Faculty of Agricultural Sciences

Study Guide

Master's Program *Crop Protection*

Winter Semester 2025/26

GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN IN PUBLICA COMMODA SEIT 1737

Master of Science Program „Crop Protection“

Foreword

Dear students,

We welcome you to the Faculty of Agriculture of the University of Göttingen and especially to the Master's Program '*Crop Protection'*.

Founded in 1737, the University of Göttingen is internationally renowned for its long-standing research tradition and its remarkable range of disciplines. In 2007, it was recognized as one of the top nine universities of excellence in Germany for its future strategy and research potential. The Göttingen University campus comprises 13 faculties with 30.000 students of which about 3.000 come from more than 100 different countries.

The Faculty of Agriculture is one of the largest research-oriented agricultural faculties in Germany and offers a broad range of subjects in life and socio-economic sciences, excellent research facilities, an outstanding quality and diversity of study programs, and a system-oriented approach in research and teaching in agricultural sciences embedded in a national and international network of education.

In accordance with one of the main targets of the University, which is to intensify internationalization, the Faculty of Agricultural Sciences offers competitive international education programs on the MSc and PhD level with English as the language of instruction. These programs are strongly demanded by students from all over the world. The Master's program '*Crop Protection'* was newly established in October 2010 stimulated by the century challenge to protect crop production from losses due to plant pathogens, insects and weeds at a time of continuing world population growth and concerns over global food security. Our Master's program offers a concise education to develop, advance and apply modern crop protection techniques within crop production systems while observing the challenges of sustainability and natural resources conservation.

This study guide provides you with essential information about the study program and gives an overview on all modules. More information at **http://www.uni-goettingen.de/en/135654.html**.

Assistance is available from the crop protection program coordinator:

Dr. Rebecka Dücker
Division of Plant Pathology and Crop Protection, Department of Crop Sciences
Grisebachstr. 6, 37077 Göttingen
Email: cropprotection@uni-goettingen.de

On behalf of the Faculty of Agricultural Sciences, we welcome you very warmly on the Göttingen University Campus and we wish you a successful and pleasant stay in Göttingen.

Prof. Dr. Andreas von Tiedemann, Study Program Director

Contents

1 Academic calendar

The academic year is divided into winter and summer term with each period lasting six months.

During these terms there are periods when lectures are held, periods when examinations are taken and block practicals are given and also breaks and public holidays. Courses usually run over 14 weeks and are followed by a 2 weeks examination period. The time between these periods are used to complete practicals, the internship, to conduct individual studies or take a job or travel.

Winter semester 2025/2026

- Beginning of semester: 1-Oct-25
- End of semester: 31-Mar-26
- Teaching period: 27-Oct-25 to 13-Feb-26
- No classes: 24-Dec-25 to 1-Jan-26

Summer semester 2026

- Beginning of semester: 1-Apr-26
- End of semester: 30-Sep-26
- Teaching period: 14-Apr-26 to 18-Jul-26

Academic calendar: http://www.uni-goettingen.de/en/47743.html

1.1 Public Holidays in Lower Saxony

German Name	English Name	2025	2026
Neujahr	New Year's Day	1-Jan-25	1-Jan-26
Karfreitag	Good Friday	18-Apr-25	3-Apr-26
Ostermontag	Easter Monday	21-Apr-25	6-Apr-26
Tag der Arbeit	Labour Day / May Day	1-May-25	1-May-26
Christi Himmelfahrt	Ascension Day	29-May-25	14-May-26
Pfingstmontag	Whit Monday / Pentecost Monday	9-Jun-25	25-May-26
Tag der Deutschen Einheit	Day of German Unity	3-Oct-25	3-Oct-26
Reformationstag	Reformation Day	31-Oct-25	31-Oct-26
1. Weihnachtstag	Christmas Day (1st)	25-Dec-25	25-Dec-26
2. Weihnachtstag	Boxing Day / St. Stephen's Day	26-Dec-25	26-Dec-26

2 Master's Degree Program in Crop Protection

2.1 Program structure

The study program is organized into modules. A module is a study unit that may include different types of courses that are thematically related. Each module has a credit value assigned according to the European Credit Transfer System (ECTS). Six ECTS credits correspond to the workload of either four hours of lectures or eight hours of practicals per week over one semester (16 weeks), including preparation and examination. Most modules in the program carry 6 credits. The Master's thesis, including the defense, is worth 30 credits in total. A regular workload amounts to 30 credits per semester, i.e., typically five modules. The number of lecture hours per week within a module is expressed as "**S**emester**w**ochen**s**tunden" (SWS), meaning semester hours per week.

The two-year MSc program consists of four semesters, during which a total of 120 ECTS must be completed. Advanced courses contribute 81 credits, a six-week internship including a written report and oral presentation accounts for 9 credits, and the Master's thesis including the colloquium is worth 30 credits. Training in concepts and practical skills is provided through lectures, seminars, laboratory classes, field courses, and project work.

In addition to the regular course work students must complete out a six-week internship in the field of crop protection, for example in agrochemical companies, in research or consulting institutions and experience the daily work situation. During the internship, students acquire specific knowledge relevant to the chosen field of work or research, while also developing transferable skills such as work organization, teamwork, interdisciplinary collaboration, and flexibility.

The final semester is dedicated to the Master's thesis, which comprises an independent research project, including experimental work, data collection and analysis, and the writing of the thesis. The thesis is defended in a colloquium of 60 minutes (30 minutes of presentation, 30 minutes of questions).

Compulsory modules (30 ECTS):

- Basic laboratory techniques
- Scientific Presenting, Writing and Publishing in Crop Protection
- Internship, minimum of 6 weeks
- Pesticides I
- Pesticides II

Elective modules (54 ECTS)

Key competences (6 ECTS)

- Practical Statistics and Experimental Design

Master's thesis and colloquium (30 ECTS)

2.2 Types of courses

Lectures: Lecture courses are delivered by university professors and offer either a comprehensive overview or in-depth knowledge of a specific subject area. Credits are awarded upon successful completion of a written or oral examination at the end of the semester.

Seminars: Seminars are an interactive form of learning and require active student participation. Oral presentations are provided by students, followed by discussions.

Colloquium: Students or invited speakers present their current scientific research, which then is discussed.

Laboratory practicals/exercises: Students gain hands-on experience by designing and carrying out experiments, and by developing proficiency in research techniques and analytical methods.

Excursions and field trips: Excursions, ranging from one to several days, expose students to new environments and provide first-hand insights into real-world field conditions.

2.3 Master's thesis

A written application for admission to the master's thesis must be submitted to the examination office, where the application forms are also available. Eligibility for the Master's thesis requires that students have earned at least 72 credits, including the completion of all compulsory modules. The application must include: the proposed thesis topic, the names of the first and second supervisors, and confirmation signatures from both supervisors. At least one supervisor must be a professor or an authorized examiner of the Faculty of Agricultural Sciences at Göttingen University. The master's thesis must be written in English. The standard period for completing the thesis is 23 weeks, with the possibility of a 6-week extension in exceptional cases, subject to the approval of the supervisors.

The colloquium usually takes place within six weeks after submission of the thesis. It consists of an introductory presentation (approximately 30 minutes) followed by a discussion (approximately 30 minutes) of the thesis. The purpose of the colloquium is to demonstrate that the candidate can address interdisciplinary and problem-specific questions on a scientific basis and can contextualize them within the field of crop protection.

3 Examination office and regulations

3.1 Examination office

The examination office is located at Büsgenweg 5, 37077 Göttingen. It provides forms and handles other academic and administrative matters. You can register for exams until **seven days** before the exam. If you are unable to take an examination due to illness, a medical certificate must be submitted within three days.

Opening hours of the examination office:

Monday to Thursday 10.00 a.m. to 4.00 p.m., Friday 10.00 a.m. to 1.00 p.m.
Telephone consultation hours: 8:00-10:30 a.m.

In case you have problems with FlexNow, registration/deregistration, or other administrative matters, please contact Mrs. Anja Kalkau (paagrar@uni-goettingen.de) or Dr. Lydia Pohl (lydia.pohl@uni-goettingen.de).

3.2 Examination periods and calendar

There are two examination periods per semester: One is within the first two weeks after the last day of lectures and one at the beginning of the following semester before the start of lectures. Students can choose to do the examination in the first or the second examination period. Examinations can be repeated twice (i.e. twice in total). In case of block seminars examinations can be offered outside the examination periods.

Types of examinations are oral exams, written exams, giving a presentation and/or preparation of a written assay, project workpapers or a herbarium.

Examination dates are published in FlexNow, which can be reached via eCampus/HISinOne.

3.3 Registration for examination: FlexNow

Registration for module examinations is done electronically by the students themselves in FlexNow:

You can only participate in an examination if you have registered for the course in FlexNow during the respective registration period (until 7 days before the exam)!

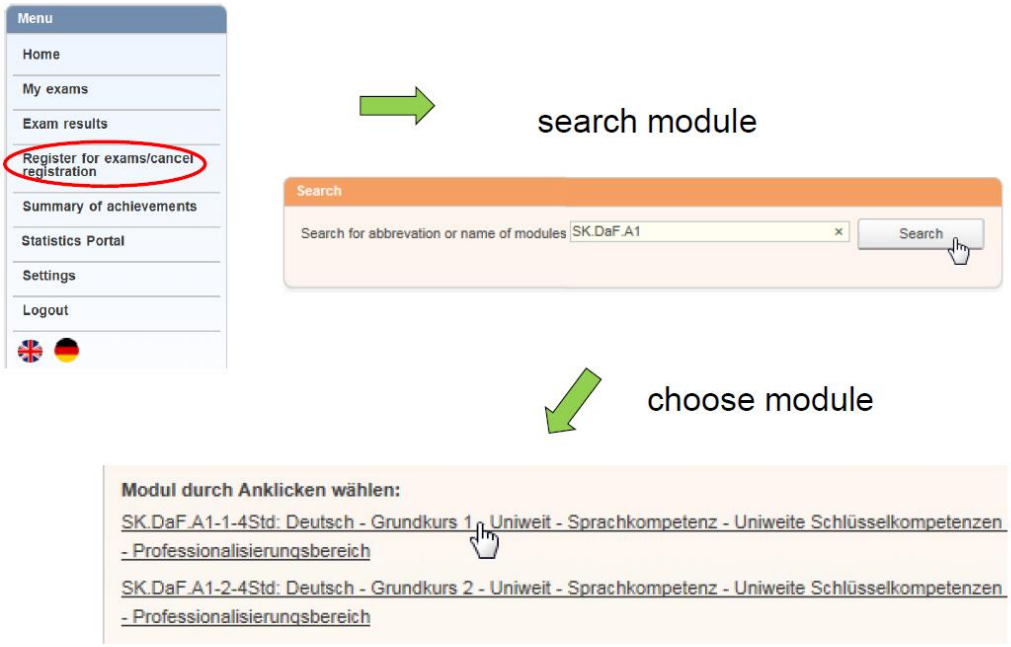
How to register via Flexnow:

To register for an examination, go to

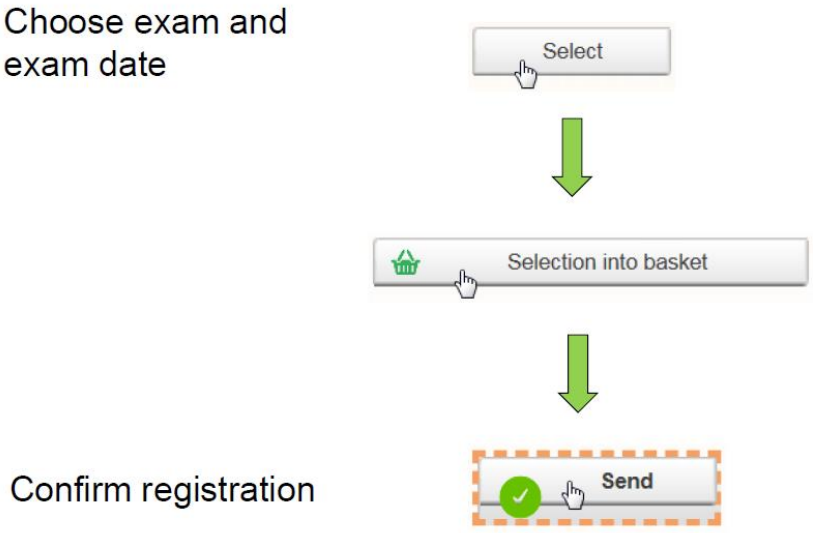
http://www.uni-goettingen.de/en/45574.html (An-/Abmeldung).

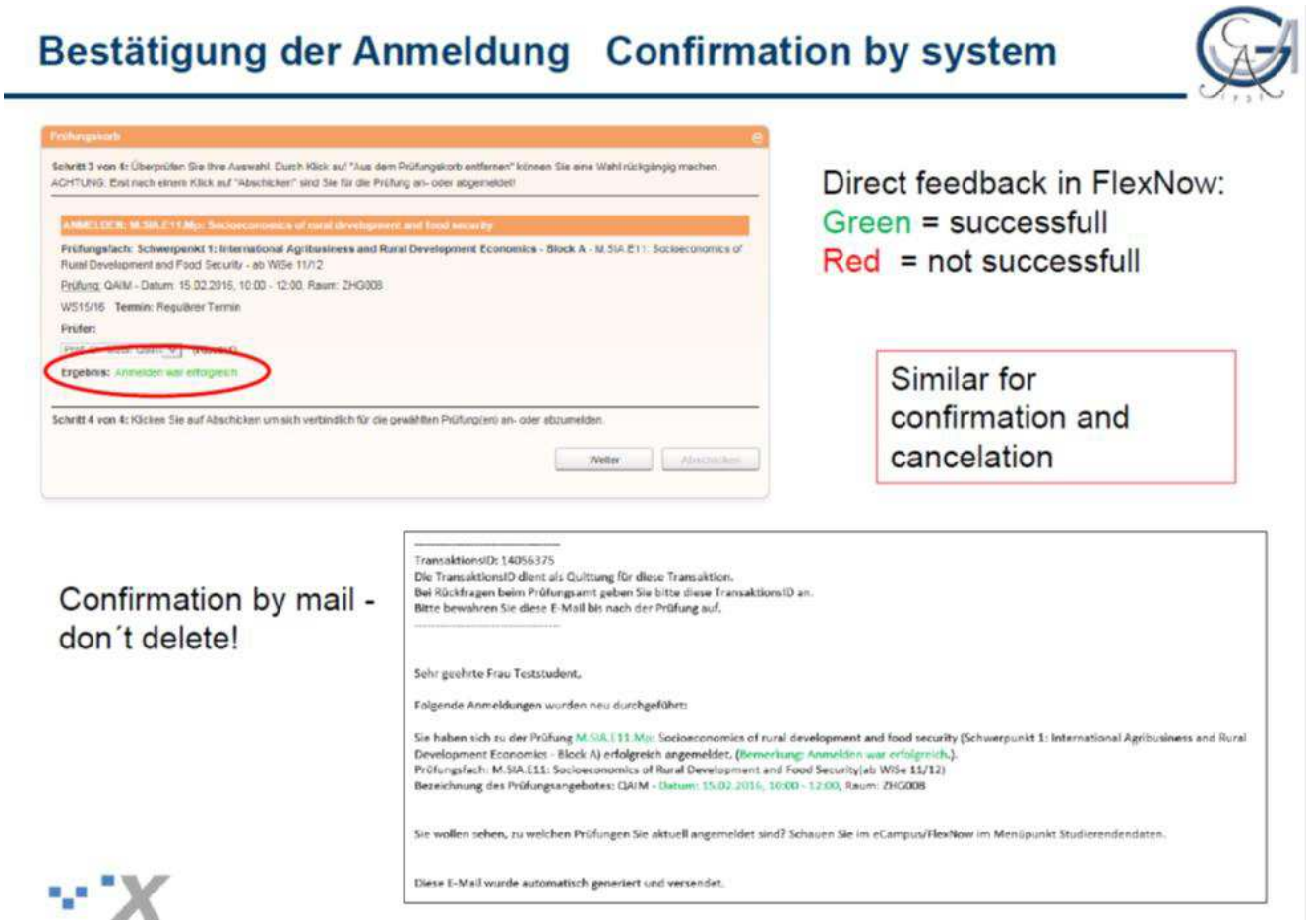
- Choose *Prüfungsan- und -abmeldung* and register with your matriculation number and your usual password.
- Under “Crop Protection (Master of Science)” open *Module im Masterstudiengang*.
- Select the module you would like to register for.
- Example: If you you want to register for “Pesticides I”, select the module. It either offers one or two possible exam dates that may be chosen, or in case you cannot register yet, a sentence saying “Gegenwärtig sind für dieses Prüfungsfach keine Aktionen möglich” (=“At the moment, there are no actions possible for this module”) appears.
- Once the possibility to register is given, click on the preferred examination date and go to the end of the page. Enter your password.
- Please be sure to select the module from the compulsory or elective compulsory or key competence module block for Crop Protection. **NOT DOUBLE DEGREE !!!!**
- To deregister, follow the same procedure; take out the check mark from the examination date and enter your password.

Register for exams



Register for exams





Absence does require de-registration! Otherwise the exam will be counted as failed!!

Standard deadlines for registration and cancellation:

Written exams

Registration up to **7 days** before the examination, **cancellation until 24 hours** before the examination date.

Oral examination

Registration and cancellation up to 7 days before the examination date (exam date defined by examiner), cancellation may only be possible until 5 days before the examination date.

Practical examinations

Registration for the coming semester is possible until two weeks after the end of the course in the preceding seminar, cancellation until two weeks before course start.

Withdrawal because of illness

If you cannot take an exam because of illness you have to provide a medical attestation from a doctor, which has to be sent with a form, which you find under this link to the examination office within 3 days:

http://www.uni-goettingen.de/en/recognition+of+an+illness/581217.html

In addition, you may as well inform the respective Professor.

If you miss the exam without attestation, the exam will be counted as failed.

Repeating exams

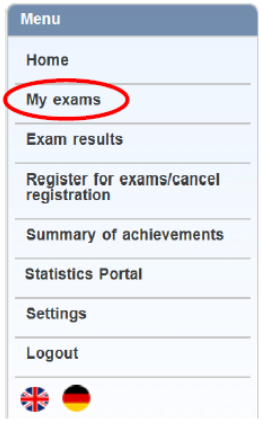
In case of failure the exam can be repeated. Only the new grade will count. You have a maximum of 3 attempts per course. The third failure will lead to exmatriculation.

Successfully completed modules cannot be repeated to improve the grade.

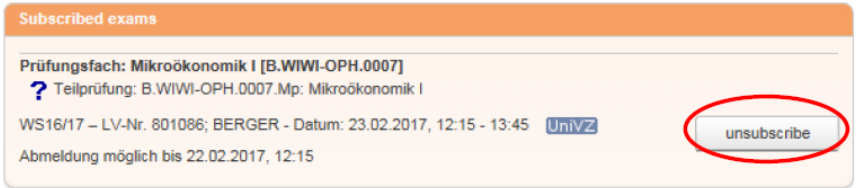
Detailed information can be found here:

http://www.uni-goettingen.de/de/438960.html

Cancel registration



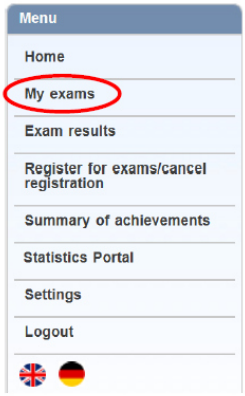
Type of exam	End of registration	End of cancelation
Writen exam	7 days prior (23:59)	24 hours prior (exact time)
Oral exam	7 days prior (23:59)	7 days prior (23:59)
Papers	0 hours prior	0 hours prior

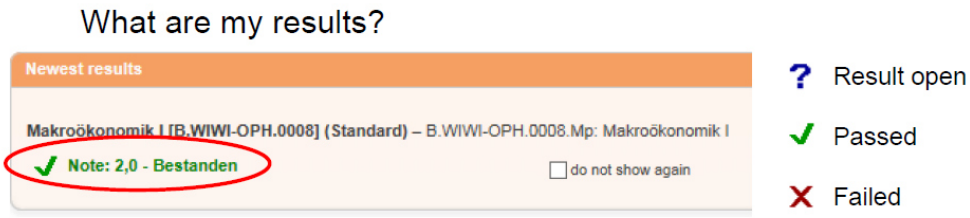


How to find your grades on Flexnow

To find your grades, go to http://www.uni-goettingen.de/en/45574.html

"My exams"





- Choose *Leistungsnachweis* and register with matriculation number and your usual password.
- There is a menu on the left side, where you choose *Studierendendaten*.
- Click now on *Abgelegte Prüfungen (zum Öffnen bitte hier klicken)* and open *Studiengang: Crop Protection (Master of Science)*.
- Here you find all passed, failed and registered exams and your grades.

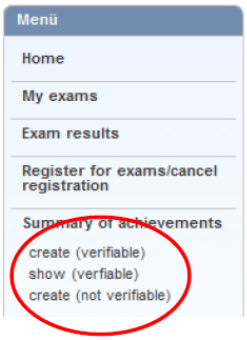
In FlexNow, it is additionally possible to generate the record of performance (Log-in on

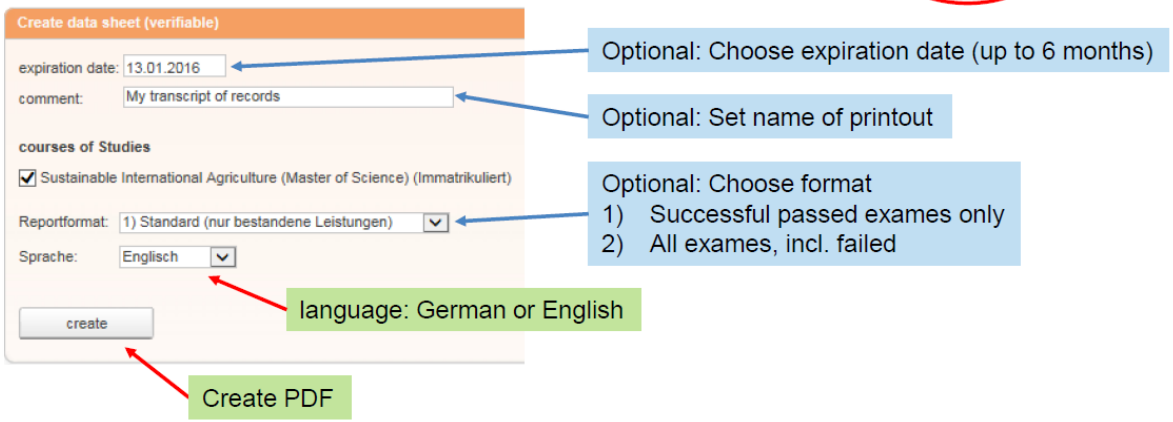
http://www.uni-goettingen.de/en/45574.html

under *Leistungsnachweis,* then ⇨ *Leistungsnachweis* ⇨ *erzeugen* ⇨ enter any future date and indicate language ⇨ click on *erzeugen*).

Summary of achievements

- Create summary of achievements on your own
- verifiable





3.4 eCampus, UniVZ, StudIP, FlexNow, Self Service functions, Email

Under **E-campus** students find all relevant information for their studies and links to UniVZ, StudIP, FlexNow, self service functions and email.

http://ecampus.uni-goettingen.de/ecampus/ (also available in English language)

Log in with your username (firstname.lastname) and your usual password.

The **UniVZ** is the internet-based information system of the university. It contains a lot of information and functions.

- List of all modules offered at the University of Göttingen including location, times, lecturer, contents.
- Module description (often incomplete), rather check here: Modules and Regulations
- Directory of institutes, rooms/facilities, and staff
- Individual schedule planner

http://univz.uni-goettingen.de (also available in English language)

StudIP is the central learning management platform of the university and helps you to manage and participate in your classes. It provides information, material and resources on classes online and is an interactive tool. You can:

- Up and download course specific information
- Register for courses **(please deregister if you decide not to participate!)**
- Manage schedules
- Take part in discussions
- Receive and write messages

To be able to make full use of StudIP's full functions you have to register and login to the system. The university provides a username and password for each student. This username and password is the same you use for your student e-mail-account or when you register for examinations.

When picking up the student ID card at the 'Chipkartenstelle' students also get log-in data for StudIP and email account with a personalized address (name.familyname@stud.uni-goettingen.de). Please check this email account regularly, because all emails and notifications by the university are sent **ONLY** to this account.

http://www.goettingen.studip.de (also available in English language).

To enter the **self-service functions** of the university, click on "*Self-service functions for students*" https://www.uni-goettingen.de/en/14632.html

and log in with your matriculation number or your user name and your usual password.

You can:

- change your contact details (*Kontaktdaten ändern – Anschriften, Telefon, Fax und E-Mail*)
- get new TAN-numbers (*TANs anfordern*)
- re-register (*Rückmeldung*)
- change pin or password (*PIN/Passwort ändern*)
- print enrolment certificates (*Bescheinigung ausdrucken*) - **Please download the enrolment certificate in the beginning of the semester!!** Once you re-register for the next semester you cannot access the form of the previous semester
- exmatriculate (*Exmatrikulation*)

To leave the self-service functions, use the button *Abmelden.*

You have an **email account** from the University of Göttingen, which can be checked here:

http://webmail.uni-goettingen.de.

4 SUB library

The library (Niedersächsische Staats- und Universitysbibliothek Göttingen, SUB) is one of the five largest scientific libraries in Germany. The central library (Zentralbibliothek) can be found here:

Platz der Göttinger Sieben 1,
37073 Göttingen

http://www.sub.uni-goettingen.de/index-e.html

Opening hours:
Monday – Friday 07.00 a.m. to 01.00 a.m.

Saturay – Sunday 09.00 a.m. to 10.00 p.m.

There is a lot of room for reading and studying. The copy machines may be used with coins or with a copy-card, which can be bought for € 5 (100 copies) in the counter (Monday to Wednesday and Friday 9.00 a.m. to 4.00 p.m., and Thursday from 9.00 a.m. to 6.00 p.m.). The computers in the SUB can be used with the usual student log-in. Furthermore, you can connect your personal laptop to the university's Wifi network.

5 Counselling service and improvement suggestions

If you have any questions regarding your studies, you can get advice. You can get help with the organization of your studies, if you have questions about the program or module combinations, and also for specific questions e.g. about the ECTS-credit system. For an appointment, please contact:

- Administrative questions: Dr. Lydia Pohl (crop.protection@uni-goettingen.de.)
- Scientific questions: Dr. Rebecka Dücker (rebecka.duecker@uni-goettingen.de)

Likewise, if you have any ideas, suggestions or criticism to bring in for the improvement of the study guide or even the study program, please tell or email them also to Dr. Rebecka Dücker.

6 Module list for Master of Science „Crop Protection“

I. Compulsory modules

M.Cp.0002	Internship, 6-8 weeks of practical work and a report	(9 C)
M.Cp.00	Scientific Presenting, Writing, Paper Reviewing and Publishing in Crop Protection	(6 C/ 2 h per sw)
M.Cp.0019	Basic Laboratory Techniques	(3 C/ 1 week practical)
M.Cp.0006	Pesticides I: Mode of Action and Application Techniques, Resistance to Pesticides	(6 C/ 4 h per sw)
M.Cp.0007	Pesticides II: Toxicology, Ecotoxicology, Environmental Metabolism, Regulation and Registration	(6 C/ 4 h per sw)

II. a) Elective compulsory modules

M.Cp.0004	Plant Diseases and Pests in Temperate Zones	(6 C/ 4 h per sw)
M.Cp.0005	Integrated Management of Pests and Diseases	(6 C/ 4 h per sw)
M.Agr.0009	Biological Control and Biodiversity	(6 C/ 4 h per sw)
M.Agr.0023	Interactions between Plants and Phytopathogens	(6 C/ 4 h per sw)
M.Cp.0008	Fungal Toxins	(6 C/ 4 h per sw)
M.Agr.0039	Molecular Techniques in Phytopathology	(6 C/ 4 h per sw)
M.Agr.0120:	Molecular Diagnostic and Biotechnology in Crop Protection	(6 C/ 4 h per sw)
M.Agr.0094	Basics of Molecular Biology in Crop Protection	(6 C/ 4 h per sw)
M.Agr.0045	Mycology	(6 C/ 4 h per sw)
M.Cp.0010	Plant Pathology and Crop Protection Seminar (currently not offered)	(3 C/ 2 h per sw)
M.Agr.0057	Plant Virology	(6 C/ 6 h per sw)
M.Agr.0058	Plant Herbivore Interactions	(6 C/ 4 h per sw)
M.Cp.0011	Agricultural Entomology Seminar	(3 C/ 2 h per sw)
M.Cp.0012	Weed Biology and Weed Management	(6 C/ 4 h per sw)
M.Agr.0056	Plant Breeding Methodology and Genetic Resources	(6 C/ 4 h per sw)
M.Agr.0010	Biotechnological Applications in Plant Breeding	(6 C/ 4 h per sw)
M.Cp.0014	Plant Nutrition and Plant Health	(3 C/ 2 h per sw)
M.Cp.0015	Molecular Weed Science	(3 C/ 2 h per sw)
M.Agr.0146	Nematology	(3 C/ 2 h per sw)
M.Cp.0023	Plant Pathogenic Bacteria	(3 C/ 2 h per ww)
M.Cp. 0024	Digital Techniques for Crop Monitoring	(6 C/ 4 h per sw)
M.Cp.0025	Analytical Techniques for Foods and Agricultural Research	(6 C/4 h per sw)
M.Agr.0174	Plant Health Management in Tropical Crops	(6 C/4 h per sw)

M.SIA.P22	Management of Tropical Plant Production Systems	(6 C/4 h per sw)
P 07 SIA	Soil and Plant Sciences	(6 C/4 h per sw)
P 03 SIA	Ecological Soil Biology	(6 C/4 h per sw)
P 15M SIA	Methods and Advances in Plant Protection	(6 C/4 h per sw)

II b). Key competences

M.Cp.0016	Practical Statistics and Experimental Design in Agriculture	(6 C/ 4 h per sw)
M.WIWI-QMW.0004	Econometrics I	(6 C/ 4 h per sw)

III. Master's thesis/Presentation and Defense (Colloquium)

For completion of the Master's thesis 24 credits are acquired. For successful presentation and defense of the master thesis 6 credits are acquired.

7 Exemplary Study Plan for the Master's Program „Crop Protection"

<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>Winter

1. Sem.

30 C</td><td>M.Cp.0005
Integrated Management of Pests and Diseases
6 C</td><td>Compulsory:
M.Cp.0019
Basic Laboratory Techniques
3 C
+
M.Agr.0173:
Nematology
3 C</td><td>Compulsory:
M.Cp.0006
Pesticides I:
Mode of Action and Application Techniques
6 C</td><td>M.SIA.P22
Management of Tropical Plant Production Systems
6 C</td><td>M.Agr.0045
Mycology
Block practical
6 C

or

M.Agr. 0058
Plant Herbivore Interactions
6 C</td></tr>
<tr><td>Summer

2. Sem.

30 C</td><td>Key Competences:
M.Cp.0016
Practical Statistics and Experimental Design in Agriculture
6 C

or

M.WIWI-QMW.0004:
Econometrics I
6 C</td><td>M.Cp.0004
Plant Diseases and Pests in Temperate Zones
6 C</td><td>Compulsory:
M.Cp.0026:
Scientific Presenting, Writing, Paper Reviewing and Publishing in Crop Protection
6 C</td><td>M.Cp.0012
Weed Biology and Weed Management
6 C</td><td>M.Agr.0094
Basics of Molecular Biology in Crop Protection
6 C</td></tr>
<tr><td>9 C</td><td colspan="5">Compulsory:
M.Cp.0002
Internship (6 weeks)
9 C</td></tr>
<tr><td rowspan="2">Winter
3. Sem.

24 C</td><td>M.Cp. 0014
Plant Nutrition and plant health
3 C</td><td>M.Cp.008
Fungal Toxins
6 C

or

M.Agr.0039
Molecular Techniques in Phytopathology
6 C</td><td>Compulsory:
M.Cp.0007
Pesticides II:
Toxicology Ecotoxicology, Environmental Metabolism, Regulation and registration
6 C</td><td>M.Agr.0023
Interactions between Plants and Pathogens
6 C

or

M.Agr.0057
Plant Virology
6 C</td><td>M.Cp.0020
Ecotoxicological Risk Assessment for Plant Protection Products
3 C
+
M.Cp.0015
Molecular Weed Science
3 C</td></tr>
<tr><td colspan="4">Compulsory:
M.Cp.0002
Internship Seminar</td></tr>
<tr><td>Summer
4. Sem.
30 C</td><td colspan="4">Master's Thesis
24 C</td><td>Thesis presentation and defense (colloquium)
6 C</td></tr>
</table>

Total 120 C

8 Time tables

8.1 M.Sc. Crop Protection - First year, 1st semester – winter term 2025/2026

	Time	Module Code	Module	Lecturers	Type	Location
Mon	10:00-11:30	P22SIA	Management of Tropical Plant Production Systems	Rötter	L	L318
	10:15 – 11:45	M.Cp.0023	Plant Pathogenic Bacteria	Kuzmanovic	L	L44
	14:15-15:45	M.Cp.0012	Molecular Weed Science	Wagner, Dücker	L	L44
	16:15-17:45	M.Agr.0058	Plant-Herbivore Interactions	Rostás	L, S	L07
Tue	08:15-09:45	M.Agr.0057	Plant Virology	Varrelmann	L	L 44
	10:15-11:45	M.Agr.0023	Interactions between Plants and Phytopathogens	Koopmann, Varrelmann	L	L07
	12:15-13:45	M.Agr.0058	Plant-Herbivore Interactions	Rostás	L, S	MN06
	14:15-15:45	P22 SIA	Management of Tropical Plant Production Systems	Rötter	L	L318
	16:15-17:45	Seminar Plant Pathology	Seminar Plant Pathology (currently not offered)	Koopmann, Mikaberidze	S	L44
	16:00-17:30	M.Agr.0044	Molecular Diagnostics and Biotechnology in Crop Protection	Varrelmann	L	L07
Wed	08:15-09:45	M.Cp.0005	Integrated Management of Pests and Diseases	Mikaberidze, Balakrishnan, Dücker	L	L07
	13:15- 15:45	M.Cp.0015	Molecular Weed Science Practical Course	Wagner, Dücker	P	GP 0.121
Thurs	10:15-11:45	M.Cp.0005	Integrated Management of Pests and Diseases	Balakrishnan, Mikaberidze, Dücker	L	L07
	14:15-15:45	M.Cp.0006	Pesticides I	Mikaberidze, Rostás	L	L44
	16:00-17:30	M.Agr.0044	Molecular Diagnostics and Biotechnology in Crop Protection	Varrelmann	L	L07
Fri	10:30-12:00 23 Jan & 30 Jan 18/19 Dec	M.Cp.0006 Pesticide Application Techniques Bayer Monheim	Pesticides I	Mikaberidze, Rostás	L	L44
	14:15-15:45	M.Cp.0014	Plant Nutrition and Plant Health	Dittert	L	L02

		BLOCK	PRACTICAL COURSES	Lecturers	Type	Location
Block	20 - 24 Oct 16 - 20 Febr	M.Cp.0016	Basic Laboratory Methods	Sirrenberg	P	GP 0.121
Block	23 Febr - 06 March	M.Cp.0008	Fungal Toxins (may not take place)	Al-Hussein	P	Seminar Room (2nd floor)
Block	23 Febr - 06 March	M.Agr.0045	Mycology	Mikaberidze, Koopmann	P	GP 0.121
Block	16 - 20 March 23 – 27 March	M.Agr.0023	Interactions between Plants and Phytopathogens	Koopmann	P	Lab/Bib 1.134
Block	16 – 20 March	M.Cp.0020	Ecotoxicological Risk Assessment for Plant Protection Products	Weltje	P	GP 0.121
Block	9 - 13 March	M.Agr.0057	Plant Virology	Varrelmann	P	GP 0.121
Block	23 – 27 March	M.Agr.0146	Nematology	Kiewnick	P	GP 0.121

***Please check information on StudIP. Dates may still change.**

8.2 M.Sc. Crop Protection - First year, 2nd semester – summer term 2026

Day	Time	Module Code	Module	Lecturer	Type	Location
Mon	8:15 – 9:45	M.Cp.0016	Practical Statistics and Experimental Design in Agriculture	Scholten, Sharifi, Kluth	L	L 06
	14:15-15:45	M.Cp.0015	Weed Biology and Weed Management	Dücker, Wagner	L	L44
	14:15-15:45	M.Agr. 0056	Plant Breeding Methodology and Genetic Resources	Link	L, P	L 01
Tues	9.15 -10:45	M.Agr.0174	Plant Health Management in Tropical Crops	Rostás	S	L 07
	13:15-14:45	M.Agr.0094	Basics of Molecular Biology in Crop Protection	Sirrenberg, Varrelmann	L	L44
	16:15-17:45	M.Cp. 0010	Plant Pathology and Plant Protection Seminar	Koopmann, Mikaberidze	S	L 44
	12:15-15:45	M.Cp.0016	Practical Statistics and Experimental Design in Agriculture	Scholten, Sharifi, Kluth	L	L 06
Wed	12:15-15:45	M.Cp.0016	Practical Statistics and Experimental Design in Agriculture	Scholten, Sharifi, Kluth	L	L 06
Thurs	8:15-9:45	M.Cp.0026	Scientific Presenting, Writing, Paper Reviewing and Publishing in Crop Protection	Mikaberidze, Rostás Dücker, Pfordt, Wagner	L, S	L 44
	14:15-15:45	M.Agr.0056	Plant Breeding Methodology and Genetic Resources	Scholten, Link	L, P	L 02
	16:15-17:45	M.Agr.0094	Basics of Molecular Biology in Crop Protection	Sirrenberg, Varrelmann	L	L 44
Fri	08:30-10:00	M.Cp.0015	Weed Biology and Weed Management (field trips)	Dücker,Wagner	P	L 44
	10:00 – 12:00	M.Cp.0004	Plant Diseases and Pests in Temperate Zones	Koopmann,Vosteen	L, P	L 07
	13:00-15:00	M.Cp.0004	Plant Diseases and Pests in Temperate Zones	Koopmann, Vosteen	L, P	L 07
			BLOCK COURSES	**Lecturers**		
Block	September 2 weeks	M.Agr.0039	Molecular Techniques in Phytopathology	Koopmann	P	

8.3 M.Sc. Crop Protection - Second year - winter term 2025/26

Day	Time	Module Code	Module	Lecturer	Type	Location
Mo	10:15 – 11:45	M.Cp.0023	Plant Pathogenic Bacteria	Kuzmanovic	L	L44
	14:15-15:45	M.Cp.0012	Molecular Weed Science	Wagner, Dücker	L	L44
	16:15-17:45	M.Agr.0058	Plant-Herbivore Interactions	Rostás	L, S	L07
Tue	8:15-9:45	M.Agr. 0057	Plant Virology	Varrelmann	L	L44
	10:15-11:45	M.Agr.0023	Interactions between Plants and Phytopathogens	Koopmann, Varrelmann,	L	L07
	16:15-17:45	Seminar Plant Pathology	Seminar Plant Pathology	Koopmann, Mikaberidze	S	L44
	16:00-17:30	M.Agr.0044	Molecular Diagnostics and Biotechnology in Crop Protection	Varrelmann	L	L07
Wed	13:15- 15:45	M.Cp.0015	Molecular Weed Science Practical Course	Wagner, Dücker	P	GP 0.121
	18:15-19:45	E 13M	Quantitative Methods in Agricultural Business Economics	Läpple	L	VG.3.108
Thu	12:15-13:45	M.Agr.0058	Plant-Herbivore Interactions	Rostás	L,S	L07
	16:00-17:30	M.Agr.0044	Molecular Diagnostics and Biotechnology in Crop Protection	Varrelmann	L	L07
Fri	08:30-10:00	M.Cp.0007	Pesticides II	Dücker and special lecturers	L	L318
	10:30-12:00	M.Cp.0007	Pesticides II	Dücker and special lecturers	L	L318
	14:15-15:45	M.Cp.0014	Plant Nutrition and Plant Health	Dittert	L	L02

		BLOCK	PRACTICAL COURSES	Lecturers	Type	Location
Block	2 weeks in October	M.Agr. 0010	Biotechnological Applications in Plant Breeding	Möllers, Ecke	P	
Block	1 week in October	M.CP 0024	Digital Techniques for Crop Monitoring	Mahlein, Paulus	P	
Block	2 weeks in March	M.Agr.0057	Plant Virology	Varrelmann	P	
Block	2 weeks	M.Cp.0025	Analytical Techniques for Foods and Agricultural Research	Alhussein	P	
Block	2 weeks in October	M.Agr.0009	Biological Control and Biodiversity	Rostás	L/P/S	L07
Block	1 week Feb/March	M.Agr.0023	Interactions between Plants and Phytopathogens	Koopmann	P	L07
Block	2 weeks in March	M.Cp. 0008	Fungal Toxins	Alhussein	P	Seminar Room (2nd floor)

9 Location

Most lectures are held in the building for Agricultural Sciences/Plant Pathology in Grisebachstr. 6:

Modulverzeichnis

für den konsekutiven Master-Studiengang "Crop Protection" - zu Anlage 2 der Prüfungs- und Studienordnung für Master-Studiengänge der Fakultät für Agrarwissenschaften (Amtliche Mitteilungen I Nr. 26/2023 S. 856)

Module *Modules*

Übersicht nach Modulgruppen *Overview by module groups*

I. Master-Studiengang "Crop Protection" *Master's program in "Crop Protection"*

Es müssen Leistungen im Umfang von insgesamt wenigstens 120 C erfolgreich absolviert werden.

The following examination components with a rating of at least 120 C should be successfully completed:

1. Fachstudium *Specialized studies*

a. Pflichtmodule *Compulsory modules*

Es müssen folgende Pflichtmodule im Umfang von insgesamt 30 C erfolgreich absolviert werden.

The following obligatory modules amounting to a total of 30 C must be completed successfully.

2. Professionalisierungsbereich *Professionalization studies*

a. Wahlpflichtmodule *Elective modules*

Es müssen Wahlpflichtmodule im Umfang von insgesamt mindestens 54 C erfolgreich absolviert werden. Ferner können Wahlmodule im Umfang von bis zu 18 C aus den Master-Studiengängen in den Agrarwissenschaften der Universität Göttingen und ein Modul (maximal 6 C) aus dem Masterstudiengang einer anderen Fakultät mit thematischem Bezug zum Studiengang frei gewählt werden.

Elective compulsory modules amounting to a total of at least 54 C must be completed successfully. Up to 18 C in the area of professionalisation can be taken by modules from other master courses of studies in the Agricultural Sciences of the University of Göttingen. In addition, upon request to the examination board, a module amounting to a maximum of 6 C from a master course of study of another faculty may be taken and credited for the area of professionalisation.

b. Schlüsselkompetenzen *Key competences*

Es muss mindestens eins von zwei Wahlpflichtmodulen im Umfang von 6 C erfolgreich absolviert werden.

At least one of two elective compulsory modules amounting to 6 C must be completed successfully.

3. Masterarbeit *Master's thesis*

Durch die erfolgreiche Anfertigung der Masterarbeit werden 24 C erworben.

24 C are awarded for successful completion of the master thesis.

4. Kolloquium zur Masterarbeit *Kolloquium of the master's thesis*

Durch das erfolgreiche Absolvieren des Kolloquiums zur Master-Arbeit werden 6 C erworben.
6 C are awarded for successful completion of the colloquium on the master thesis.

Georg-August-Universität Göttingen **Module M.Agr.0003: Agribusiness Sugar Beet- an advanced education for graduate students and junior employees of the sugar supply chain (English)**	6 C

Learning outcome, core skills: • profound knowledge in the following fields of the sugar value chain: breeding and other upstream sectors, technology of the sugar and bioethanol industry and biogas production, other downstream sectors, sugar market, agricultural policy • detailed identification of causal relationships in the process management on the basis of recent scientific knowledge • knowledge enhancement by interpreting scientific figures and tables and their statistics • opportunity of an advanced education particularly suitable as an on-the-job training program • opportunity to develop a professional network with other graduate students and external participants from different professional backgrounds and sugar beet growing areas worldwide	**Workload:** Attendance time: 54 h Self-study time: 126 h

Course: Agribusiness Sugar Beet - an advanced education for graduate students and junior employees of the sugar supply chain (English) (Block course, Lecture, Excursion) *Contents*: In comparison to other cash crops the refining of sugar from sugar beet is characterized by a considerable degree of cooperation between agriculture and food industry. Consequently all specific impacts of the entire production chain of sugar from beet are covered by this module as there are plant breeding, soil cultivation, growing impacts from sowing to harvest including all technical and cultivation aspects, crop yield, extension services, weed control, pathogen and pest management, precision agriculture, as well as definition and analysis of the technical quality, processing technology of sugar beets, logistics of harvest and transportation, global trade, sugar as food and its marketing. The module consists of lectures by invited speakers and lecturers of the Institute of Sugar Beet Research, workshops, field trips and excursion.	
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** Knowledge of the sugar value chain and understanding of different influences on the system on the basis of the latest scientific insights.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Anne-Katrin Mahlein
Course frequency: each summer semester	**Duration:** 2 weeks

Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

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

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

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

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

Georg-August-Universität Göttingen **Modul M.Agr.0010: Biotechnological Applications in Plant Breeding** *English title: Biotechnological Applications in Plant Breeding*	6 C 4 SWS

Learning objectives/skills: Students learn how to independently apply biotechnological methods to current problems and develop solutions. They learn to analyze and process complex scientific texts and communicate them to third parties in an understandable form.	**Workload:** Attendance time: Self-study time: 124 Hours

Course: Biotechnological Applications in Plant Breeding (Block course, practical course, lecture, seminar) *Contents:* In this module, students acquire in-depth theoretical and practical knowledge of biotechnological and molecular genetic methods in plant breeding. As part of the student seminars, current applications in plant breeding and agriculture are presented and their effects are critically discussed. Key theoretical and practical topics include the application of rapid in vitro propagation, the production and use of haploids, interspecific sexual and somatic hybridization, direct and indirect gene transfer, biochemical and molecular characterization of transgenic plants, current applications in genetic engineering and risk assessment, properties and application of various types of molecular markers in plant breeding.	4 SWS
Examination: Written exam (90 Minutes) **Examination requirements:** In-depth and complex theoretical knowledge of the most important biotechnological methods and applications in plant breeding	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Module coordinator:** Dr. Christian Möllers
Course frequency: every winter semester	**Duration:** 1 Semester
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Georg-August-Universität Göttingen | 6 C, 4 SWS

Modul M.Agr.0023: Interactions between plants and pathogens

English title: Interactions between Plants and Pathogens

Learning objectives/skills:

Knowledge of complex interactions between plants and pathogens. Derivation of scientific questions and critical evaluation of applied methods supported by own practical laboratory work.

Workload: 56 h
Attendance time:

Self-study time:
124 Hours

Course: Interactions between plants and pathogens as well as viruses | 4 SWS

(Exercise,Lecture)

Contents:

The module deals with the interaction of plants with phytopathogenic fungi, bacteria, and viruses. It covers fungal, bacterial, and viral aspects of infection theory. In this context, spore germination, penetration, and spread of pathogens (including virus replication and spread) in the host plant are presented. The study of infection is followed by a description of plant resistance factors (preformed and induced), their significance, and the possibilities for inactivation on the part of the pathogen. The module also covers phenomena such as induced and/or systemically acquired resistance (SAR). The Agrobacterium tumefaciens / dicotyledonous plant pathosystem is discussed in detail. The gene-for-gene hypothesis and its experimental verification are explained using concrete examples. Well-known resistance genes are briefly discussed and examples are given. As part of the practical component, students will extract phytoalexins from rapeseed and perform analytical procedures to verify their presence and biological effectiveness using chromatographic techniques (HPLC and TLC bioassay).

Examination: Written exam (90 Minutes) | 6 C

Prüfungsvorleistungen:

Participation in the practical part of the module following the lecture and preparation of a report accepted by the examiners in terms of content.

Examination requirements:

Profound knowledge of infection processes in viruses, bacteria, and fungi, mechanisms of host colonization, pathogen recognition, signal transduction, preformed and induced resistance mechanisms, and the gene-for-gene hypothesis

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Module coordinator:** Dr. Birger Koopmann
Course frequency: every winter semester	**Duration:** 1 Semester
Number of repeat examinations permitted:	**Recommended semester:**

twice	
Maximum number of students: 36	

Georg-August-Universität Göttingen | 6 C, 4 SWS

Modul M.Agr.0039: Molecular Techniques in Phytopathology

English title: Molecular Techniques in Phytopathology

Learning objectives/skills:

Methodological knowledge in handling nucleic acids, derivation of methodological approaches to scientific questions. Presentation of results and fundamental methodological knowledge as well as interpretation of results in self-study: framework of a final discussion. 56 Hours

Workload:

Attendance time:

Self-study time:
124 Hours

Course:Molecular Techniques in Phytopathology (Exercise, Lecture) 4 SWS

Contents:

During this internship, basic molecular biology techniques are taught with the help of experiments: isolation of plasmids and total DNA as well as DNA fragments from agarose gels, restriction analysis, agarose gel electrophoresis, cloning of PCR products (enzymatic modification, ligation), transformation and in vivo amplification of plasmids, DNA blotting, labeling of DNA probes with non-radioactive methods (DIG-dUTP), Southern hybridization and immunological detection of hybridized probes with chemiluminescent substrates, ITS-RFLP analyses of fungal rapeseed pathogens, real-time PCR diagnostics of mycotoxin-producing fungal cereal pathogens. The accompanying lecture component covers fundamental and application-related knowledge of nucleic acid chemistry and protein chemistry, which is necessary for understanding not only the techniques presented. In addition, an application-related component presents and discusses approaches to solving specific scientific problems.

Examination: Oral (ca. 30 Minutes) | 6 C

Prerequisites for examination:

Preparation of an internship report accepted by the examiner

Examination requirements:

Basic knowledge of the structure of nucleic acids, enzymes and their use in molecular biology experiments, standard analytical methods (Southern blot, PCR, electrophoresis, DNA sequencing), multivariate data analysis, and the use of various methods for scientific questions.

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Module coordinator:** Dr. Birger Koopmann
Course frequency: every summer semester	**Duration** 1 Semester
Number of repeat examinations permitted: twice	**Recommended semester:**

Maximum number of students: 16	

Georg-August-Universität Göttingen | 6 C, 4 SWS

Modul M.Agr.0045: Mycology

English title: Mycology

Learning objectives/skills:
Dealing with and identifying phytopathogenic fungi. Experimental work in the context of various phytopathological issues. Group work with spokesperson role, evaluation, and presentation of test results in an English-language presentation.

Workload:
Attendance time:
56 Hours
Self-study time:
124 Hours

Course: Mycology (Exercise, Lecture) — 4 SWS

Contents:

Overview of the ecology and taxonomy of phytopathologically relevant fungi. Exercises in taxonomic classification based on morphological characteristics in pure cultures, conducting experiments on fungal isolation, antagonist extraction, detection of natural fungistats in soil, seed disinfection, in situ studies on the pathogenesis of biotrophic and necrotrophic fungi, race determination in powdery mildew, investigations into fungicide resistance.

Examination: Oral (ca. 20 Minutes) — 6 C

Prerequisites for examination:
Group protocol and presentation of results

Examination requirements:
Basic knowledge of fungal taxonomy, life cycles, ecological requirements, diagnostic characteristics, diseases and plant-associated structures, defense mechanisms, and methods

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Module coordinator:** Prof. Dr. Anke Sirrenberg
Course frequency: every winter semester	**Duration** 1 Semester
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 1
Maximum number of students: 12	

Georg-August-Universität Göttingen | 6 C, 4 SWS

Modul M.Agr.0056: Plant breeding methodology and genetic resources

English title: Plant Breeding Methodology and Genetic Resources

Learning objectives/skills:
Students learn to integrate classical and molecular methods and techniques in solving plant breeding problems. They learn to draw their own conclusions from classical and recent publications and to communicate these to scientists and students in a comprehensible, concise, and clear manner.
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Workload:
Attendance time:
56 Hours
Self-study time:
124 Hours

Course:Plant breeding methodology and genetic resources (Lecture) 4 SWS

Contents:

Fundamentals of breeding methodology: population genetics, breeding methods in clonal, line, hybrid, and population breeding, marker-assisted selection for monogenic and polygenic traits. Use of plant genetic resources: wild species, ex situ and in situ conservation, on-farm management. Breeding for marginal locations with examples from temperate and tropical latitudes.
This module and the module “Genetic Principles of Plant Breeding” complement each other.

Examination: Written exam (weighting: 80%, duration: 90 minutes), presentation, lecture, or co-lecture (weighting: 20%, duration: approx. 20 minutes) — 6 C

Examination requirements:
Fundamentals of: population genetics, use of markers in plant breeding, concepts for the use of plant genetic resources. Good knowledge of: pre-breeding, categories and methods of plant breeding.

Admission requirements: none	**Recommended previous knowledge:** none
Language: Deutsch, English	**Module coordinator:** apl. Prof. Dr. Wolfgang Link
Course frequency: every summer semester	**Duration** 1 Semester
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Georg-August-Universität Göttingen **Module M.Agr.0057: Plant Virology**	6 C 6 WLH

Learning outcome, core skills:	**Workload:**
Knowledge in classical and molecular Plant Virology, Learning of practical plant virus detection methods with electron-optical methods, immunological methods. Deduction of scientific questions and hypotheses and critical review of methods applied based on personal lab experience.	Attendance time: 80 h Self-study time: 100 h

Course: Plant Virology (Internship, Lecture) *Contents*: Lecture: systematics, vectors, modes of transmission, genome organisation, gene expression strategies, control strategies Practical course: learning of diagnostic methods, symptom recognition, immunogical and molecular detection methods	6 WLH
Examination: Written exam (45 minutes, weighing 50%) and term paper (max. 20 pages, weighing 50%) **Examination prerequisites:** Regular participation at the practical course following the lecture **Examination requirements:** Understanding of the imparted detection methods and knowledge about virus biology.	6 C

Admission requirements:	**Recommended previous knowledge:**
none	none
Language: English	**Person responsible for module:** Prof. Dr. Mark Varrelmann
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 16	

Georg-August-Universität Göttingen **Modul M.Agr.0058: Plant herbivore interactions** *English title: Plant-Herbivore Interactions*	6 C 4 SWS

Learning objectives/skills:	**Workload:**
Knowledge of complex interactions between plants and herbivorous insects. Derivation of scientific questions and critical evaluation of applied methods by developing your own seminar paper on current research results.	Attendance time: 60 Hours Self-study time: 120 Hours

Course:Plant herbivore interactions (Lecture,Seminar) *Contents:* This module deals with the interaction between plants and herbivorous insects. The diversity of the organisms involved and the biotic communities are presented. On the plant side, the various defense strategies, including resistance mechanisms against herbivores, are presented by way of example. The sensory equipment of herbivorous insects for recognizing plants is described. Multiple interactions between plants, herbivores, and natural antagonists, as well as possible applications, are discussed. Finally, the interrelationships between plants and pollinating or flower-visiting insects are addressed. As part of the seminar section, students will present their latest research findings and discuss them in relation to the topics covered in the lectures. The seminar will take place on Wednesdays from 1:00 p.m. to 3:00 p.m.	4 SWS
Examination: Written exam (weight: 67%, duration: 45 minutes) and presentation, lecture, or co-lecture (weight: 33%, duration: approx. 20 minutes) **Prerequisites for examination:** Participation in seminars and preparation and presentation of a seminar paper. **Examination requirements:** Comprehensive knowledge of the key factors influencing host plant selection by herbivorous insects, plant defense strategies, determinants for herbivorous communities on specific plants, multitrophic interactions between plants, herbivorous insects, and antagonists; interactions between plants and pollinators. Both parts of the exam must be successfully completed and passed.	6 C

Admission requirements:	**Recommended previous knowledge:**
none	none
Language: English	**Module coordinator:** Prof. Dr. Michael Georg Rostás
Course frequency: every winter semester	**Duration** 1 Semester
Number of repeat examinations permitted: twice	**Recommended semester:**

Maximum number of students: 20	

Georg-August-Universität Göttingen **Modul M.Agr.0094: Basics of Molecular Biology in Crop Protection** *English title: Basics of Molecular Biology in Crop Protection*	6 C 4 SWS

Learning objectives/skills: Understanding of the fundamentals of important agricultural research methods such as ELISA and PCR, understanding of the biochemical and molecular biological fundamentals of breeding and plant resistance to pests.	**Workload:** Attendance time: 56 Hours Self-study time: 124 Hours
Course:Grundlagen und Anwendung der Molekularbiologie in der Phytomedizin (Lecture) *Contents:* Biochemical and molecular biological methods are increasingly being used in agricultural research and diagnostics. The lecture teaches the basics necessary for understanding these methods and prepares students for advanced practical courses and lectures. Topics covered include: cytology, structure of cell walls of different groups of organisms, structure and function of macromolecules (proteins, DNA, RNA, carbohydrates), function and regulation of enzymes, DNA replication, transcription and translation, regulatory mechanisms, introduction to the principle of basic molecular detection methods, lipids and membranes, phytohormones, selected secondary substances.	4 SWS
Examination: Written exam (90 Minutes) **Examination requirements:** Structure of macromolecules, starting materials, typical types of bonds, function, significance, regulatory mechanisms at the protein and nucleic acid level, phytohormones, secondary metabolism	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Module coordinator:** Dr. Anke Sirrenberg
Course frequency: every summer semester	**Duration** 1 Semester
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.Agr.0120: Molecular Diagnostic and Biotechnology in Crop Protection**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Participants will be able to understand nucleic acid based as well as immunologic diagnostic tools for detection of plant pathogens and pests. More the ability to select appropriate diagnostic techniques and make informed decisions regarding their development and application is one of the core skills. Students shall understand the role of biotechnology in plant protection and resistance breeding to be able to assess the potentials and risks of GM crops and other GMOs in plant protection.	Attendance time: 65 h Self-study time: 115 h

Course: Molecular Diagnostic and Biotechnology in Crop Protection (Lecture) *Contents*: Principles and applications of diagnostic techniques in plant protection with a focus on nucleic acid analysis (characteristics as accuracy, detection level, multiplexing, quantification, portability, and designability). Nucleic acid detection: RT-PCR viruses, group specific primers, multiplex dsRNA-diagnosis (viruses), qPCR (SYBR, TaqMan, fluorophores), Nested-PCR, RFLP, MLSA, ddPCR (phytoplasma), Barcoding (fungi, insects, weeds) SNP-genotyping (KASP, etc.), RCA (DNA viruses, Padlock-probes), Hybridisation (dot-blot viruses, RNAscope, SABER-FISH), DNA-arrays (microarrays), HTS/NGS/ Transcriptomics (Virome/metagenomics analysis, discovery of new virus diseases), Sequencing platforms (Roche 454, Illumina, Solid and Ion Torrent, SMRT and MinION nanopore sequencing), Isothermal amplification techniques (LAMP, RPA, HAD, NASBA), CRISPR based diagnosis (viruses) Molecular detection of specific traits (fungicide, herbicide, insecticide resistance). Protein detection: ELISA, TPIA, LFA, Immune fluorescence, ISEM electron microscopy, confocal microscopy and fluorescent labelled viruses, Immuno(capture)-PCR, Luminex. Biotechnology in plant protection: Crop trait targets, techniques to increase genetic diversity, cisgenesis, NGS and third generation sequencing, omics, genetically modified organisms (GMOs) in engineering resistance to viruses, pests, herbicides, bacterial and fungal pathogens, genome editing tools, applications of RNA interference and epigenome modifications, RNAi machinery, cross-kingdom RNAi, VIGS, HIGS, SIGS, Epigenetics, regulation and public acceptance, risk assessment	4 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** Understanding concepts and technical principles of molecular diganostic methods and the applicatoin of molecular markers and plant biotechnology in plant protection. Demonstration of the ability to read primary literature that describes applications of techniques covered by the module	6 C

Admission requirements:	**Recommended previous knowledge:**
none	none

Language: English	**Person responsible for module:** Prof. Dr. Mark Varrelmann
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Georg-August-Universität Göttingen | 3 C
Module M.Agr.0173: Nematology | 2 WLH

Learning outcome, core skills:
Basic knowledge of nematode biology, importance as pests; basic methods with regard to their detection, identification and measures of control, use of beneficial nematodes in biological insect control programs; their role in regulation of processes in ecosystems.

Workload:
Attendance time: 40 h
Self-study time: 50 h

Course: Nematology (Exercise, Seminar)
Contents:
The module deals with the biology of nematodes and their importance in plant protection. The most important taxa of nematodes are presented using permanent slides and living specimen; the most important morphological characters will be identified.

Interactions between plant parasitic nematodes, their host plants and antagonistic microorganisms will be discussed. The use of nematodes for innundative biological control will be discussed as well. During the course, students will become familiar with different plant parasitic nematode species and will learn basic techniques for detection and identification. Plant parasitic nematodes will be used to demonstrate effects of different compounds on activity and viability.

Examination: Written examination (45 minutes) | 3 C
Examination requirements:
Basic knowledge of morphological characters of nematodes; species identification by DNA-barcoding ability to discriminate between different feeding types of nematodes; biological control of and biological control with nematodes; importance of nematodes for biodiversity

Admission requirements:
none

Recommended previous knowledge:
Basic knowledge of molecular diagnostics

Language:
English

Person responsible for module:
Dr. Birger Koopmann, Dr. Sebastian Kiewnick

Course frequency:
each winter semester

Duration:
1 semester[s]

Number of repeat examinations permitted:
twice

Recommended semester:
from 3

Maximum number of students:
12

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

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

Workload:
Attendance time: 36 h
Self-study time: 144 h

Course: Plant Health Management in Tropical Crops (Lecture,Excursion,Seminar) | 4 WLH
Contents:
Blended learning module; presentation of the most important pests and diseases of the most important tropical crop plants: symptoms, life cycles and plant health management (eg. in rice, maize, cacao, coffee, bananas). Additional crops may be included according to students´ preferences and practical experience. Introduction to relevant international data banks and networks. Use of scientific videos on selected topics of crop protection in the tropics.

Examination: Written exam (45 min, 40%), Student presentation with discussion (ca. 20 min presentation + ca. 10 min discussion 60%) | 6 C
Examination requirements:
- Written exam: main groups of causal agents, basic botany of the crop plants treated, basic biology of causal agents (life cycles etc.), recognition of symptoms, knowledge of control strategies.
- Presentation: appropriate according to the standard of international conferences: relevant and sound content, clear structure, style, language (written and spoken) and pronunciation, citation and use of sources according to good scientific practice.
- You must successfully complete and pass both partial examinations.

Admission requirements:
none

Recommended previous knowledge:
Basics of plant pathology, including basics of integrated pest management

Language:
English

Person responsible for module:
Prof. Dr. Michael Georg Rostás

Course frequency:
each summer semester

Duration:
1 semester[s]

Number of repeat examinations permitted:
twice

Recommended semester:
from 2

Maximum number of students:
30

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

Georg-August-Universität Göttingen

Modul M.Agr.0175: Plant-Herbivore Interactions (Experimental course)

English title: Plant-Herbivore Interactions (Experimental course)

3 C
2 SWS

Learning objectives/skills:

Students will learn how to plan and conduct experiments, evaluate them statistically, represent them graphically, and interpret them. They will be able to isolate and quantify secondary metabolites with defensive or signaling functions from plants. Students will learn how to conduct bioassays designed to demonstrate the defensive function of secondary metabolites.

Workload:

Attendance time:
40 Hours

Self-study time:
50 Hours

Course:Plant-Herbivore Interactions (Experimental course) — 2 SWS

(Übung,Seminar)

Contents:

The module complements the lecture of the same name and deals with the interactions between (crop) plants and herbivorous insects. The practical course aims to deepen the knowledge acquired in the lecture and teach methods of
chemical ecology/agricultural entomology. In particular, various defense strategies of plants against herbivorous pests are examined. The importance of predators and parasitoids for the population control of herbivorous pests, and thus for integrated pest management, is discussed.

Literature: Schoonhoven et al. (2005) Insect-Plant Biology, 2nd Ed., Oxford University Press

Examination: Protocol on the experiments carried out (max. 15 pages) — 3 C
Examination requirements:

Documentation and interpretation of the experiments conducted in accordance with scientific standards.
Seminar presentation.

Admission requirements: none	**Recommended previous knowledge:** M.Agr.0058 Plant-Herbivore Interactions
Language: English	**Module coordinator:** Prof. Dr. Michael Georg Rostás
Course frequency: every summer semester	**Duration** 1 Woche
Number of repeat examinations permitted: once	**Recommended semester:** ab 2
Maximum number of students: 12	

Georg-August-Universität Göttingen **Module M.Cp.0002: Internship**	9 C 6 WLH

Learning outcome, core skills:	**Workload:**
Subject-specific knowledge of the respective field of work, social skills (work organization, teamwork, interdisciplinary work, flexibility), practical methodological skills.	Attendance time: 240 h Self-study time: 30 h

Course: Internship (Internship) *Contents*: Practical work in various areas of plant protection, industry, departmental research, consulting. Insight into working methods, tasks, and everyday work in plant protection. Acquisition of practical, application-oriented knowledge. Internship duration: 6 weeks	6 WLH
Examination: Seminar paper (max. 20 pages, weighting: 50%) and presentation, or co-presentation (approx. 20 minutes, weighting: 50%) Practical work in various areas of plant protection, internship report, and presentation.	9 C

Admission requirements:	**Recommended previous knowledge:**
none	none
Language:	**Person responsible for module:**
English	Prof. Dr. Alexey Mikaberidze, Dr. Rebecka Dücker
Course frequency:	**Duration:**
each semester	1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**
twice	Master: 3
Maximum number of students:	
20	

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

Learning outcome, core skills:	**Workload:**
Knowledge and diagnosis of diseases and animal pests affecting crops. Understanding the origin, spread, and dynamics of pests in the field as a basis for developing control measures.	Self-study time: 124 h Attendance time: 56 h

Course: Plant Diseases and Pests in Temperate Climate Zones (Lecture, Excursion, Exercise) *Contents*: The most important harmful organisms (viruses, bacteria, fungi, nematodes, mites, insects, etc.) that occur on crops in temperate zones are dealt with in detail. In addition to the identification and diagnosis of harmful organisms and typical infestation symptoms, the focus is on their economic significance, biology, prognosis, and various control options, particularly with regard to control and damage thresholds. The course is aimed at agricultural scientists, agricultural engineers, agricultural technicians, and other professionals working in the field of plant protection. **Examination: Written examination (45 minutes)**	4 WLH
Examination prerequisites: Participation in field trips and exercises **Examination requirements:** Knowledge and diagnosis of plant diseases and animal pests affecting crops in temperate climates, their development and life cycles in the field	6 C

Admission requirements:	**Recommended previous knowledge:**
Once the Module B.Agr.0346 Spezielle Phytomedizin has been successfully completed, the module M.Cp.0004 Plant Diseases and Pests in Temperate Climate Zones can no longer be taken.	none
Language:	**Person responsible for module:**
English	Dr. Birger Koopmann
Course frequency:	**Duration:**
each summer semester	1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**
twice	Master: 2
Maximum number of students:	
30	

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

Learning outcome, core skills: Understanding and designing plant protection strategies against pathogens and pests within the overall concept of the cultivation system.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Integrated Management of Pests and Diseases (Lecture) *Contents*: Explanation of the concept of integrated pest management (IPM) and discussion of its most important elements in relation to the control of fungal pathogens and insect pests in temperate latitudes: preventive measures, targeted use of pesticides; effects of cultivation factors and systems (tillage, sowing date, fertilization, crop rotation, variety) on the occurrence, spread, and harmful effects of pathogens and pests; diagnosis and quantification of infestation; forecasting systems.	4 WLH
Examination: Oral examination (approx. 20 minutes) **Examination requirements:** Knowledge of the effects of cultivation factors and cultivation systems on the occurrence of diseases and pests in temperate latitudes.	6 C

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

Georg-August-Universität Göttingen **Module M.Cp.0006: Pesticides I: Mode of action and application techniques, resistance to pesticides**	6 C 4 WLH

Learning outcome, core skills: Students learn about plant protection products, in particular how they work and how to apply them. They understand how resistance to pesticides develops and how this can be delayed or circumvented.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Pesticides I: Mode of Action and Application Techniques, Resistance to Pesticides (Lecture, Excursion) *Contents*: The module presents the effects and application methods of chemical plant protection products (fungicides, insecticides, acaricides, herbicides) and discusses the most important groups of active ingredients. Technical and technological requirements of modern plant protection methods and application techniques are presented. The development of resistance to pesticides is also discussed.	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Knowledge of areas of application, modes of action (targets), side effects of plant protection products; application methods; factors contributing to the development of resistance and how to avoid them.	6 C

Admission requirements: Enrolled in the Crop Protection program	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Alexey Mikaberidze
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 1
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module M.Cp.0007: Pesticides II: Toxicology, Ecotoxicology, Environmental Metabolism, Regulation and Registration**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Students will understand the basic and applied pesticide toxicology and ecotoxicology, the development of pesticides and risk assessment, and the regularory framework of pesticide registration and pesticide risks (Germany, EU)	Attendance time: 56 h Self-study time: 124 h

Course: Pesticides II: Toxicology, Ecotoxicology, Environmental Metabolism, Regulation and Registration (Lecture) *Contents*: This unique module gives an overview of all aspects of pesticide science, presented by Several lecturers, being specialists. Basic and applied toxicology of pesticides , ecotoxicology of pesticides, environmental fate and metabolism of compounds in different environments, development of pesticides, regulation of pesticide use and registration.	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Knowledge of the toxicology of pesticides, ecotoxicology, fate and metabolism in the environment, regulation and registration of pesticides in Germany and the EU.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Rebecka Dücker
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 3
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module M.Cp.0008: Fungal toxins**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Participants will learn about the importance of secondary metabolites from fungi in plant production. They will be able to carry out a comparative assessment of the relevance of natural toxins and anthropogenic substances and classify various food contaminants toxicologically. In the laboratory section, they will acquire practical knowledge of chemical analysis methods, enabling them to select the optimal analytical method for specific tasks in their profession.	Attendance time: 56 h Self-study time: 124 h

Course: Fungal Toxins (Lecture, Practical course) *Contents*: The most important mycotoxins in practice are presented, concepts for determining toxicity are explained, methods for deriving legal limits are explained, and the risk posed by mycotoxins to the health of consumers and farm animals is assessed. The ecological functions of mycotoxins are discussed, methods for determining mycotoxins are explained, and procedures for reducing mycotoxin contamination in plant products are explained.The ecological functions of mycotoxins are discussed, methods for determining mycotoxins are explained, and procedures for reducing mycotoxin contamination in plant products are explained. The ecological functions of mycotoxins are discussed, methods for mycotoxin determination are explained, and procedures for reducing mycotoxin contamination in plant products are explained. Selected phytotoxins and phytohormones are presented that are involved as virulence or pathogenicity factors in the etiology of plant diseases. In the practical part, module participants will prepare plant material and apply selected methods for mycotoxin determination.	4 WLH
Examination: Written examination (60 minutes) **Examination prerequisites:** Prerequisite is accepted internship report **Examination requirements:** The most important mycotoxins in plant production; methods for determining toxicity, derivation of legal limits; ecological functions of mycotoxins; methods for mycotoxin determination; factors influencing mycotoxin contamination of plant products; the role of phytotoxins and phytohormones as virulence and pathogenicity factors.	6 C

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

Georg-August-Universität Göttingen **Module M.Cp.0010: Plant Pathology and Plant Protection seminar**	3 C 2 WLH

Learning outcome, core skills:	**Workload:**
Presentation of your own scientific project and its defense in the context of a discussion in English. Critical and constructive discussion of external results in a professional context.Self-study time:	Attendance time: 28 h 62 h

Course: Plant Pathology and Plant Protection Seminar (Seminar) *Contents*: During this event, projects, project goals, and results are presented in English to a critical, scientific audience and discussed by master's students and research assistants. The aim is not only to train presentation skills and discussion abilities, but also to provide inspiration for further work within the framework of the discussion.	2 WLH
Examination: Presentation, lecture, or co-lecture (approx. 20 minutes) **Examination prerequisites:** Participation in 12 Seminars **Examination requirements:** Knowledge of one's own field of research and the corresponding presentation requirements. PC presentation of one's own results in English, participation and discussion.	3 C

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

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

Learning outcome, core skills: Die Studierenden erlangen hierbei die Kompetenz, Forschungsergebnisse aufzubereiten, vorzutragen und in einer fachübergreifenden Diskussion zu verteidigen. Fachlich kritische und konstruktive Diskussion fremder Ergebnisse. *Students will acquire skills in evaluating and defending their own research in front of a scientific audience. Current presentation techniques will be learned as well as the capability to critically and constructively discuss work of other researchers*	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Agricultural Entomology Seminar (Seminar) *Contents*: Im Rahmen dieser Veranstaltung werden die Forschungsziele, Methoden und Ergebnisse aus aktuellen Projekten in der Agrarentomologie von Studierenden vorgestellt. Die Ergebnisse werden diskutiert und Anregungen und Ausblicke für weiterführende Arbeiten gegeben. *Current projects as well as important literature in the field of agricultural entomology will be presented by the students. The research will be critically discussed.*	2 WLH
Examination: Presentation, talk or co-presentation (ca. 20 Minutes) **Examination prerequisites:** Participation in 12 Seminars **Examination requirements:** *Assessment requirements are a very good knowledge of the relevant research field, a seminar presentation in English and active participation in the discussion.*	3 C

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

Georg-August-Universität Göttingen **Module M.Cp.0012: Weed biology and weed management**	6 C 6 WLH
Learning outcome, core skills: Understanding the biology and control of local and globally important weeds, their taxonomy, life-forms and habitat requirements, as well as their evolution, distribution, ecology, population dynamics and genetics. Endangered, as well as invasive species, the interactions of weeds and crops (allelopathy and competition) and weed control with direct and indirect measures will be taught.	**Workload:** Attendance time: 30 h Self-study time: 150 h
Course: Weed Biology and Weed Management (Lecture, Excursion, Seminar) *Contents*: The module consists of a lecture, a visit to a field trial and the preparation of a herbarium following instructions. The lecture will provide knowledge about weed management and the biology of plant species and their potential as weeds. Direct and indirect control strategies for weed management will be presented, taking into account economic and environmental aspects, and solutions for individual production systems will be discussed. Advantages and disadvantages of weed control for health, economy, society and ecology are discussed. For the herbarium, 30 plant species occurring in the agricultural landscape will be collected in their flowering stage (20 dicots and 10 monocots) and identified. Information on their importance in the agricultural landscape (ecological values, aspects of crop competition and peculiarities) should also be provided in brief.	6 WLH
Examination: Written exam (60%; 60 minutes) and a herbarium prepared as home work (40%) **Examination prerequisites:** Submission of the herbarium **Examination requirements:** Basic knowledge on the biology and ecology of arable weeds and knowledge about direct and indirect measures of weed control as well as the ability to identify key weed species.	6 C

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

30	

Georg-August-Universität Göttingen **Module M.Cp.0014: Plant Nutrition and Plant Health**	3 C 2 WLH

Learning outcome, core skills:	**Workload:**
Knowledge of and ability to present the presented topics in their context: development of nutritional and processing quality in different crop plants; quality requirements and ways of realization by crop production methods.	Attendance time: 28 h Self-study time: 62 h

Course: Plant Nutrition and Plant Health (Lecture, Seminar) *Contents*: Nutrient uptake and transport in the plant; function of different nutrients in the plant especially with respect to plant health (susceptibility, tolerance, resistance); mechanisms to increase the efficiency of nutrient availability, uptake and use; characteristics of plant health, effect of nutrient imbalances on plant metabolism and development of plant harvest products, the nutrient concentrations and processing quality.	2 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Understanding the relationship between plant nutrition and plant health and its significance in the value-added food chain.	3 C

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

Georg-August-Universität Göttingen **Module M.Cp.0015: Molecular Weed Science**	3 C 3 WLH

Learning outcome, core skills:	**Workload:**
Understanding the basic principles of the interactions between herbicides and the target plant and herbicide selectivity. Resistance mechanisms in weeds and mechanisms of tolerance in cultivated plants are understood, can be distinguished and interpreted.	Attendance time: 30 h Self-study time: 60 h

Course: Molecular Weed Science (Laboratory and greenhouse course) *Contents*: The students will grow their own weeds, the weeds will be treated with herbicides and the symptoms and the herbicide efficacy will be assessed. The students will take leaf samples and extract DNA in the laboratory. The quality of the DNA will be rated using gel electrophoresis and subsequently a PCR will be conducted. The students will be able to analyze the herbicide resistance mechanism using molecular and simple bioinformatic tools. Finally, the students will interpret the results and draw conclusions for practical agriculture.	3 WLH
Examination: Written exam (90 minutes) **Examination prerequisites:** Attendance of the laboratory course.	3 C

Admission requirements: None	**Recommended previous knowledge:** None
Language: English	**Person responsible for module:** Dr. Jean Wagner
Course frequency: Each winter semester	**Duration:** 1 semester
Number of repeat examinations permitted: Twice	**Recommended semester:**
Maximum number of students: 20	
Additional notes and regulations:	

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

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

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

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

Additional notes and regulations:
This module and M.Agr.0036 "Methodisches Arbeiten: Versuchsplanung und -auswertung" are mutually exclusive.

Georg-August-Universität Göttingen **Module M.Cp.0019: Basic Laboratory Techniques**	3 C 2 WLH

Learning outcome, core skills:	**Workload:**
Safe and responsible behavior in everyday laboratory work (chemistry, microbiology) as a prerequisite for an experimental master's thesis in phytopathology. Logical planning, preparation, and evaluation of experiments, systematic and logical explanation of methods and equipment operation.	Attendance time: 28 h Self-study time: 62 h

Course: Basic Laboratory Techniques (Exercise) *Contents*: The internship teaches the theoretical basics of working in a chemical-microbiological laboratory and how to operate important equipment through experiments: laboratory safety, handling chemicals, technical calculations (concentrations in media and buffers), basic microbiological methods (media preparation, sterilization procedures, sterile working practices, light microscopy, germ count determination), pH value, pH meter, buffers, photometry, centrifugation, experiment preparation, and record keeping, practice of instructional situations. **Examination: Written examination (45 minutes)**	2 WLH
Examination prerequisites: Accpted protocol. **Examination requirements:** Basic knowledge of calculating concentrations, sterilization techniques, the significance and composition of buffers, the principles of photometry and centrifugation, and determining live and total cell counts.	3 C

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

Georg-August-Universität Göttingen **Module M.Cp.0020: Ecotoxicological Risk Assessment for Plant Protection Products**	3 C 2 WLH

Learning outcome, core skills: To gain a basic knowledge of ecotoxicology and understanding its principles and associated testing and ecological risk assessment methods, specifically for application to plant protection products.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Ecotoxicological Risk Assessment for Plant Protection Products (Lecture, Exercise) *Contents*: In this module, students will be lectured on the basics of risk assessment for plant protection products. The most important aspects and definitions in the field of exposure, selection of representative test species, (statistical) data evaluation and risk assessment will be discussed. The for registration purposes considered organism groups, i.e. birds, mammals, aquatic organisms (incl. fish, invertebrates, primary producers), honeybees, soil organisms (incl. earthworms), non-target arthropods and non-target plants, and the corresponding data requirements will be reviewed. Specific aspects of exposure and assessment of each of these organism groups will be discussed. Furthermore, the importance of ecotoxicology in the registration process of a plant protection product will be discussed. The theoretical basis will be handled in the lectures and subsequently some aspects will then be applied in the practical part. This includes: - Methods in ecotoxicology (e.g. standardisation and quality of testing) - Exposure pathways, bioavailability - Selection of test species and testing methods - Risk assessment and risk management In the practical part, students will learn to design, conduct and evaluate acute toxicity tests with plant protection products in the laboratory. It is planned to use test species from the group of arthropods, mainly insect larvae (depending on animal availability). The aim of the tests is to obtain a dose-response relationship and (mathematically) derive EC50 or LC50 values and also, if the data permit, to (statistically) derive NOEC and LOEC values. Finally, a choice of publically available European registration dossiers will be reviewed and critically discussed.	2 WLH
Examination: Written examination (60 minutes) **Examination requirements:**	3 C

Knowledge of ecotoxicological testing methods and their evaluation for the risk assessment of plant protection products.	

Admission requirements: Plant Health/Crop Protection	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Lennart Weltje
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Georg-August-Universität Göttingen **Module M.Cp.0023: Plant Pathogenic Bacteria**	3 C 2 WLH

Learning outcome, core skills: Students gain knowledge on the most important plant pathogenic bacteria, their biology, dissemination, life cycle, diagnosis and control, as well as on their molecular and taxonomic features. They are able to understand the theoretical background and to apply in practice gained knowledge. In particular, students are able to recognize plant bacterial diseases presented during this course and to make a preliminary diagnosis. They critically evaluate scientific and non-scientific publications on plant pathogenic bacteria, and know where to find relevant and reliable information. Students are able to prepare a scientific presentation according to the standards of international conferences and use interactive teaching material.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Plant Pathogenic Bacteria (Lecture, Seminar) *Contents*: Blended learning module; this module comprises general and specific part. The general part addresses the following topics: history of phytobacteriology; origin and evolution of phytopathogenic bacteria; diversity and taxonomy of phytopathogenic bacteria; general features of phytopathogenic bacteria, their cultivation and preservation; epidemiology and ecology of plant bacterial diseases, and economical significance; pathogenesis, host-pathogen interactions and symptomatology; diagnosis and management of plant bacterial diseases, including use of bacteriophages. The specific part is organized in separate lessons, according to the main bacterial taxa causing diseases on plants. In particular, it covers the most important phytopathogenic bacteria and diseases they cause, and includes sections on their distribution, economical significance, symptomatology, epidemiology, pathogen characteristics and disease management.	2 WLH
Examination: Written exam, 90 min, 70%; Student presentation with discussion, 30% Each part of the examination must be passed with at least 50% of the maximum possible number of score points **Examination requirements:** Each part of the examination must be passed with at least 50% of the maximum possible number of score points.	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. A. Mikaberidze Dr. N. Kuzmanovic; Dr. B. Koopmann
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 3
Maximum number of students:	

30

Georg-August-Universität Göttingen **Module M.Cp.0024: Digital Techniques for Crop Monitoring**	6 C
Learning outcome, core skills: Learning outcome, core skills: The module teaches basic principles for the use of digital tools in greenhouse and field experiments. It covers camera-based methods for single plant and plot scale (RGB, spectral, 3D) as well as the use of GPS for georeferenced measurements. Furthermore, the analysis of data, for single recordings and time series, is taught. Upon completion of the module, the students are able to independently carry out measurements with selected technologies of crop plants according to a measurement protocol, combine reference measurements, carry out analyses and compile results. Furthermore, they can plan complex measurement procedures for their own experimental projects and assess the effort involved. Finally they obtain skills to interpret sensor data with an agricultural meaning.	**Workload:** Attendance time: 40 h Self-study time: 140 h
Course: Digital Techniques for Crop Monitoring (Block course, Internship) *Contents*: In the course, selected topics on the use of digital technologies in field experiments for crop science are focused. The students are enabled to actively use optical sensors. In addition to data acquisition, the main content focuses on the processing of raw data, evaluation, and combination with reference data. Reference data is extracted with established tools from the plant sciences and geo-referenced in the field using GPS, in a way that an allocation to the optical measurement methods is possible. Data acquisition is carried out using digital carrier platforms (robot, drone, etc.). Another essential content is the summary of metadata of field trials in order to store trial data in such a way that they can be reused and used by third parties. The module is divided into two sub-aspects: (i) Theoretical basics as a lecture and (ii) hands-on exercises with digital technologies. While the practical handling is taught in the exercises, the theoretical lecture teaches the overall context, the differences between the sensors, as well as the analysis using sample data sets, and the application of complex evaluation algorithms. *Literature: latest publication from the providing institute* *Course frequency:* each winter semester	
Examination: Providing a technical video (5 Minutes). This professional video includes a structured introduction into the topic (sensors and measuring) Idea description and screenplay must be provided. **Examination prerequisites:** Regular participation in the block course **Examination requirements:** Understanding of digital methods and sensor technologies and their application at different scales. Deep understanding of the planning of a digital survey in field testing. Knowledge of methods of evaluation, referencing and interpretation of optical sensor data.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Anne-Katrin Mahlein, Dr. Stefan Paulus
Course frequency: 1	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.Cp.0025: Analytical Techniques for Foods and Agricultural Research**	6 C 4 WLH

Learning outcome, core skills: This module aims to provide students with a comprehensive understanding of chemical analysis techniques employed in agricultural research through a combination of practical experiments and lectures, which will cover the analysis of major chemical groups in plants, fungi, and pesticide residues.	**Workload:** Attendance time: 70 h Self-study time: 110 h

Course: Analytical Techniques for Foods and Agricultural Research (Lecture,Practical course) *Contents*: The module will include various topics related to chemical analysis methods in agricultural sciences. The analysis of plant primary and secondary metabolites (such as carbohydrates, amino acids, organic acids, phytohormones, phytoalexins, glucosinolates, and volatiles) will be discussed. Moreover, the analysis of mycotoxins, fungal secondary metabolites, and pesticide residues will be covered. The module will introduce the fundamental analytical chemistry methods, including sample preparation, separation techniques, detection methods, characterization, and quantification of metabolites using state-of-the-art chromatographic and mass spectrometric methods.	4 WLH
Examination: oral exam (30 min, 70%), Student presentation with discussion (ca. 20 min presentation + ca. 10 min discussion, 30%)	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Mohammad Alhussein
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 16	

Georg-August-Universität Göttingen **Module M.Cp.0026: Scientific Presenting, Writing, Paper Reviewing and Publishing in Crop Protection**	6 C 4 WLH

Learning outcome, core skills: Students are expected to learn writing scientific papers in English, to design graphics and tables, to conduct a literature search, to prepare oral and poster presentations, and to analyze, critically discuss and review scientific papers. Students know the process of scientific publication, from writing to submitting and reviewing and become aware of the principles in good scientific practice.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Scientific Presenting, Writing, Paper Reviewing and Publishing in Crop Protection (Lecture, Seminar) *Contents*: Students will learn how to properly write scientific texts (papers, applications etc.), how to collect information from scientific literature by literature search, how to prepare a presentation on a selected topic in crop protection and how to present it. In a particular 'journal club', students will analyze the structure, content, relevance and soundness of scientific papers and present and discuss their evaluations in the classroom. They will learn the principles and institutions established to save-guard good scientific practice and avoid scientific misconduct. They obtain insight into the process of scientific publishing from the preparation and submission of a manuscript until revision and correspondence with publishers and reviewers.	4 WLH
Examination: Reviewing an individual scientific paper and presenting the review in the class, 15 min PPT (30%) Discussion of scientific papers (20%) Reviewing a paper and writing a review in a written exam, 120 Min (50%) **Examination prerequisites:** Participation in the lectures and discussion seminars	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Alexey Mikaberidze, Dr. Rebecka Dücker
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** second semester Crop Protection/Plant Health
Maximum number of students: not limited	

Georg-August-Universität Göttingen — 6 C, 4 WLH

Universität Kassel/Witzenhausen

Module M.SIA.E13M: Microeconomic theory and quantitative methods of agricultural production

Learning outcome, core skills:
The course introduces microeconomic theory and quantitative methods applied to the agri-food system.

On successful completion of the course, students should be able to:

- Apply economic principles to understand consumer and producer decisions in relation to food production and consumption.
- Understand different market structures in the agri-food sector.
- Use behavioral economic concepts to explain decision-making.
- Understand concepts on agricultural investment behavior.
- Perform quantitative analysis applied to the agri-food sector.

Workload:
Attendance time: 56 h
Self-study time: 124 h

Course: Microeconomics and Quantitative Analysis for Agri-Food Systems — 4 WLH
(Lecture,Exercise)
Contents:
Microeconomic theory of agricultural production:

This part of the course introduces students to the concepts of microeconomic theory applied
to the agri-food sector. Topics include consumer behavior, production and resource use, perfect, imperfect competition and market power, and concepts from behavioral economics.
This is complemented with exercises and student presentations on selected economic topics.

Quantitative methods in agricultural business economics:

This part of the course provides students with the tools for conducting quantitative analysis in the agri-food sector. Topics covered include the process of agricultural decision-making, basic concepts in finance, and investment behavior in agriculture. The theoretical learning is complemented by hands-on exercises and student presentations on
peer-reviewed papers.

Examination: Written end-of semester 90 min exam (70 % of grade) and continuous assignments (30%) — 6 C
Examination requirements:
Consumer and producer theory; Market structure, behavioral economics risk; technological
progress; farm household models; agricultural decision-making; investment behavior; quantitative analysis.

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

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

After the successful conclusion of M.Agr.0060, students can not complete M.SIA.E13M. This module is designed for students without or limited previous knowledge of economics.

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

Learning objectives/skills: Bridge module to impart the latest knowledge in basic plant cultivation subjects, particularly with regard to issues of organic farming, which are not usually taught in this way. Students who have taken this course can continue on to the advanced crop production modules.	**Workload:** Attendance time: 60 Hours Self-study time: 120 Hours

Course:Soil and plant science (Lecture,Seminar) *Contents:* Influence of soil formation processes on physical properties (soil type, soil water, pore space), chemical properties (buffering capacity, exchange capacity, nutrients), and biological properties (organic matter, edaphon). Nutrient availability and mobilization under conventional and organic farming conditions, major and trace nutrients, and food quality. Breeding objectives for different agricultural systems: plant morphology, genetics, and breeding, plant domestication and utilization, characterization and evaluation, use of genetic resources in plant breeding. Genetics of host-parasite interactions, epidemiology of plant diseases, plant defense mechanisms, insect physiology and ecology. Specific general and scientific articles related to the destination country of the excursion will be made available via an e-learning platform.	4 SWS
Examination: Written exam (120 minutes) or technical interview approx. 20 min) **Examination requirements:** Physical properties (soil type, soil water, pore space); chemical properties (buffering capacity, exchange capacity, nutrients); biological properties (organic matter, edaphon); soil formation and classification. Role of major and trace nutrients in plants, nutrient availability and mobilization, plant nutrients and food quality. Plant morphology, genetics, and breeding, principles of plant domestication and utilization, characterization and assessment, use of genetic resources in plant breeding, genetic basis for breeding. Principles of plant diseases and entomology, origin of plant diseases, epidemiology, plant defense mechanisms, insect physiology and ecology.	6 C

Admission requirements: none	**Recommended previous knowledge:** none

Language: English	**Module coordinator:** Dr. Helmut Saucke
Course frequency: every winter semester; Witzenhausen	**Duration** 1 Semester
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: No limit	

Georg-August-Universität Göttingen | 6 C
Universität Kassel/Witzenhausen | 4 SWS

Modul M.SIA.P15M: Methods and advances in plant protection

English title: Methods and advances in plant protection

Learning objectives/skills:

Students are able to critically evaluate published results and apply this knowledge to current problems in the field. They are also able to identify problems and formulate experimental and analytical approaches to solving them.

Workload:

Attendance time: 60 Hours

Self-study time: 120 Hours

Course: Methods and advances in plant protection (Lecture, Excursion, Exercise) — 4 SWS

Contents:

- Advanced course in plant protection (entomology and pathology)
- Methodology and evaluation methods in plant protection
- Case studies of specific plant protection topics in organic farming in the form of lectures, seminars, and practical exercises

Examination: Written exam (120 minutes) or technical discussion (approx. 20 minutes) (weighted: 70%) and protocol (max. 3 pages) or presentation (approx. 10 minutes) (weighted: 30%) — 6 C

Examination requirements:

Advanced knowledge of plant protection (entomology and pathology), methodology, and evaluation methods in plant protection based on case studies of specific plant protection topics.

Admission requirements:
Pflanzenschutz (min. 6 ECTS) or
M.SIA.P07 Soil and Plant Science

Recommended previous knowledge:
none

Language:
English

Module coordinator:
Prof. Dr. Maria Renate Finckh

Course frequency:
every winter semester; Witzenhausen

Duration
1 Semester

Number of repeat examinations permitted:
zweimalig

Recommended semester:

Maximum number of students:
nicht begrenzt

Georg-August-Universität Göttingen | 6 C
Universität Kassel/Witzenhausen | 4 SWS

Modul M.SIA.P22: Management of tropical plant production systems

English title: Management of tropical plant production systems

Learning objectives/skills:

Knowledge of the botanical, ecological, and agronomic facts of the crops and cropping systems presented, assignment of crops and cropping systems to different site conditions, and system-oriented assessment of sustainable production at selected sites.

Workload:

Attendance time: 60 Hours

Self-study time: 120 Hours

Course: Management of tropical plant production systems (Lecture) — 4 SWS

Contents:

Presentation of the most important crops of the tropics and subtropics in terms of botany, morphology, origin, climatic and ecological requirements, cultivation systems, harvesting methods, significance in land use systems, use as food, feed, raw material, and for energy production from biomass. Discussion of the various cultivation systems in the tropics and subtropics and specific management for a sustainable increase in productivity.

Literature

Rehm, S., Espig, G. 1991: The Cultivated Plants of the Tropics and Subtropics. Verlag Josef Margraf. Weikersheim, Germany; lecture notes

Examination: Written exam (90 minutes) or oral exam (ca. 30 minutes) — 6 C

Examination requirements:

Knowledge of the botanical, ecological, and agronomic facts of the crops and cropping systems presented. Knowledge of the classification of crops and cropping systems according to different site conditions, as well as system-oriented assessment of sustainable production at selected sites.

Admission requirements:
none

Recommended previous knowledge:
none

Language:
English

Module coordinator:
Prof. Dr. Reimund Paul Rötter

Course frequency:
every winter semester; Göttingen

Duration
1 Semester

Number of repeat examinations permitted:
zweimalig

Recommended semester:

Maximum number of students:
35

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

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

Learning outcome, core skills: This course enables students to approach empirical research problems within the framework of the linear regression model, including model specification and selection, estimation, inference and detection of heteroscedasticity and autocorrelation. Moreover, the students can apply the methods discussed to real economic data and problems using the statistical software package R and they are able to assess estimator properties (finite sample and asymptotic). This course enables students to access more advanced topics in econometrics.	**Workload:** Attendance time: 56 h Self-study time: 124 h
Course: Econometrics I (Lecture) *Contents*: The lecture covers the following topics: 1. Introduction to the basic multiple regression model, model specification, OLS estimation, prediction and model selection, Multicollinearity and partial regression. 2. The normal linear model, including maximum likelihood and interval estimation, hypothesis testing. 3. Asymptotic properties of the OLS and (E)GLS estimators. 4. Generalized linear model: GLS and EGLS estimators, properties of these, heteroskedastic and autocorrelated models, testing for heteroscedasticity and autocorrelation.	2 WLH
Course: Econometrics I (Exercise) *Contents*: The practical deepens the understanding of the lecture topics by applying the methods from the lecture to economic problems and data, and reviewing and intensify theoretical concepts.	2 WLH
Course: Econometrics I (Tutorial) *Contents*: The tutorials are small classes with max. 20 students, which give room for applying the concepts to specific problem sets and discussing questions, that students might encounter regarding the concepts addressed in the lecture and practical. A part of the tutorial are hands-on computer exercises using the software R. This enables students to conduct regression analysis in practice and prepares them for others (applied) courses.	2 WLH
Examination: Written examination (90 minutes)	6 C

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

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

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