of Europe"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: The course consists of preparatory seminars and excursions to enterprises, research institutes, organizations and agricultural enterprises with the topics as follows: - to become acquainted with the plant production within the scope of processing chains in the preceding area (breeding, plant protection, fertilization, agricultural machinery sector) and the following sector (feed industry). Skills: The course should impart competences and key qualifications to the PhD students in the following areas: - advanced, direct experience of the decision process in enterprises; duties and organisational structure of institutions, administration, politics and the economic sector in the framework of the requirements of the society. - case-related training of the participants, including a follow-up of the themes through preparing a poster Examination requirements: deep knowledge of plant production in the framework of process chains in the preceding sector (breeding, plant protection, fertilization, agricultural machinery sector) and the following sector (feed industry). Independently compilation of case-studies in the thematic field with a presentation.	6 / 6
Courses and Examinations 1. Type of course: seminar with excursion 2. Examination: report of 20 min Examiner: Prof. Dr. B. Märländer, Associated Institute of Sugar beet Research	**Workload:** 180 hrs 72 hrs excursion 8 hrs seminar 100 hrs study time by oneself

Choices	**Application requirements**
Compulsory	None
Number of times the course can be repeated: twice	**Applicability** IPAG, expert knowledge
Course frequency summer semester	**Duration** The module can be completed in one semester.
Language German or English	**Maximum number of students** 15

Coordinator: Prof. Dr. B. Märländer

Institution: Associated Institute of Sugar beet Research

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0070

"Risk Analysis and Risk Management in Agriculture"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**
Learning targets: In the centre of this course the risk evaluation, the risk analysis and the risk management. The content of the teaching are: - distribution and stochastic processes - value-at-risk concept - risk-programming approaches - insurances - evaluation of derivatives incl. real options and whether derivatives Skills: The students gain the methodical armamentarium to measure, to analyse and to manage risks in agricultural enterprises. They are able in specific cases to identify the problem and to apply the appropriate techniques to solve the problem. They gain methodical competences to solve their own research project. Examination requirements: very good knowledge of statistical concepts, of the insurances related to causes and effects, of dynamical programming and of the theory of option prices.	6 / 5
Courses and Examinations 1. Type of course: lectures with exercises 2. Examination: project report Examiners: Prof. Dr. Martin Odening, Institute of Economics and Social Sciences of Agriculture (Humboldt University, Berlin), Chair of Agricultural Business Prof. Dr. Oliver Musshoff, Dep. of Agricultural Economics and Rural Development, Chair of Agricultural Business	**Workload:** 180 hrs 44 hrs lectures 20 hrs exercises 116 hrs study time by oneself

Choices	**Application requirements**
Compulsory	None
Number of times the course can be repeated: twice	**Applicability** IPAG, expert knowledge
Course frequency summer semester	**Duration** The module can be completed in one semester.
Language English	**Maximum number of students** 25

Coordinator: Prof. Dr. Oliver Musshoff

Institution: Dep. of Agricultural Economics and Rural Development, Chair of Agricultural Business

Georg-August University in Göttingen

Program of Study: Ph.D. Program for Agricultural Sciences in Göttingen (PAG)

Module PAG 0000

"Value Creation Chain and healthy nutrition"

Learning Targets, Skills, Examination requirements	**Number of ECTS credits / total semester periods per week**

Learning targets: The course serves to describe and to combine the different elements of the value creation chain in the focus of healthy nutrition, with a subsequent evaluation. The module has an introductory lecture part, case studies, project reports and excursions.
Skills: The course should impart which background stories and feedback mechanisms exist resp. how the demands of the social requirements will be transferred.
Examination requirements: Very good knowledge must be verified of the value creation chain as well of the plant production, including:
- selected topics in preceding and following sector of the
  ○ feed industry (first and second step of processing)
  ○ distributive trades (wholesale and retail, incl. consultation and marketing)
  ○ consumers (nutrition behaviour and health aspects)
	6 / 4

Courses and Examinations 1. Type of course: lectures with seminar and excursion 2. Examination: home work, 20 pp. Examiners: Prof. Dr. E. Pawelzik, Dep. of Crop Sciences, chair of quality of plant products PD Dr. Ch. Hoffmann, Institute of Sugar beet Research Prof. Dr. A. Spiller, Dep. of Agricultural Economics and Rural Development, Chair of Food Marketing and Agricultural Products PD Dr. Th. Ellrott, Neuronal-Psychological Research, Chair of Psychiatry and Psychotherapy	**Workload:** 180 hrs 30 hrs lectures 10 hrs excursions 20 hrs seminar 120 hrs study time by oneself

Choices	**Application requirements**
Compulsory	none
Number of times the course can be repeated: twice	**Applicability** IPAG, expert knowledge
Course frequency summer semester	**Duration** The module can be completed in one semester.
Language German	**Maximum number of students** 45

Coordinator: Prof. Dr. E. Pawelzik
Institution: Dep. of Crop Sciences, chair of quality of plant products

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