Molecular Plant-Microbe Interactions					
Identification number	Workload	Credit points	Term of studying	Frequency of occurence	Duration
MN-BC-GSM14 MN-B-SM (PG 2)	360 h	12 CP	1st or 2nd term of studying	Summer term, 2nd half	7 weeks

1	Type of lessons	Contact times	Self-study times	Intended group size*
	a) Lectures	12 h	24 h	max. 12
	b) Practical/Lab	162 h	132 h	max. 4
	c) Seminar	6 h	24 h	max. 3

2 Aims of the module and acquired skills

Students who successfully completed this module …

- have gained in-depth knowledge of state-of-the-art technology for plant-microbe interaction research particularly on plant immune response and its evasion by plant associated microbes as well as different approaches for localization and functional characterization of fungal effector-proteins.
- are able to use modern techniques in advanced molecular mycology, biochemistry, basic bioinformatic and genetics (see contents of the module).
- can independently carry out small scientific projects related to the topic of the module.
- have learned how to present research results in oral and written form and to critically discuss scientific publications related to the topic of the module on a professional level.
- are able to transfer skills acquired in this module to other fields of biology.

3 Contents of the module

- Modern concepts and methods in molecular plant-microbe interactions (also used in other sciences)
- Bioinformatic analysis of gene expression data
- Bioinformatic analysis/prediction of protein function and structure
- Advanced techniques of fluorescence microscopy (confocal microscopy with different staining methods, life-cell-imaging, 3-dimensional projection) including sample preparation
- Plant colonization and disease or growth promotion scoring
- Expression and purification of recombinant proteins
- Biochemical analyses of beneficial and pathogen-effector proteins
- *In-vivo* detection of plant immune responses and their inhibition by effectors
- Basic techniques of molecular cloning (DNA preparation, transformation, ligation, RNA synthesis)
- Basic protein techniques (PAGE, Western blotting)

4 Teaching/Learning methods

- Lectures; Practical/Lab (Project work); Seminar; Guidance to independent research; Training on presentation techniques in oral and written form

5 Requirements for participation

Enrollment in the Master´s degree course “Biological Sciences” or in the Master´s degree course “Biochemistry”

6	Type of module examinations The final examination consists of three parts: Two hours written examination about topics of the lectures and the practical/lab part (50 % of the total module mark), oral presentation (25 % of the total module mark) and seminar paper (25 % of the total module mark)
7	Requisites for the allocation of credits Regular and active participation; Each examination part at least "sufficient" (see appendix of the examination regulations for details)
8	Compatibility with other Curricula Biological subject module in the Master´s degree course "Biological Sciences"
9	Significance of the module mark for the overall grade 10 % of the overall grade in the Master's degree course "Biochemistry" (see also appendix of the examination regulations)
10	Module coordinator Prof. Dr. Alga Zuccaro, phone 470-7170, e-mail: azuccaro@uni-koeln.de
11	Additional information General Subject module of the Master´s degree course "Biochemistry", Focus of research: (P) Molecular Plant Sciences; (G) Genetics and Cell Biology Participating faculty: Prof. Dr. G. Döhlemann, Dr. G. Langen, Dr. J. Misas-Villamil, Dr. S. Wawra, Prof. Dr. A. Zuccaro Literature: • Buchanan, B., Gruissem, W., Russell, J. (2002) Biochemistry and Molecular Biology of Plants. Wiley-Blackwell • Agrios, G. (2005) Plant Pathology. 5th edition, Elsevier • Sanchez-Serrano, J.J., Salinas J. (2014) Arabidopsis Protocols. 3rd edition, Springer • Recent review articles on particular topics will be provided prior to the course General time schedule: Week 1-5 (Mon.-Fri.): Lectures, practical/lab and preparation for the seminar talk (seminar presentation will be held in the weeks 4-6); Week 6 (Mon.-Fri): Writing seminar paper; Week 7 (Mon.-Fri): Preparation for the written examination Note: The module contains hand-on laboratory work conducted by small groups of students and is taught in course rooms or research laboratories depending on the number of students. The module does not contain computer-based practicals/research as a main component. Introduction to the module: May 20, 2019 at 10:00 a.m., Cologne Biocenter, room 4.002 (fourth floor) Written examination: July 12, 2019, second/supplementary examination August 30, 2019; the latter date may vary if students and module coordinator agree. More details will be given at the beginning of the module.

* 11 students from the Master´s degree course "Biological Sciences" and 1 student from the Master´s degree course "Biochemistry".