Module Name	Module Code
Biological Systems as Bioreactors	AEF-agrig017
Module Coordinator	
Michael Kleine	
Organizer	
Dekanat der Agrar- und Ernährungswissenschaftlichen Fakultät	
Faculty	
Faculty of Agricultural and Nutritional Sciences	
Examination Office	
Faculty of Agricultural and Nutritional Sciences - Examination Office	

ECTS Credits	6
Evaluation	Graded
Duration	one semester
Frequency	Only takes place during summer semesters
Workload per ECTS Credit	30 hours
Total Workload	180 hours
Contact Time	60 hours
Independent Study	120 hours
Teaching Language	English

Recommended Requirements			
Advanced understanding of genetics and gene technology			
Module Courses			
Course Type	**Course Name**	**Compul-sory/Optional**	**SWS**
Lecture	Structure and use of Bioreactors for the Production of Recombinant Proteins		2
Seminar	Bioreactors		2
Prerequisits for Admission to the Examination(s)			

Examination(s)				
Examination Name	**Type of Examination**	**Evaluation**	**Compulsory / Optional**	**Weighting**
Oral Examination: Biological Systems as Bioreactors	Oral Examination	Graded	Compulsory	100

Further Information on the Examination(s)

1.+2. period in summer semester
1. period in winter semester

examiner: Dr. Kleine
QIS: 62200 with number of Examination 2750

Course Content

- Description of different protein expression systems: plant, animal, microbes, cell culture systems, molecular structure of expression vectors, transfection technology and culture conditions
- Analysis and monitoring processes, e.g. chromatography, mass spectrometry etc.
- Downstream purification processes
- Adaptation of these processes to a technical scale
- Economical and ecological aspects approval processes

Learning Outcome

Students that have succesfully passed this course will be able to understand

- the general and specific molecular technologies of the genetic modification of plants, animals, microbes, cell cultures (e.g. stable transformation, transient transfomation, oligo directed mutagenesis, Crispr/Cas, microinjection, transfection)
- the strategies of the identification of transgenic organisms
- specific molecular techniques (e.g. PCR, NGS)
- production methods of transgenic organisms
- purification methods of recombinant proteins produced in bioreactors
- the way of producing biopharmaceuticals and their quality assurance

In addition, every student will be able
- to present scientific results by a power point presentation
- to scientifically discuss processes of the aforementioned topics
- to explain scientific processes to an auditorium

Reading List

Printed contents, review articles and textbooks, internet links.
Production of Recombinant Proteins (2004), Gerd Gellissen (Editor), Wiley-VCH, Weinheim
Molecular Farming – Plant-made Pharmaceuticals and Technical Proteins (2004), Rainer Fischer, Stefan Schillberg (Editors), Wiley-VCH, Weinheim

Additional Information
Maximum number of participants: 12 Enrollment at PLANTON GmbH, Am Kiel-Kanal 44, 24106 Kiel, Tel 0431-380150 within workdays Monday through Friday in the 1nd week of the 2. audit period of the preceding semester. Following information are necessary: matriculation number last name first name degree study program stu-Email The allocation of the places takes place in the 2nd week of the 2. audit period of the preceding semester. Acceptance of the place by students only through participation at the first day of the course. Students without a place can get a place at the first day of the course by move-up procedure.

Use	**Compulsory / Optional**	**Semester**
Master, 1-Subject, Agricultural Sciences, Special. Agricultural Economics and Agribusiness # Specific Field of Study: Agricultural Economics, (Version 2008)	Optional	-
Master, 1-Subject, Agricultural Sciences, Special. Agricultural Economics and Agribusiness # Specific Field of Study: Agribusiness, (Version 2008)	Optional	-
Master, 1-Subject, Agricultural Sciences, Specialisation Crop Sciences, (Version 2008)	Optional	-
Master, 1-Subject, Agricultural Sciences, Specialisation Animal Sciences, (Version 2008)	Optional	-
Master, 1-Subject, Agricultural Sciences, Specialisation Environmental Sciences, (Version 2008)	Optional	-
Master, 1-Subject, AgriGenomics, (Version 2017)	Optional	-
Master, 1-Subject, AgriGenomics, (Version 2010)	Optional	-
Master, 1-Subject, Dairy Science, (Version 2017)	Compulsory	-
Master, 1-Subject, Nutritional and Consumer Economics, (Version 2017)	Optional	-
Master, 1-Subject, Nutritional and Consumer Economics, (Version 2013)	Optional	-
Master, 1-Subject, Nutritional Sciences and Household Economics, Specialisation Nutritional and Consumer Economics, (Version 2008)	Optional	-
Master, 1-Subject, Nutritional Sciences and Household Economics, Specialisation Nutritional Sciences, (Version 2008)	Optional	-