UNIVERSITÄT HOHENHEIM

Modulhandbuch

für den Studiengang

Master of Science Biotechnology

Stand Oktober 2024

Inhaltsverzeichnis

Modul: Advanced Flavor Chemistry (1508-410)

Modulverantwortung	Yanyan Zhang
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Scientific background in chemistry and biotechnology
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 1)
Studiengänge	Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl Food Science and Engineering (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Systems (Master, PO vom 01.10.2019) 2. Semester, Wahl
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	60
Selbststudium (in Stunden)	165
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	This course will offer students the knowledge on flavour legislation, flavour analysis, aroma retention & release, flavour generation, flavour biotechnology, and the roles of flavour compounds on food process & storage. The students: • know the various analytical measurements of flavour compounds, correlated instrument and data analysis • arrange instrumental analyse and sensory evaluation on flavor compounds of food and drink using the proper methods and equipment • be familiar with presenting their work through written reports and oral presentations.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written exam (80%), seminar (20%), practical course (passed)

Studienleistung und Gewichtung	Participation in lecture, seminar (presentation & report), and practice course (protocol)
Advanced Flavor Chemistry (1508-411)	
Person(en) verantwortlich	Yanyan Zhang
Lehrform	Vorlesung mit Übung
SWS	5
Inhalt	Lecture: Basic information on flavor property, individual aroma compounds and corresponding non-enzymatic or enzymatic pathways, flavor biotechnology, principles of analytical instruments involved in aroma analysis, sources of off-flavor compounds in raw materials, food processing and storage. Lab exercise: Perceiving and distinguishing the different odorants by sniffin sticks & Gas chromatography-olfactometry (GC-O) & data analysis of MS fragmentation & semi-quantification of odourants & bioflavor generation by submerged cultivation of edible basidiomycetes
Literatur	Belitz, H.D., Grosch, W., Schieberle, P.: Food Chemistry. Springer, 2009. Berger, R.G.: Flavours and Fragrances. Springer, 2007.
Anmerkungen	-

Modul: Advanced Meat Science and Technology (1507-500)

Modulverantwortung	Jochen Weiss
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Admission to a Master’s program
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 1)
Studiengänge	Food Science and Engineering (Master, PO vom 01.10.2013) 3. Semester, Wahl Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 3. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 3. Semester, Wahl Food Systems (Master, PO vom 01.10.2019) 1. Semester, Wahl
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	60
Selbststudium (in Stunden)	165
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The aim of the course is that after completion of the course, students are able to recall knowledge of fundamental biochemical properties of animal-based raw materials. They understand various industrial processes used to convert these specific raw materials into various meat products. They generate self-reliantly the most popular and commonly manufactured meat products in teamwork. They perform the required process operations on a pilot plant scale to generate those products. They know and recognize the function and role of various additives and ingredients used to manufacture industrial meat products. They analyze and calculate the most important quality parameters for meat and meat products and know the legal framework. The students restructure raw material and technological elements according to a specific task into new products. They understand scale up issues and topics surrounding hygiene and safety of meat-based products.

	Furthermore, students are able to have advanced knowledge in key unit operations. Participants apply critical problem assessments and discriminate tasks and targets with analytical thinking. They evaluate the results for evaluation of known quality criteria. They develop their creative potential, their ability to communicate and cooperate in teamwork. They represent scientific results in an appropriate manner and improve their verbal skills.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 16 Registration: Ilias 150g, please provide the name of your master program upon registration in Ilias. Registration period: Registration opens 4 weeks prior to the start of the semester Criteria according to which places are allocated: Students of the Food Science and Engineering program will be preferred in order of registration in Ilias (first come first served). Maximum number of participants: 16
Modulprüfung und Gewichtung	Written exam 80% and oral presentation 20%; oral or online exam optional
Studienleistung und Gewichtung	oral presentation
Advanced Meat Science and Techology (1507-501)	
Person(en) verantwortlich	Jochen Weiss Monika Gibis Kurt Herrmann
Lehrform	Vorlesung
SWS	4
Inhalt	A focus of the course is to introduce students to modern industrial processes used to generate the most popular and commonly manufactured meat products, i.e. boiled, cooked or raw, fermented sausages and cooked or raw hams. Students will learn about the properties of raw materials used and issues surrounding their provisioning (e.g. slaughtering, cutting, conditioning or confectioning). The course features various guest speakers from industry that will introduce students to specific aspects of this industrial sector (e.g. encasing of products, smoking and drying of products, use of starter cultures). The course will allow an insight into key analytical methods that are required to comply with regulatory aspects of the meat products, such as method to analyze meat product quality and safety. In the course the lecturers demonstrate in a practical way the manufacturing of different kind of meat products like (emulsified, cooked and raw

	fermented sausages as well as cooked and raw ham). These products will get tested by a sensory during the course.
Literatur	Script to the module
Anmerkungen	Registration opens 4 weeks prior to the start of the semester and closes at the beginning of the semester. First preference will be given to students enrolled in the M.Sc. Food Science and Engineering and then M.Sc. Food Biotechnology. Remaining free slots will then be given to students enrolled in other M.Sc. degree programs. Lectures and part of the demonstrations will be held online.
Advanced Meat Science and Technology (1507-502)	
Person(en) verantwortlich	Jochen Weiss Monika Gibis Kurt Herrmann
Lehrform	Praktikum
SWS	2
Inhalt	A focus of the course is to introduce students to modern industrial processes used to generate the most popular and commonly manufactured meat products, i.e. boiled, cooked or raw, fermented sausages and cooked or raw hams. Students will participate in daily pilot plant exercises where they will have the opportunity to manufacture boiled, cooked or raw, fermented sausages and cooked or raw hams products themselves. The course will allow an insight into key analytical methods and will analyze the most important analytical methods for meat products that are required to comply with regulatory aspects of the meat products. They will present their group exercise in a presentation.
Literatur	Script to the module
Anmerkungen	Registration opens 4 weeks prior to the start of the semester and closes at the beginning of the semester. First preference will be given to students enrolled in the M.Sc. Food Science and Engineering and then M.Sc. Food Biotechnology. Remaining free slots will then be given to students enrolled in other M.Sc. degree programs.
Advanced Meat Science and Technology (1507-503)	
Person(en) verantwortlich	Jochen Weiss Monika Gibis Kurt Herrmann

Lehrform	Exkursion
SWS	1
Inhalt	The participants of the module will have the opportunity to visit one or more industrial meat product manufacturing facilities.
Literatur	Script to the module
Anmerkungen	Depending on availability of industrial partners, this part of the course might be transformed into another learning material.

Modul: Advanced Process Engineering Techniques for Cereal Processing (1509-500)

Modulverantwortung	Mario Jekle
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	English language skills
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 2)
Studiengänge	Food Science and Engineering (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl Food Systems (Master, PO vom 01.10.2019) 2. Semester, Wahl
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	In the module advanced techniques and methods of the processing of cereals on their way to food will be presented. Process measurement, analysis, evaluation as well as optimization techniques will be discussed. After the module the participant knows: - Fundamentals of advanced process engineering techniques - The diversity of cereals as raw material - Milling, fermenting and baking techniques - Functional ingredients - Molecular reactions that occur during cereal processing, The advanced process analytics and monitoring methods (like NIR-, fluorescence spectroscopy, image analysis),

	Different kinds of models to describe important processing steps, Process optimization procedures.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	a written exam
Studienleistung und Gewichtung	Passing the practical course
Advanced Process Engineering Techniques for Cereal Processing (1509-501)	
Person(en) verantwortlich	Mario Jekle Alexander Schaum
Lehrform	Vorlesung mit Exkursion und Praktikum
SWS	4
Inhalt	In the module advanced techniques and methods of the processing of cereals on their way to food will be presented. The topics are: • Process analysis technology of cereal processing, • Breeding and growing aspects, • Storage, cleaning and milling techniques, • Cereal products, • Functional ingredients and molecular reactions, • NIR-, fluorescence, image analysis, • Mixing, kneading, proving, baking techniques • Modeling techniques of processing steps
Literatur	Burns, D.A.; Ciurczak, E.W.: Handbook of Near-Infrared Analysis, CRC Press, Boca Raton, 2008; Cauvain, S.P.: Bread making, Woodhead Publishing Limited, Cambridge 2003; Gobbetti, M.; Gänzle, M. (Eds.): Handbook on Sourdough Biotechnology, Springer, New York, 2013; MacRitchie, F.: Concepts in Cereal Chemistry, CRC Press, Boca Raton, 2010
Anmerkungen	-

Modul: Advanced Technologies for Dairy Products and Alternatives (1505-530)

Modulverantwortung	Jörg Hinrichs
Bezug zu anderen Modulen	The module complements analytically or process-engineering oriented modules with the background of processing of milk and plant based raw material to sophisticated milk products and alternative, e.g. milk and plant-based concentrates, isolates and their application up to powders.
Teilnahmevoraussetzung	Scientific background and basics in food microbiology, chemistry, engineering, and soft matter science.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester (Block 2)
Studiengänge	M.Sc. Food Biotechnology, 2. Semester, Wahl M.Sc. Food Science and Engineering, 2. Semester, Wahl M.Sc. Food Systems, 4. Semester, Wahl M.Sc. Lebensmittelchemie, 4. Semester, Wahl M.Sc. Bioeconomy, 2. Semester, Wahl
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	84
Selbststudium (in Stunden)	96
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The students learn to understand the advanced processing of milk and plant-based raw material in relation to the physical, chemical and microbiological properties of the raw material and the final product properties. Thereby analytical tools to characterize composition and structure of products thereof are studied in order to understand material-process-function relationships. It also teaches the concept of mass and energy balance, the estimation of microbiological risk of products and the hazard associated with the various processing steps. The students develop their ability to work independently through practical exercises. In addition, they are expected to work in teams for some exercises, e.g. practical tasks, trouble shooting. Knowledge is deepened in composition, analytics, hygiene and aseptic, and processing by means

	of membrane filtration/fractionation, evaporation, powder processing. Finally, trouble shooting on practical issue will be done in groups and an outlook will be given to running research projects addressed on future developments and innovations.
empfohlene Vorkenntnisse	-
Anmerkungen	Anzahl Teilnehmerplätze: 25 Registration via ILIAS („First come, first served“) Students who have a contagious disease according to the Federal Epidemics Act are not allowed to participate!
Modulprüfung und Gewichtung	exam (90%), protocol (10%)
Studienleistung und Gewichtung	-

Science and Engineering of Advanced Processing (1505-531)

Person(en) verantwortlich	Jörg Hinrichs
Lehrform	Vorlesung
SWS	2
Inhalt	The topics are: 1. Physics, chemistry milk and plant based raw material 2. Chemical and physical analytics 3. Hygiene and Aseptic processing 4. Vacuum evaporation and concentrates 5. Membrane materials and processing 6. Drying basics 7. Drying 8. Trouble shooting methods 9. Research innovations and outlook
Literatur	Scientific literature, doctoral theses, publications from the department, textbooks in the departmental library. Encyclopedia of Dairy Science, 3rd Edition, 2021 Elsevier Verlag, Editor John W. Fu-quay, P. F Fox, Hubert Roginski, ISBN: 978-0-12818-767-8

	Kessler H.G.: Food & Bio-Process Engineering – Dairy Technology. Verlag A. Kessler, München 2011 Belitz H.D., Grosch W., Schieberle P. Food Chemistry.3rd Edition. 2004, Springer Verlag Lecture handouts
Anmerkungen	-
Seminar in advanced processing (1505-532)	
Person(en) verantwortlich	Jörg Hinrichs
Lehrform	Seminar
SWS	2
Inhalt	Rework lecture and questions, evaluation, discussion and deepening knowledge of the lecture.
Literatur	Scientific literature, doctoral theses, publications from the department, textbooks in the departmental library. Lecture handout
Anmerkungen	-
Pilot plant experiments in advanced processing (1505-533)	
Person(en) verantwortlich	Jörg Hinrichs
Lehrform	Übung mit Exkursion
SWS	2
Inhalt	Training in processing, analytics and sensory (from raw material to the final product) using membrane filtration, e. g. reverse osmosis and ultrafiltration in processing of raw material, fouling & cleaning, consumer milk and analogs & sensory, ice cream Excursion in processing companies (the latter cannot be guaranteed, as legal requirements/contact persons in companies can change rapidly).
Literatur	Lecture handout and exercise handout
Anmerkungen	Students who have a contagious disease according to the Federal Epidemics Act are not allowed to participate! Participation in the experiments in the pilot plant of the Hohenheim Research and Teaching Dairy is only permitted with appropriate protective clothing.

Modul: Alternative Food Protein Solutions (1504-510)

Modulverantwortung	Mario Jekle
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	To complete the module successfully, students need competences in Englisch, mathematics, statistics and laboratory, which are not taught in the scope of this module, as well as basic knowledge in food science and technology (e.g. from a Bachelor in Food Technology, Nutritional Sciences or Food Chemistry).
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester (Block 3)
Studiengänge	M.Sc. Bioeconomy, 3rd semester, elective (profile: Transforming Food Systems within the Bioeconomy) M.Sc. Clinical Nutrition, 3rd semester, elective M.Sc. Molecular Nutrition, 3rd semester, elective M.Sc. Biotechnology, 3rd semester, elective M.Sc. Food Biotechnology, 3rd semester, elective M.Sc. Food Science and Engineering, 3rd semester, elective M.Sc. Food Science and Technology, 3rd semester, elective M.Sc. Food Systems, 1st semester, elective M.Sc. Food Chemistry, 3rd semester, elective
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	70
Selbststudium (in Stunden)	155
Arbeitsaufwand (in Stunden)	255
Lern- und Qualifikationsziele	After completing this module, students are able - to identify raw materials for sustainable food design - to develop and validate strategies for fractionation and extraction of food-grade proteins - to understand, implement and evaluate food processes in terms of their energy and carbon footprint performance - to understand the concept of life cycle assessment

	- to practically apply strategies in practice for dry fractionation, wet extraction, novel fractionation, functionalisation, extrusion, electrospinning, and fermentation of protein sources to food products - to evaluate novel processes for protein biomass production - to identify and apply analytical strategies in practice including functional properties
empfohlene Vorkenntnisse	-
Anmerkungen	Available places: 20, Registration via ILIAS Place allocation: Module allocation system for Food Master via ILIAS
Modulprüfung und Gewichtung	80% written exam, 20% essay/presentation. Prerequisite for exam: All practical exercises must be completed, with all lab reports per group being accepted. Each participant is responsible for at least 1 lab report.
Studienleistung und Gewichtung	protocol and lab report, active participation in practical exercises
Alternative food protein solutions (1504-511)	
Person(en) verantwortlich	Mario Jekle
Lehrform	Vorlesung mit Seminar und Exkursion
SWS	-
Inhalt	Lectures accompanied by advanced practical exercises, seminar, and excursion Fields of the new foods sector with special focus on sustainable food protein solutions such as - Introduction into the topic - Protein analysis (chemical, molecular, and functional properties) - Protein interactions - Technologies for protein recovery, purification, fractionation - Technologies for protein functionalization - Processing of selected protein sources

	- Life Cycle Assessment.
Literatur	Lecture notes and manual of the advanced practical course containing recommended literature for the different topics
Anmerkungen	-

Modul: Applied Mathematics for the Life Sciences (1101-400)

Modulverantwortung	Philipp Kügler
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Knowledge of the contents of the modul "Mathematik für Biowissenschaften" as part of the B.Sc.-programme “Lebensmittelwissenschaft und Biotechnologie” at the University of Hohenheim.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 2)
Studiengänge	M.Sc. Food Science and Engineering, 1st semester, compulsory M.Sc. Food Biotechnology, 3rd semester, elective M.Sc. Biologie, 3rd semester, semi-elective M.Sc. Agrarbiologie, 3rd semester, semi-elective
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	84
Selbststudium (in Stunden)	141
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Students will learn the basic principles of modeling and simulation with ordinary and partial differential equations in the life sciences. They will be able to classify and formulate mathematical models of processes in food science and engineering and use the software packages MATLAB to implement and numerically analyze them. Furthermore, students will know basic concepts of parameter identification and model control.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 50
Modulprüfung und Gewichtung	computer exam
Studienleistung und Gewichtung	Regular attendance and active software programming
Applied Mathematics for the Life Sciences (1101-401)	
Person(en) verantwortlich	Philipp Kügler
Lehrform	Vorlesung mit Übung
SWS	6
Inhalt	ordinary differential equations, Initial value problems, boundary value problems, numerical Integration, finite difference methods, parameter identification

	problems, control of ordinary differential equations, MATLAB
Literatur	M.S. Gockenbach, Partial Differential Equations: Analytical and Numerical Methods, SIAM, Philadelphia, 2010 R.J LeVeque, Finite Difference Methods for Ordinary and Partial Differential Equations, SIAM, 2007 L. Edsberg, Introduction to Computation and Modeling for Differ-ential Equations, Wiley, 2008 B.R. Hunt, R.L. Lipsman, J.E. Osborn, J.M. Rosenberg, Differential Equations with MATLAB, Wiley, 2012
Anmerkungen	-

Modul: Applied Mathematics for the Life Sciences II (1101-410)

Modulverantwortung	Philipp Kügler
Bezug zu anderen Modulen	Builds on the module "Applied Mathematics for the Life Sciences (1101-400)".
Teilnahmevoraussetzung	Successful completion of the module "Applied Mathematics for the Life Sciences (1101-400)" is required.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 2)
Studiengänge	M.Sc. Agricultural Biology, 2nd semester, semi-elective M.Sc. Biology, 2nd semester, elective M.Sc. Biotechnology, 2nd semester, elective M.Sc. Food Biotechnology, 2nd semester, elective M.Sc. Food Science and Engineering, 2nd semester, elective M.Sc. Food Science and Technology, 2nd semester, elective M.Sc. Biobased Products and Bioenergy, 2nd semester, elective M.Sc. Ernährungsmedizin, 2nd semester, elective M.Sc. Clinical Nutrition, 4th semester, elective M.Sc. Molekular Nutrition, 4th semester, elective M.Sc. Sustainable Biobased Technology, 2nd semester, elective
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	84
Selbststudium (in Stunden)	141
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Upon completion of the module students are able to: - classify and numerically solve common partial differential equations, - formulate optimization tasks and solve them numerically, - use simulation software.

	- independently solve simple simulation taks in research and development, - enter a dialogue with simulation experts in the context of interdisciplinary cooperation, - analyze scientific problems in a structured manner.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	computer exam
Studienleistung und Gewichtung	Active participation in the lecture and exercise sessions
Applied Mathematics for the Life Sciences II (1101-411)	
Person(en) verantwortlich	Philipp Kügler
Lehrform	Vorlesung mit Übung
SWS	6
Inhalt	- classification of partial differential equations - finite difference method and finite element method - classification of optimization tasks - ways to solve constant optimization problems - control and parameter identification tasks
Literatur	M.S. Gockenbach, Partial Differential Equations: Analytical and Numerical Methods, SIAM, Philadelphia, 2010 R.J. LeVeque, Finite Difference Methods for Ordinary and Partial Differ-ential Equations, SIAM, 2007 L. Edsberg, Introduction to Computation and Modeling for Differential Equations, Wiley, 2008
Anmerkungen	-

Modul: Arzneistoffe & Ernährung (1402-460)

Modulverantwortung	Sascha Venturelli
Bezug zu anderen Modulen	Das Modul baut auf der Grundlagenvorlesung Biochemie der Ernährung auf
Teilnahmevoraussetzung	Grundlagen der Biochemie, Deutsch- und Englischkenntnisse, Kenntnisse im Umgang mit Literaturdatenbanken
Lehrsprache	deutsch
ECTS	7,5
Angebotshäufigkeit	jedes Semester
Dauer des Moduls	4 Wochen (Block 2)
Studiengänge	M.Sc. Molekulare Ernährungswissenschaft, 2./3. Semester, Wahlpflicht oder Wahl M.Sc. Molekulare Ernährungswissenschaft (ab Studienbeginn WS23/24), 2./3. Semester, Wahlplficht oder Wahl M.Sc. Ernährungsmedizin, 2./3. Semester, Wahlpflicht oder Wahl M.Sc. Medizinische Ernährungswissenschaft, 2/3. Semester, Wahlpflicht oder Wahl M.Sc. Food Biotechnology, 2. Semester, Wahl M.Sc. Food Science and Engineering, 2. Semester, Wahl M.Sc. Agrarbiologie, 2. Semester, Wahlpflicht
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Ziel des Moduls ist, dass die Studierenden nach dessen Abschluss in der Lage sind, die wichtigsten biochemischen Grundlagen bedeutender Krankheitsbilder zu beherrschen und auch wiederzugeben zu können. Zusätzlich sollen die Studierenden auch darüber Bescheid wissen, welche Arzneistoffe für die entsprechenden Krankheitsbilder eingesetzt werden und wie diese biochemisch wirken. Darüber hinaus soll auch der Einfluss einer geeigneten Ernährung beziehungsweise Diät im Hinblick auf Prävention und Therapie dieser Erkrankungen erörtert werden. Abschließend sollen die Studierenden auch über mögliche Einflüsse falscher Ernährung bei der Entstehung

	dieser Krankheitsbilder Bescheid wissen und gegenüber bestimmten Wechselwirkungen zwischen Arzneistoffen und Ernährung sensibilisiert werden. Darüber hinaus sind Studierende in der Lage, sich eigenständig aktuelle Informationen zu Krankheitsbildern, den zugehörigen Arzneimitteln und Ernährungsempfehlungen zu beschaffen und diese auch kritisch zu bewerten sowie vor den anderen Modulteilnehmern zu präsentieren. Darüber hinaus lernen die Studierenden auch den Inhalt von aktueller Fachliteratur kritisch zu diskutieren und einzuordnen. Insbesondere sollen die Studierenden in die Lage versetzt werden Studiendaten zu interpretieren und Vernetzungsmöglichkeiten verschiedener Disziplinen im Kontext der Therapie von Krankheiten zu erkennen.
empfohlene Vorkenntnisse	-
Anmerkungen	Anzahl Teilnehmerplätze: 15 Anmeldung zum Modul über ILIAS Bevorzugt werden die Studierenden aus ernährungswissenschaftlichen Masterstudiengängen zugelassen.
Modulprüfung und Gewichtung	Präsentation (50%) und mündliche Prüfung zur Präsentation (50%)
Studienleistung und Gewichtung	aktive Teilnahme am Seminar
Arzneistoffe und Ernährung (1402-461)	
Person(en) verantwortlich	Sascha Venturelli
Lehrform	Vorlesung mit Seminar
SWS	4
Inhalt	Inhalt des Moduls sind die biochemischen Grundlagen zum Verständnis unterschiedlicher Krankheitsbilder sowie die wichtigsten pharmakologischen Eingriffsmöglichkeiten. Basierend auf diesen Grundlagen wird dann der Einfluss der Ernährung auf die Therapie und Prävention dieser Krankheitsbilder sowie auf die Wirkung unterschiedlicher Arzneistoffe behandelt und analysiert. Wichtige Krankheitsbilder, die besprochen

	werden, sind u.a. Diabetes mellitus Typ 1 und 2, Krebserkrankungen und Herz-Kreislauferkrankungen.
Literatur	Löffler Petrides: Biochemie und Pathobiochemie, Springer-Verlag Berlin Heidelberg 9. 2014 Auflage
Anmerkungen	15 Teilnehmer

Modul: Bioethanol and Distilled Spirits (1506-500)

Modulverantwortung	Jochen Weiss
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 4)
Studiengänge	Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Science and Engineering (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	70
Selbststudium (in Stunden)	155
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	On successful completion of the module you are familiar with the basic concepts of bioethanol and distilled spirits production. You are acquainted with the raw materials used in ethanol production. You know the methods and procedures used to convert the sugar present in the raw materials into ethanol and you have learned to apply this theoretical knowledge in practice. Furthermore, you know how some of the popular distilled spirits are made. You improved your skills in recognizing problems in the manufacturing process of food or beverages and to find goal-oriented solutions to these problems. You enhanced your understanding of the basic concepts in food technology and learned how to apply these concepts in practice.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 20
Modulprüfung und Gewichtung	Written exam
Studienleistung und Gewichtung	Regular attendance and active participation. Practical report.
Bioethanol and Distilled Spirits, Lecture (1506-501)	

Person(en) verantwortlich	Daniel Einfalt
Lehrform	Vorlesung
SWS	2
Inhalt	In the lecture, the different steps in the manufacturing process of fermentation ethanol from feedstock preparation to mashing process, fermentation and distillation are presented. The different feedstocks are discussed with respect to their properties and suitability for ethanol production. Also, the production process of some popular distilled spirits will be examined in detail. In addition, we talk about the basics of sensory testing of distilled spirits.
Literatur	Alcohol Textbook, Lyons, Kelsall, Murtagh (Eds.), Nottingham University Press (2004) Sprituosen-Technologie, Kolb, Behr Verlag (2004) The Biotechnology of Ethanol, Rohr (Ed.), Wiley-VCH (2001)
Anmerkungen	Alcohol Textbook, Lyons, Kelsall, Murtagh (Eds.), Nottingham University Press (2004) Sprituosen-Technologie, Kolb, Behr Verlag (2004) The Biotechnology of Ethanol, Rohr (Ed.), Wiley-VCH (2001)
Bioethanol and Distilled Spirits, Seminar (1506-502)	
Person(en) verantwortlich	Daniel Einfalt
Lehrform	Seminar
SWS	1
Inhalt	In the seminar, you will deepen certain aspects brought up in the lecture, like e.g. specific problems with different feedstocks in starch to sugar conversion. You learn about herbal drugs used in distilled spirits production. You practice alcoholometric calculations. Finally, you will apply your sensory expertise acquired in the lecture to organoleptic testing of whiskies.
Literatur	-
Anmerkungen	-
Bioethanol and Distilled Spirits, Practical (1506-503)	
Person(en) verantwortlich	Daniel Einfalt
Lehrform	Praktikum
SWS	2
Inhalt	In the practical, you will put your theoretical knowledge gained in the lecture into practice. You will perform the mashing process of starchy feedstock in lab scale and pilot plant scale at our university

	distillery and analyze the process parameters. You will examine in detail the distillation process on our 48-stage rectification column. You will make use of fractioned distillation on a "birectificator" to evaluate the quality of different cognacs or brandies.
Literatur	-
Anmerkungen	-

Modul: Biology of Aging and the Impact of Nutrition (1403-500)

Modulverantwortung	Jan Frank
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	B. Sc. education with toxicology, biofunctionality, biochemistry or similar.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 2)
Studiengänge	M.Sc. Agrarbiologie, 2. Semester, Wahlpflicht M.Sc. Ernährungsmedizin, 2. Semester, Wahlpflicht oder Wahl M.Sc. Medizinische Ernährungswissenschaft, 2. Semester, Wahlpflicht M.Sc. Molekulare Ernährungswissenschaft, 2. Semester, Wahlpflicht oder Wahl M.Sc. Molekulare Ernährungswissenschaft (ab Studienbeginn WS2/24), 2. Semester, Wahlpflicht M.Sc. Food Biotechnology, 2. Semester, Wahl M.Sc. Food Science and Engineering, 2. Semester, Wahl
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The students - understand the basics of the ageing process. - understand the pathomechanism of age-related diseases. - understand the potentials and limitations of nutritional interventions in the ageing process and the pathophysiology of age-related diseases.
empfohlene Vorkenntnisse	-
Anmerkungen	Registration: via ILIAS, at the latest four weeks before the start of the module
Modulprüfung und Gewichtung	Written examination (100%)
Studienleistung und Gewichtung	-

Biology of Aging and the Impact of Nutrition (1403-501)	
Person(en) verantwortlich	Jan Frank
Lehrform	Vorlesung
SWS	4
Inhalt	- Mechanistic changes in the ageing process - Social, demographic changes in old age - Ageing and nutrition (supply situation, intervention) - Pathophysiology of selected diseases - Role of the supply of nutrients and micronutrients in pathology
Literatur	Aging: Facts and Theories (Interdisciplinary Topics in Gerontology) Robert, L.,Fulop, T. (Karger) 2014 Masoro, Austad: Handbook of the Biology of Aging, Academic Press, 2001
Anmerkungen	-

Modul: Biotechnology (1502-450)

Modulverantwortung	Lutz Fischer
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester (Block 2)
Studiengänge	M.Sc. Food Biotechnology (1. Semester, Pflicht) M.Sc. Food Science and Engineering (1./3. Semester, Wahl) M.Sc. Lebensmittelchemie (3. Semester, Wahl)
Prüfungsdauer (in Minuten)	30
Präsenzstudium (in Stunden)	90
Selbststudium (in Stunden)	135
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	After completing the module, students will be able to explain and apply basic aspects of biotechnology, molecular biology, recombinant protein expression and working with enzymes. Upon completion of this module the students are able to plan and work in a laboratory independently. They will be able to interpret their results and to compare them with known data from literature.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 24
Modulprüfung und Gewichtung	Protocol (100%)
Studienleistung und Gewichtung	Lab book and seminar & lab experiments

Biotechnology (1502-451)

Person(en) verantwortlich	Lutz Fischer
Lehrform	Vorlesung mit Praktikum
SWS	4
Inhalt	In interactive lessons the students will learn basic aspects of biotechnology, the principles of DNA cloning techniques (e.g. Isolation of DNA, PCR, restriction, ligation, transformation as well as Gibson

	Cloning and Golden Gate Cloning), the methods used for the recombinant production of enzymes in Escherichia coli. In addition, students will also learn about the aspect and concepts of recombinant production in food-grade organisms. Furthermore, the students learn how to work with enzymes. In the practical part of this module the students use the theoretical knowledge to plan and carry out the experiments. The students will clone a gene that codes for a relevant enzyme using Gibson Cloning. They will produce an enzyme recombinantly in E. coli, determine the enzyme activity and protein content and investigate the substrate selectivity. Moreover, they will use it for a biotransformation. The analysis of the results and their interpretation will be discussed and evaluated.
Literatur	-
Anmerkungen	-

Modul: Cellular Microbiology (1909-430)

Modulverantwortung	Julia Fritz-Steuber
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 2)
Studiengänge	Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Science and Engineering (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl Biologie (Master, PO vom 01.10.2010) 2. Semester, Wahlpflicht
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The students know different strategies of bacterial pathogens to manipulate the host. They understand the mechanism of action of virulence factors on a molecular level. They understand the importance of environmental factors for the morphology of a bacterial cell, for example during biofilm formation. The students are encouraged to work as independent as possible in a team solving a current problem in research. They analyse their data and discuss their results with respect to existing theories in the field. They write a scientific report of their research
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 6 Registration: via ILIAS Registration period: from March 18 to April 5

	Module code until summer term 2022: 2502-430
Modulprüfung und Gewichtung	Oral presentation (50%) and protocol (50%)
Studienleistung und Gewichtung	Regular and active participation
Cellular Microbiology, Lecture (1909-431)	
Person(en) verantwortlich	Julia Fritz-Steuber
Lehrform	Vorlesung
SWS	1
Inhalt	The students know different strategies of bacterial pathogens to manipulate the host. They understand the mechanism of action of virulence factors on a molecular level. They understand the importance of environmental factors for the morphology of a bacterial cell, for example during biofilm formation.
Literatur	Michael Wilson, Rod McNab, Brian Henderson: "Bacterial Disease Mechanisms: An Introduction to Cellular Microbiology", Cambridge University Press, 2002 Pascale Cossart, Patrice Boquet, Staffan Normark, Rino Rappuoli: "Cellular Microbiology", ASM Press, 2004
Anmerkungen	Maximum of 6 participants | Requirement for participation: Regular and active participation of the course “Cellular Microbiology, Research Internship” (1909-432)
Cellular Microbiology, Research Internship (1909-432)	
Person(en) verantwortlich	Julia Fritz-Steuber
Lehrform	Praktikum
SWS	3
Inhalt	The students are encouraged to work as independent as possible in a team solving a current problem in research. They analyse their data and discuss their results with respect to existing theories in the field. They write a scientific report of their research project according to the rules for scientific writing. They present their results in a lecture.
Literatur	Kathleen McMillan, Jonathan Weyers: "How to Write Dissertations & Project Reports" Pearson Education, 2007
Anmerkungen	Maximum of 6 participants | Requirement for participation: Regular and active participation of the course “Cellular Microbiology, Lecture” (1909-431)

Modul: Chemical Analytical Methods (1508-400)

Modulverantwortung	Yanyan Zhang
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Basic scientific knowledge in inorganic, organic and analytical chemistry
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester (Block 4)
Studiengänge	M.Sc. Food Biotechnology, 1. semester, compulsory
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	70
Selbststudium (in Stunden)	155
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	After having completed the module, students should be able to explain and apply important principles and/or concepts and recall important facts from topics relevant to the course. These topics include: - basics of analytical chemistry - method development of qualification and quantification - expertise in a variation of analytical methods (incl. photometry/spectroscopy, spectrometry, chromatography, element analysis) - interpretation of mass spectra - interpretation of lab results Furthermore, the students should be able to link theory with practice, independently carry out experiments and analyses, evaluate/interpret analytical and spectroscopic data and critically assess and evaluate their results. They should also be able to organize their experiments in such a way that all experiments can be performed in the time allocated. The creating of well-structured protocols will help students to improve their written skills.

empfohlene Vorkenntnisse	-
Anmerkungen	Max. number of participants: 25 Students of Food Biotechnology first, further seats: first-come, first-serve
Modulprüfung und Gewichtung	seminar presentation (30%), written exam (70%)
Studienleistung und Gewichtung	Regular participation proven by laboratory protocols, seminar presentation and exposé
Chemical Analytical Methods (1508-401)	
Person(en) verantwortlich	Yanyan Zhang
Lehrform	Vorlesung mit Seminar, Praktikum und Exkursion
SWS	6
Inhalt	The students acquire skills in - basics of analytical chemistry - method development of qualification and quantification - chose, advantages and disadvantages of several analytical methodologies - interpretation of mass spectra - literature research on a specific seminar topic - preparing a presentation (10-15 min) - writing an exposé about the presentation topic Exercises related to the topics of the lecture and practical part. Witin the lab course students acquire practical skills in - performing laboratory experiments in the fields of fermentation, sample preparation, chromatography (GC and HPLC), photometry - the analysis and interpretation of experimental results.

	Excursion to a company (e.g. WALA) to visit the Research & Development as well as Quality control Departments
Literatur	Skoog, West & Holler „Fundamentals of Analytical Chemistry” Lundanes, Reubsaet & Greibrokk “Chromatography: Basic principles, sample preparation and related methods” Schäfer “Gas chromatography – mass spectrometry – How do I get the best results” Matissek, Steiner & Fischer “Lebensmittelanalytik”
Anmerkungen	Max. number of participants: 25

Modul: Computational Thinking (1511-400)

Modulverantwortung	Christian Krupitzer
Bezug zu anderen Modulen	No previous knowledge is expected for this module.
Teilnahmevoraussetzung	
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester (Block 4)
Studiengänge	M.Sc. Food Biotechnology, 3. Semester, Wahl M.Sc. Food Science and Engineering, 3. Semester, Wahl M.Sc. Lebensmittelchemie, 3. Semester, Wahl M.Sc. Food Systems, 3. Semester, Wahl M.Sc. Bioeconomy, 3. Semester, Wahl (Profil: Transforming Food Systems | Data Science and Artificial Intelligence)
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	63
Selbststudium (in Stunden)	162
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	This module will provide essential knowledge of the technological foundations of information systems. Based on this, students will be able to assess technology but also to develop software and acquire fundamentals for learning machine learning techniques. The students will learn basic concepts of computer hardware (von Neumann architecture) and system software (operating systems concepts), programming fundamentals (Java or Python), as well as algorithms and data structures (searching, sorting, lists, hash-tables, trees). This includes an understanding of the basic architectures of modern information systems, software implementation, and how to model problems in algorithms/software and how solve them using modern programming languages.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written examination: 100%

Studienleistung und Gewichtung	-
Computational Thinking (1511-401)	
Person(en) verantwortlich	Christian Krupitzer
Lehrform	Vorlesung mit Übung
SWS	6
Inhalt	The students will learn basic concepts of computer hardware (von Neumann architecture) and system software (operating systems concepts), programming fundamentals (Java or Python), as well as algorithms and data structures (searching, sorting, lists, hash-tables, trees). This includes an understanding of the basic architectures of modern information systems, software implementation, and how to model problems in algorithms/software and how solve them using modern programming languages.
Literatur	List of English literature will be provided at start of course.
Anmerkungen	No previous knowledge is expected for this module.

Modul: Databases and Software Tools in Protein Science (1502-520)

Modulverantwortung	Lutz Fischer
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester (Block 3)
Studiengänge	M.Sc. Food Biotechnology , 2nd semester, elective M.Sc. Biology, 2nd semester, elective M.Sc. Molecular Nutrition, 2nd semester, elective M.Sc. Clinical Nutrition, 2nd semester, elective
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	70
Selbststudium (in Stunden)	155
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The aim of the module is that after its completion the students are able to apply the relevant databases and software tools for research in the field of protein biochemistry and enzyme technology. The students are able to work independently on the conception, planning and practical implementation of a molecular biology project. • Introduction in the databases Brenda, ENA, PDB, BLAST, Clustal Omega und ESPript • Introduction to the use of the software tools Clone Manager/Serial Cloner and Py-MOL • Practical implementation of cloning and site-directed mutagenesis Furthermore students are able to - work on scientific tasks by themselves - organize and conceptualize scientific tasks - apply their foreign language competence - adequately apply their written and spoken scientific articulateness

	- conceptualize and plan for experimental proceedings by themselves.
empfohlene Vorkenntnisse	-
Anmerkungen	Available places: 6 - 12 Registration via ILIAS
Modulprüfung und Gewichtung	excercises 30 % colloquium 30 % protocoll 40 %
Studienleistung und Gewichtung	Participation in the discussion of exercises and practical work
Databases and Software Tools in Protein Science (1502-521)	
Person(en) verantwortlich	Lutz Fischer
Lehrform	Vorlesung mit Seminar und Laborübungen
SWS	5
Inhalt	Students will be introduced to various databases (BRENDA, PDB ENA, BLAST, Clustal Omega and ESPript) and software tools CloneManager/Serial Cloner and PyMOL that are important in the field of protein biochemistry and enzyme technology and will apply them practically in exercises. To further prepare for the practical experiment, students are also taught basic knowledge of primer design and DNA sequencing. In the practical course, the students will clone a gene that codes for a relevant enzyme and perform site-directed mutagenesis on this example. Based on the knowledge obtained in the first part, the students have to develop the cloning strategy and create an experimental setup by themselves. The outcome will be analyzed and discussed in a colloquium before the start of the practical part. At the end of the practical course a protocol has to be written, in which the knowledge obtained about databases and software tools has to be applied.
Literatur	-
Anmerkungen	-

Modul: Drying, Granulation and Instantisation (1503-540)

Modulverantwortung	Reinhard Kohlus
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Knowledge of equivalent to Food Process Design I, e.g. Basics of fluid mechanics, mass and heat transfer, unit operations in food processing.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 4)
Studiengänge	Food Science and Engineering, 2nd semester, elective Food Biotechnology, 2nd semester, elective Food Systems, 2nd semester, elective
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	70
Selbststudium (in Stunden)	155
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	• The students will learn to model drying problems. Starting at the physical basics of drying up to equipment design. • They know key quality parameter and degradation mechanism for dry / low aw food. • The learned skills focus on applicable knowledge which is based on strong basic / theoretical foundations allowing to apply it in a wide context. • The application of computer based methods is trained by working on application case studies. • Key competencies addressed in this module are critical problem assessment and analytical thinking.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 20 Registration via ILIAS until 2 weeks before the course starts.
Modulprüfung und Gewichtung	Written exam (60 minutes), oral exam (30 minutes).
Studienleistung und Gewichtung	-

Drying, Granulation and Instantisation (1503-541)

Person(en) verantwortlich	Reinhard Kohlus

Lehrform	Vorlesung mit Praktikum
SWS	5
Inhalt	Selection and lay out (dimensioning) of drying equipment for tasks in food processing. Scientific description of dryer, typical equipment used in food drying: i.e. spray dryer, belt drier, roller drier, freeze drier Analysis and modelling of temperature-moisture behaviour of foods. Fundamentals of Agglomeration / granulation. Design, Scale up and operation (Process lay out) of granulators and agglomerators (Fluid bed and High shear mixer). Computation of relevant problems related to dry food. Fundamental approach to problems in drying and dealing with low aw foods. Selected examples of recipe effects in drying and instantisation of food. Quality parameter of dry foods, interactions and storage effects. Characterisation, functionality and quality of food powders and related property functions, importance of amorphous state mechanism and parameter determining the quality of low aw food and their relation to the drying process.
Literatur	Trocknungstechnik in der Lebensmittelindustrie , Gehrmann, Esper, Schuchmann, Behrs-Verlag 2009; Die wissenschaftlichen Grundlagen der Trocknungstechnik Band 1, , O. Krischer, W. Kast Springer Verlag 1992 List of English literature will be provided at start of course
Anmerkungen	-

Modul: Einführung in wissenschaftliches Programmieren (1509-900)

Modulverantwortung	Alexander Schaum
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	-
Lehrsprache	deutsch/englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	Promotionsstudiengang Naturwissenschaften (Promotionsstudiengänge, PO vom 14.02.2015) 2. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	28
Selbststudium (in Stunden)	197
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Ziel des Moduls ist, dass die Studierenden nach dessen Abschluss in der Lage sind, eine Programmierumgebung, typische Datentypen, Operatoren und Ausdrücke sowie Kontrollstrukturen zu handhaben. Die strukturierte Vorgehensweise beim Erstellen von Programmen kennen und praktische wissenschaftliche Problemstellungen durch selbst geschriebene Programme lösen können (Algorithmen aus der Mathematik, z.B. für Approximationen, Optimierung oder Analyse von Daten in Dateien, ...). - Selbstständiges Arbeiten und Programmieren - Kritisches, analytisches Denken
empfohlene Vorkenntnisse	-
Anmerkungen	Teilnehmerplätze: 10 Anmeldung: ILIAS Anmeldezeitraum: 01.02.-31.03.2017
Modulprüfung und Gewichtung	Programmieraufgabe lösen
Studienleistung und Gewichtung	Erstellen eines Programms
Einführung in wissenschaftliches Programmieren (1509-901)	

Person(en) verantwortlich	Alexander Schaum
Lehrform	Vorlesung mit Übung
SWS	2
Inhalt	- Modelle und deren Nutzen in den Wissenschaften - Sinn und Zweck von Simulations- und Vorhersagemodellen - Erstellen von Simulationen - Praxisnahe Studien entsprechend Teilnehmerwunsch
Literatur	themenspezifische Literaturempfehlung in der Veranstaltung
Anmerkungen	-

Modul: Enzymatic Reactions (1502-410)

Modulverantwortung	Lutz Fischer
Bezug zu anderen Modulen	The module is part of the series Enzyme Biotechnology .
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 4)
Studiengänge	M.Sc. Food Biotechnology, 3. Semester, Wahl M.Sc. Food Science and Engineering, 3. Semester, Wahl M.Sc. Biologie, 3. Semester, Wahl M.Sc. Molekulare Ernährungswissenschaft, 3. Semester, Wahl M.Sc. Molekulare Ernährungswissenschaft (ab Studienbeginn WS23/24), 3. Semester, Wahl
Prüfungsdauer (in Minuten)	30
Präsenzstudium (in Stunden)	90
Selbststudium (in Stunden)	135
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Upon completion students are able to determine the enzyme activity of different kinds of enzymes. In addition, students are able to plan, perform and evaluate scientific experiments to characterize enzymes using different biochemical methods on their own. The students are able to plan and performe a gene transformation and express an enzyme recombinantly in a microorganism. The aim of this module is that students are able to plan and work in a laboratory indepedently. They will be able to interpret their results and to compare them with known data from literature. In addition, they will be able to present their results in front of an audience.
empfohlene Vorkenntnisse	-
Anmerkungen	Minimum number of participants: 6 Maximum number of participants: 12

	Registration: via ILIAS
Modulprüfung und Gewichtung	oral examinations (50%), protocol (50%) (oral examinations are about the theory and results of the practical parts which will be presented by the student in seminars)
Studienleistung und Gewichtung	Attendance and active participation in seminars and practical course, protocol
Enzymatic Reactions | Lectures and Seminar (1502-411)	
Person(en) verantwortlich	Sabine Lutz-Wahl Timo Stressler Lutz Fischer
Lehrform	Vorlesung mit Seminar
SWS	1,5
Inhalt	Students will learn the theoretical backgrounds for enzyme activity determination, enzyme process development and they will gain knowledge about enzyme applications in the industry. The students will learn to examine and use current scientific literature about certain enzyme classes. Key words: - Screening for suitable and/or new enzymes - Enzymes in non-conventional media - Enzymes modified by bioimprinting methodology - Immobilisation of biocatalysts - HPLC and CGC Analaysis to quantify enzyme activities Besides the students will present their own results, evalutate and discuss them (will be marked).
Literatur	Current original papers about enzymes, text books for laboratory work, General Literatur: Bisswanger, H.: Practical Enzymology, 2. ed., Wiley-Blackwell Buchholz, K., Kasche V., Bornscheuer U.: Biocatalysts and Enzyme Technology, 2. ed., Wiley-Blackwell Current scientific publications (will be provided)
Anmerkungen	-
Enzymatic Reactions | Practical course (1502-412)	
Person(en) verantwortlich	Lutz Fischer
Lehrform	Praktikum
SWS	6
Inhalt	Students will learn to apply knowledge from the literature and text books by itself. By doing so, They will learn to determine the enzyme activity of a particular enzyme class with suitable methods. In addition, the enzymes will be partrly characterized

	biochemically (e.g. pH-profile, temperature profile, inhibitors,...).
Literatur	Current literature about particular enzyme classes, original articles and reviews (will be discussed with supervisor) General text books: Bisswanger, H.: Practical Enzymology, 2. ed., Wiley-Blackwell Buchholz, K., Kasche V., Bornscheuer U.: Biocatalysts and Enzyme Technology, 2. ed., Wiley-Blackwell
Anmerkungen	-

Modul: Food and Nutrition Security (4902-430)

Modulverantwortung	Kirsten Boysen-Urban
Bezug zu anderen Modulen	This module will be of particular interest for students with a specialization in development economics and policy.
Teilnahmevoraussetzung	Students should be familiar with the basics in microeconomics and macroeconomics. Furthermore, some previous exposure to aspects related to poverty and economic development is assumed.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 semester
Studiengänge	Bioeconomy (Master) 3. Semester, elective (profile: Bioeconomy Policy Analysis |Transforming Food Systems within the Bioeconomy) Food Biotechnology (Master) 3. Semester, elective Agricultural Sciences in the Tropics and Subtropics (Master) 3. Semester, elective Agricultural Sciences - Agricultural Economics (Master) 3. Semester, semi-elective Agricultural Sciences - Transformation Management for Sustainable Agri-Food Systems (Master) 3. Semester, semi-elective (Profile Tropics and Subtropics | Consumers and Food Value Chains) Earth and Climate System Sciences (Master) 3. Semester, elective (Profile: Agroecosystems and Food Security)
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students will become familiar with the multidimensional problems of hunger and malnutrition, including global trends, measurement concepts, causes, and economic implications. Furthermore, policies to improve food and nutrition security will be analyzed and discussed. Students will acquire communication and cooperation skills within a multicultural framework. They will be instructed to think critically and analytically about the multidimensionality of hunger and malnutrition. Students will be able to effectively evaluate and

	communicate the problems and challenges of food security.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written (100%)
Studienleistung und Gewichtung	-
Food and Nutrition Security (4902-431)	
Person(en) verantwortlich	Manfred Zeller Kirsten Boysen-Urban
Lehrform	Vorlesung
SWS	4
Inhalt	This module focuses the socio-economic aspects of malnutrition and overnutrition, including causes, consequences and remedies. It also discusses the different drivers of food supply and demand in the world market. Students are expected to be familiar with the basics of micro- and macro-economics and to have some prior knowledge of aspects of poverty and economic development. Overview of main topics covered: • Global Perspective on Hunger and Food Insecurity • Concepts of Hunger and Malnutrition: Measurement Approaches and Nutrition-Health Linkages • The World Food Equation: Factors of Global Food Supply and Demand • Trade Policies in Developing Countries; Poverty and Trade • Multidimensionality of Hunger and Poverty: Food Security-Poverty Linkages • Access to Rural Finance: Empowerment, Participation and Gender • Targeting of Rural Development Policies • Food Demand Analysis: Empirical Approaches and Data Collection • Food and Nutrition Policies • Multidimensionality of Hunger and Poverty: Risk and Vulnerability • Institutional Change: Access to Land and Water Resources • The Challenge of Food Security Through the lectures and discussion of case studies you will become familiar with the multidimensional problems of hunger and malnutrition, including

	global trends, measurement concepts, causes, and economic implications.
Literatur	• Leathers, H.D., and P. Foster (2009): The World Food Problem: Towards Ending Undernutrition in the Third World. 4th edition. Lymne Rienner Publishers, Boulder. • Leathers, H.D., and P. Foster (2004): The World Food Problem: Tackling the Causes of Undernutrition in the Third World, 3rd edition, Lymne Rienner Publishers, Boulder. • Southgate, D., D.H. Graham and L. Tweeten (2010): The World Food Economy. Oxford, Blackwell Publishing. • Thirlwall, A.P. (2006): Growth and Development. With Special References to Developing Economies. 8th edition. Palgrave Macmillian, New York. • Todaro, M. P. and S. C. Smith (2009): Economic Development. 10th edition. Pearson, London.
Anmerkungen	-

Modul: Food Microbiology (1501-440)

Modulverantwortung	Herbert Schmidt
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Bachelor's degree in a natural science degree programme in Life Sciences
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 1)
Studiengänge	M.Sc. Food Biotechnology (1. Semester, Pflicht) M.Sc. Biotechnology (1. Semester, Pflicht)
Prüfungsdauer (in Minuten)	45
Präsenzstudium (in Stunden)	96
Selbststudium (in Stunden)	129
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The aim of the module is that upon completion students will be able to - understand and explain basic principles of scientific operation - present various principles of diagnostics and taxonomy of food-associated microorganisms - conceptualise, prepare and discuss presentations in microbiology based on original publications - discuss and apply new experimental, analytical methods in the field of food microbiology - independently plan, prepare and carry out practical laboratory experiments in the field of isolation and characterisation of lactic acid bacteria from fermented milk products. - understand and apply laboratory record keeping and scientific documentation. - apply bioinformatic sequence analysis of 16S rRNA genes. - understand and discuss ethical principles in science.

	- work independently and acquire knowledge - read and discuss technical literature critically - use technical terms correctly - use scientific terminology - plan, carry out and evaluate laboratory experiments independently - evaluate own results against the background of the scientific literature. - apply the acquired knowledge in an interdisciplinary manner - apply communication and cooperation skills
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 24 Registration: via ILIAS Criteria according to which places are allocated: Registration within the registration period, study course
Modulprüfung und Gewichtung	Protocol / seminar presentation / poster (All three performances must be completed. The module is ungraded)
Studienleistung und Gewichtung	-
Food Microbiology - Laboratory Course and Documentation (1501-441)	
Person(en) verantwortlich	Herbert Schmidt
Lehrform	Vorlesung mit Seminar und Laborübungen
SWS	6
Inhalt	- Microbial starter cultures: taxonomy, fermentation, metabolism and genetics - Literature databases - Documentation and presentation tools - Preparation of culture media, solutions and buffer - Isolation and characterization of lactic acid bacteria from fermented dairy products

	- Identification by 16S rRNA PCR and DNA sequencing - Bioinformatic analysis of DNA sequences
Literatur	Hutkins, Robert W., 2006. Microbiology and Technology of Fermented Foods. IFT Press, Blackwell Publishing, 2121 State Avenue, Ames, Iowa 50014, USA, 1st Edition.
Anmerkungen	-

Modul: Food Process Design I - Efficient Processing and Transport Phenomena (1503-520)

Modulverantwortung	Reinhard Kohlus
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Technical basics, process engineering, physical chemistry or thermody-namics of multiphase systems
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 3)
Studiengänge	Food Science and Engineering (Master, PO vom 01.10.2013) 1. Semester, Pflicht Bioeconomy (Master, PO vom 01.10.2014) 3. Semester, Wahl (Profil: Transforming Food Systems) Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 3. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 3. Semester, Wahl Bioeconomy (ab WS 16/17) (Master, PO vom 01.04.2017) 3. Semester, Wahl Food Systems (Master, PO 01.10.2019) 1. Sem., Wahl
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	80
Selbststudium (in Stunden)	145
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The students know the fundamentals of thermal separation processes. They are capable of applying physical-chemistry fundamentals, to design the processes. The laws of energy and mass and momentum transfer are known and can be applied to standard problems. The fundamental calculation methods are mastered.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 50

Modulprüfung und Gewichtung	oral exam (20 minutes), optional written exam (120 minutes)
Studienleistung und Gewichtung	-
Food Process Design I - Efficient Processing and Transport Phenomena (1503-521)	
Person(en) verantwortlich	Reinhard Kohlus
Lehrform	Vorlesung mit Übung
SWS	6
Inhalt	Lecture: Application of the fundamentals of thermal separation processes, multiphase flow and food process design. Specifically covered topics are drying technology, distillation and rectification, extraction, crystallization, heat transfer processes. Fundamentals: Equilibria equations, Phase and state diagrams, mass transfer equations, Multiphase flows: especially gas –liquid flows, Mass transfer in multiphase systems, two film theory, surface renewance theory Design of rectification system: McCabe Thiele Diagram, hydrodynamic design of rectification columns. Description of residence time distributions, prediction of RTD's Drying, coupling of heat and mass transfer, Glass transition temperature, sorp-tion isotherms. Optimisation of energy requirements, coupling of heat flows- Design and decision taking of heat transfer systems. Exercises and problems in the above given areas will be covered using calcu-lation and engineering software.
Literatur	Sattler; Thermische Trennverfahren; VCH Verlag Kraume, Kraume, M: Transportvorgänge in der Verfahrenstechnik, Grundlagen und Apparative Umsetzung , Springer Verlag 2004
Anmerkungen	-

Modul: Food Process Design II - Process Integration and Scale up (1503-500)

Modulverantwortung	Reinhard Kohlus
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Knowledge of equivalent to Food Process Design I, e.g. Basics of fluid mechanics, mass and heat transfer, unit operations in food processing.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 3)
Studiengänge	Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Science and Engineering (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl Food Systems (Master, PO vom 01.10.2019) 2. Semester, Wahl Bioeconomy (Master), 2. Semester, Wahl (Profil: Transforming Food Systems within the Bioeconomy)
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The students will learn to structure a line design problem and place it in the economical context. They will be able to make a systematic construction based on the main process-product interactions. They know the principles of the design of experiment approach and can apply these to a process design question. The students are able to solve scale up problems by principles of similitude. The learned skills focus on applicable knowledge which is based on strong basic / theoretical foundations allowing to apply it in a wide context.

	A key skill needed in this context is the ability to combine the set of tools to appropriately tackle a complex process design problem. Key competencies addressed in this module are threefold: decision making and dealing with complexity, understanding different roles in project management and team work and lastly professional communication with business partner.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 24 Registration via ILIAS
Modulprüfung und Gewichtung	oral exam (20 minutes), optional written exam (120 minutes)
Studienleistung und Gewichtung	-
Food Process Design II - Process Integration and Scale up (1503-501)	
Person(en) verantwortlich	Reinhard Kohlus
Lehrform	Vorlesung mit Übung
SWS	5
Inhalt	Set-up of requirement lists, systematic construction processes (i.e. conceptual process design), apparatus and plant engineering and construction, Process-product interactions, Robust plant design, Process scale up, Design of experi-ments for process modelling. Hygienic design rules and cleaning considera-tions (cip, wip, sip), process control strategies and process optimization.
Literatur	Blass, E.; Entwicklung Verfahrenstechnischer Prozesse; Springer, Berlin (1997) Zlokarnik, M.; Scale up ; WILEY-VCH Verlag GmbH (2005) Kleppmann, W.; Taschenbuch Versuchsplanung; Hanser Verlag 2008 Douglas, J.,M. ; Conceptual Design of Chemical Prozesses; Mac GrawHill, Boston 1976 Hauser, G.; Hygienische Produktgestaltung; WILEY-VCH Verlag GmbH (2007)
Anmerkungen	List of English literature will be provided at start of course

Modul: Food Product Development: From Concept Ideation to Product Launch (1507-520)

Modulverantwortung	Jochen Weiss
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Student of one of the above mentioned Master programes with good command in English language
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes Semester
Dauer des Moduls	1 Semester (Block 3)
Studiengänge	M.Sc. Food Systems, 1./3. Semester, Wahl M.Sc. Bioeconomy, 3. Semester, Wahl Profil: Transforming Food Systems M.Sc. Food Biotechnology, 3. Semester, Wahl M.Sc. Food Science & Engineering, 3. Semester, Wahl M.Sc. Lebensmittelchemie, 3. Semester, Wahl M.Sc. Molekulare Ernährungswissenschaft, 3. Semester, Wahl M.Sc. Molekulare Ernährungswissenschaft (ab Studienbeginn WS 23/24), 3. Semester, Wahl M.Sc. Ernährungsmedizin, 3. Semester, Wahl M.Sc. Medizinische Ernährungswissenschaft, 3. Semester, Wahl
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	70
Selbststudium (in Stunden)	155
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Students will be able to identify and respond to market needs based on a basic understanding on. Holistic insights into food product development and business creation will give them the tools to critically assess tasks in the field of product development and improvement, as well as entrepreneurial challenges to bring products to the market. This will allow them to develop leadership qualities and to work together as a team. Furthermore they will know technical terms and prerequisites related to these fields. The goal of the module is to develop a joint team project, which is assessed as part of the module

	examination. Students learn to develop and present their own ideas and work on them in small groups. In doing so, students strengthen their social and teamwork skills as well as their presentation skills.
empfohlene Vorkenntnisse	-
Anmerkungen	Number of participants: 20 Registration via ILIAS Place allocation: Eligibility and registration order in ILIAS
Modulprüfung und Gewichtung	written business case (60%) and oral presentation (40%)
Studienleistung und Gewichtung	active participation at the lectures due to presentations is required
Food Product Development: From Concept Ideation to Product Launch (1507-521)	
Person(en) verantwortlich	Lisa Berger Jochen Weiss
Lehrform	Vorlesung
SWS	3
Inhalt	The module will cover different topic areas, such as: - Ideation in Start-Ups (conceptualization; start-up hub & entrepreneurial spirit) - Current Trends (market analysis, market trends, consumer trends) - Applied Product Development (emerging materials, emerging technologies, labelling & claims, sensory analysis, case studies, food safety, legal assessments and IP, challenges) - Corporate Identity (brand development, PR & marketing) - Innovations in Packaging (packaging materials science, packaging trends) - External Demands on Start-Ups (investment, targeting the retail) - Start-Up Case Studies (pre-seed, seed invest, invested & scaled, established businesses)
Literatur	Will be provided during the module

Anmerkungen	The corresponding module is offered in winter and summer. Please note, a double enrollment of modules (summer and winter semester) is not possible !

Modul: Free Project Work (1500-020)

Modulverantwortung	Lutz Fischer
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	M.Sc. Food Biotechnology
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes Semester
Dauer des Moduls	n. V.
Studiengänge	Food Biotechnology (Master, PO vom 01.10.2016) 2./3. Semester, Wahl Food Systems (Master, PO vom 01.10.2019) 1. Semester, Wahl
Prüfungsdauer (in Minuten)	30
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Upon completion of this module students - have gained insight into a current research project - understand the theoretical foundation and methodology of the research project - acquire practical experience by employing the methodology - learn how to properly document research findings - acquire experience in presenting research findings orally
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 3 Students have to find a professor to supervise the project.
Modulprüfung und Gewichtung	Report (50%) and Presentation (50%)
Studienleistung und Gewichtung	-

Free Project Work (1500-021)

Person(en) verantwortlich	Mario Jekle Herbert Schmidt Jochen Weiss Lutz Fischer

	Jörg Hinrichs Reinhard Kohlus Rudolf Hausmann Yanyan Zhang Monika Gibis Christian Krupitzer Alexander Schaum
Lehrform	Projekt/Projektarbeit
SWS	-
Inhalt	-
Literatur	-
Anmerkungen	-

Modul: Genetic Engineering Techniques in Microbiology (1501-460)

Modulverantwortung	Herbert Schmidt
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	The modules "Food Microbiology" and optionally "Identification and Characterization of Foodborne Microorganisms" must be successfully completed.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester (Block 2)
Studiengänge	M.Sc. Food Biotechnology, 3rd semester, elective
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	84
Selbststudium (in Stunden)	141
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	-
empfohlene Vorkenntnisse	-
Anmerkungen	Number of particpants: 8 Registration via ILIAS Criteria by which study places are allocated: - registration during the registration period - students of food biotechnology first, for open seats first-come, first-serve
Modulprüfung und Gewichtung	written report (100%)
Studienleistung und Gewichtung	presentation

Genetic Engineering Techniques in Microbiology (1501-461)

Person(en) verantwortlich	Herbert Schmidt
Lehrform	Vorlesung mit Seminar und Praktikum
SWS	6
Inhalt	- Important methods for molecular microbiology - In-silico construction of deletion mutant - In-silico cloning of recombinant plasmid

	- In-silico PCR and ligation - Construction of deletion mutant of laboratory E. coli strain - Complementation of deletion mutant - Experiments using the constructed strains - Documentation of the results - Presentation of a relevant molecular biological method
Literatur	-
Anmerkungen	-

Modul: Global Nutrition and Food Security (1403-400)

Modulverantwortung	Jan Frank
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Basic knowledge of nutrition physiology (macro- and micronutrients: biochemical function and requirements) is assumed.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester (Block 4)
Studiengänge	M.Sc. Molekulare Ernährungswissenschaft, 3. Semester (Wahl) M.Sc. Molekulare Ernährungswissenschaft (ab Studienbeginn WS 23/24), 3. Semester, Wahl M.Sc. Ernährungsmedizin, 3. Semester, Wahl M.Sc. Medizinische Ernährungswissenschaft, 3. Semester, Wahl M.Sc. Food Science and Engineering, 3. Semester, Wahl M.Sc. Food Biotechnology, 3. Semester, Wahl M.Sc. Lebensmittelchemie, 3. Semester, Wahl M.Sc. Food Systems, 3. Semester, Wahl
Prüfungsdauer (in Minuten)	60
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Students can explain the framework of Food and Nutrition Security and the drivers of food insecurity. They are familiar with the nutrition situation of developing and industrialized countries and with the problems of nutrition transition. They can analyze the complexity of the interrelationship between nutrition and health in particular in the case of vulnerable groups such as pregnant women, breastfeeding mothers, children and elderly. They will be able to assess food intake and measure nutritional status, taking into account the role of food analyses. Strategies to improve nutrient intake by both food-based and non-food based approached, their limitations and how these differ between developing

	and industrialized countries are finally known by the students.
empfohlene Vorkenntnisse	-
Anmerkungen	Number of participants: 50 Registration for the module: ILIAS Registration period: 1.4. to 1 week before the start of the module Criteria according to which places are allocated: Order of registration.
Modulprüfung und Gewichtung	Written Exam (70%) and Presentation (30%)
Studienleistung und Gewichtung	Regular and active participation
Global Nutrition and Food Security (1403-401)	
Person(en) verantwortlich	Jan Frank
Lehrform	Vorlesung
SWS	4
Inhalt	This module will provide a basic oversight as to the state of global nutrition and food security and how it is assessed: dietary and anthropometric assessment, biomarkers of nutritional status and food security. The direct and indirect causes of malnutrition and food insecurity will be evaluated as well as the food based and non-food based strategies available to address these. The emerging health crisis of the double burden of malnutrition, together with nutritional transitions will be evaluated. The risks with regard to malnutrition and food insecurity for vulnerable groups such as pregnant and lactating women and refugees will be evaluated. The important roles of agricultural development, climate change and gender equality in global nutrition and food security will be discussed. Special attention will also be paid to the differences between developed and developing countries in the risks factors, vulnerable populations and appropriate strategies to address malnutrition and food insecurity.
Literatur	Development Initiatives, 2020. Global Nutrition Report 2020: Action on equity to end malnutrition, Bristol, UK: Development Initiative. Development Initiatives, 2018. Global Nutrition Report 2018: Shining a light to spur action on nutrition, Bristol, UK: Development Initiative.

	GBD 2017 Diet Collaborators. “Health effects of dietary risks in 195 countries, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017.” Lancet (London, England) vol. 393,10184 (2019): 1958-1972. https://www.thelancet.com/article/S0140-6736(19)30041-8/fulltext FAO, IFAD, UNICEF, WFP and WHO. 2020. The State of Food Security and Nutrition in the World 2020. Transforming food systems for affordable healthy diets. Rome, FAO. https://doi.org/10.4060/ca9692en FAO, IFAD, UNICEF, WFP and WHO. 2019. The State of Food Security and Nutrition in the World 2019. Safeguarding against economic slowdowns and downturns. Rome, FAO. https://www.wfp.org/publications/2019-state-food-security-and-nutrition-world-sofi-safeguarding-against-economic
Anmerkungen	Ansprechpartner für diese Veranstaltung ist Herr Stütz (wolfgang.stuetz@uni-hohenheim.de)

Modul: Identification and Characterization of Foodborne Microorganisms (1501-410)

Modulverantwortung	Herbert Schmidt
Bezug zu anderen Modulen	Part of the major "Food Microbiology" of the program in Food Biotechnology
Teilnahmevoraussetzung	Participants need to want to complete the major "Food Microbiology" of the program in Food Biotechnology and need to have successfully completed the modules "Scientific Writing and Reporting (1502-500)" and "Fermentation Technology (1501-400)"
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 4)
Studiengänge	Food Biotechnology, 2nd Semester, elective
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	84
Selbststudium (in Stunden)	141
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Students gain theoretical knowledge in relevant molecular methods used in Microbiology and Biotechnology and apply them in a practical context in the laboratory. Students learn to plan their experiments, to perform them and to analyze the data. Students learn to - organize and carry out their practical work independently, and to analyze their results critically, - improve written and oral skills, as well as the practical skills in the laboratory and in a team.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 8
Modulprüfung und Gewichtung	Successful seminar participation, protocol, and written examination (2h)
Studienleistung und Gewichtung	Seminar and lab protocol
Identification and characterization of foodborne microorganisms (1501-411)	
Person(en) verantwortlich	Herbert Schmidt

Lehrform	Seminar mit Übung
SWS	6
Inhalt	-
Literatur	-
Anmerkungen	-

Modul: Innovative Technologien für Milchprodukte und pflanzliche Alternativen (1505-520)

Modulverantwortung	Jörg Hinrichs
Bezug zu anderen Modulen	Das Modul ergänzt analytisch und verfahrenstechnisch orientierte Module und setzt sich insbesondere mit der Erforschung und Entwicklung neuer Ideen und Strategie zur Nachhaltigkeit, Ernährung, neuen Rohstoffen und Umweltfragen auseinander.
Teilnahmevoraussetzung	Grundlagen in Mikrobiologie, Chemie, Physik
Lehrsprache	deutsch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester (1. Block)
Studiengänge	M.Sc. Food Biotechnology, 3. Semester, Wahl M.Sc. Food Science and Engineering, 3. Semester, Wahl M.Sc. Food Systems, 3. Semester, Wahl M.Sc. Lebensmittelchemie, 3. Semester, Wahl
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	70
Selbststudium (in Stunden)	155
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Ziel des Moduls ist, dass die Studierenden nach dessen Abschluss in der Lage sind, wissenschaftliche Publikationen zu neuen Themen zu suchen, einzuordnen und zu bewerten. Sie sind in der Lage, neue Fragestellungen z. B. hinsichtlich Nachhaltigkeit, neuer Rohstoffe in Verbindung z. B. mit adressierter Produktfunktionalität zu strukturieren. Sie gewinnen Kompetenz in der Anwendung von Unit Operations zur Verarbeitung innovativer Lebensmittelprodukte und der Auswahl von physikalischen, chemischen und mikrobiologischen Methoden zur quantitativen oder qualitativen Bewertung von Zielparametern. Sie sind in der Lage, im Team Potenziale für neue Verfahren oder Produkte aus wissenschaftlicher Sicht zu identifizieren, Hypothesen zu formulieren und Verarbeitungswege zu postulieren. Daraus abgeleitet sind Forschungs- und daraus abgeleitete Entwicklungsideen im Team kurz und prägnant schriftlich zusammenzustellen, zu diskutieren und zu präsentieren.

	Dieses Modul dient zudem der Einführung in die selbstständige Durchführung eines Forschungsprojektes und bereitet auf die Bearbeitung der Masterarbeit vor. Verfassen eines Manuskripts unter Verwendung der einschlägigen wissenschaftlichen Literatur zum Thema (10-15 Seiten). Diese Arbeit wird eingereicht und mit dem Betreuer besprochen und ggf. zur Publikation in einem Journal vorbereitet.
empfohlene Vorkenntnisse	-
Anmerkungen	Anzahl Teilnehmerplätze: 10 Anmeldung zum Modul: Beginn WS über ILIAS Kriterien, nach denen Studienplätze vergeben werden: First in Studierende, die eine ansteckende Krankheit nach Bundesseuchengesetz haben, dürfen nicht teilnehmen! Die Teilnahme an den Experimenten im Technikum der For-schungs- und Lehrmolkerei Hohenheim ist nur zulässig mit entsprechender Schutzkleidung.
Modulprüfung und Gewichtung	Mitarbeit im Seminar und in den praktischen Übungen; ausgearbeitetes Manuskript
Studienleistung und Gewichtung	schriftlicher Bericht

Forschung erleben und gestalten: Innovative Technologien für Milchprodukte und pflanzliche Alternativen (1505-521)

Person(en) verantwortlich	Jörg Hinrichs
Lehrform	Vorlesung
SWS	-
Inhalt	In diesem Modul werden Fähigkeiten und Fähigkeiten vermittelt, um die Abfolge von Unit-Operations im Hinblick auf die Prozess-Struktur-Funktions Beziehungen für Milchprodukte und pflanzliche Alternativen zu analysieren. Sie lernen neue und alternative Prozesse in Forschung und Entwicklung kennen anhand von Beispielen aus der aktuellen Forschung. Präsentiert werden ausgewählte, ständig aktualisierte Topics aus dem wissenschaftlichen Bereich und

	wirtschaftlichen Umfeld der Verarbeitung von Milch und deren Alternativen. Gewährt werden Einblicke in die Beantragung und Durchführung von Forschungsprojekten.
Literatur	Wissenschaftliche Literatur, Dissertationen, Veröffentlichungen des Fachgebiets, Lehrbücher in der Fachbereichsbibliothek.
Anmerkungen	-
Projektplanung und experimentelles Arbeiten (1505-522)	
Person(en) verantwortlich	Jörg Hinrichs
Lehrform	Seminar
SWS	1
Inhalt	Die Studierenden analysieren aktuelle Themen aus dem Bereich der nachhaltigen Lebensmittelverarbeitung auf der Basis von Natur- und Ingenieurwissenschaften. Die Auswahl des Themas erfolgt in Absprache mit dem Betreuer. Mit Unterstützung des Betreuers beschreiben, analysieren und identifizieren die Studierenden Lücken auf der Grundlage einer Literaturrecherche. Abschließend werden Forschungs- und Entwicklungsfragen diskutiert und in Manuskriptform formuliert. Folgende Methoden und Instrumente werden für die Analyse verwendet: - Literaturrecherche - Zusammenstellung und Einordnung von Daten und Erkenntnissen aus der Literatur. - Verfassen von wissenschaftlichen Texten und Erstellen von aussagekräftigen Bildern und Tabellen.
Literatur	Wissenschaftliche Literatur, Dissertationen, Veröffentlichungen des Fachgebiets, Lehrbücher in der Fachbereichsbibliothek.
Anmerkungen	-
Forschungspraxis in Labor und Technikum (1505-523)	
Person(en) verantwortlich	Jörg Hinrichs

Lehrform	Praktische Übung
SWS	2
Inhalt	In diesem Modul werden Fähigkeiten und Fähigkeiten vermittelt, um die Abfolge von Unit-Operations im Hinblick auf die Prozess-Struktur-Funktions Beziehungen zu analysieren. Sie lernen neue und alternative Prozesse in Forschung und Entwicklung kennen anhand von Beispielen aus der aktuellen Forschung. Theoretische Übungen und experimentelle Arbeiten im Rahmen von Projekten unter Nutzung von Pilotanlagen und spezifischen Analysen.
Literatur	Dissertationen, Aktuelle Veröffentlichungen des Fachgebiets
Anmerkungen	-

Modul: Insights into Food Production and Entrepreneurship (1504-520)

Modulverantwortung	Mario Jekle
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	To complete the module successfully, students need competences in Englisch and basic knowledge in food science and technology (e.g. from a Bachelor in Food Technology, Nutritional Sciences or Food Chemistry).
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester (Block 4)
Studiengänge	M.Sc. Bioeconomy, 3rd semester, elective (profile: Innovation and entrepreneurship in the bioeconomy) M.Sc. Biotechnology, 3rd semester, elective M.Sc. Food Biotechnology, 3rd semester, elective M.Sc. Food Science and Engineering, 3rd semester, elective M.Sc. Food Science and Technology, 3rd semester, elective M.Sc. Food Systems, 1st semester, elective M.Sc. Food Chemistry, 3rd semester, elective
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	70
Selbststudium (in Stunden)	155
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	After completing this module, students are able - to apply knowledge in special fields of plant foods self-critically on the basis of in-depth knowledge of raw materials, technology, and supply chains - to apply strategies for successful handling of product development tasks self-critically - to understand and to apply principles of entrepreneurial thinking and action
empfohlene Vorkenntnisse	-
Anmerkungen	Available places: 20, Registration via ILIAS

	Place allocation: Module allocation system for Food Master via ILIAS
Modulprüfung und Gewichtung	exam (100%)
Studienleistung und Gewichtung	-
Insights into food production and entrepreneurship (1504-521)	
Person(en) verantwortlich	Mario Jekle
Lehrform	Vorlesung mit Übung und Exkursion
SWS	5
Inhalt	Lecture series given by experts from business incl. excursions and demonstrations / practical exercises on site and in the enterprises Special fields of plant foods being relevant for the entire food technology sector such as - Beverage technology, base materials for non-alcoholic soft drinks - Plant-based colorants - Dietary fibres, pectins - Chocolate technology - Adsorber technology - Pharmaceutical technology, applied phytochemistry - Research fields in the sector of plant and plant-based foods
Literatur	Lecture notes containing recommended literature for the different topics
Anmerkungen	-

Modul: Integrated Bioprocess Engineering - Bioproduction (1510-420)

Modulverantwortung	Rudolf Hausmann
Bezug zu anderen Modulen	Is part of the module series Integrated Bioprocess Engineering
Teilnahmevoraussetzung	First experiences in microbiology are required
Lehrsprache	deutsch/englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 2)
Studiengänge	Bioeconomy, 2. Semester, Wahl (Profil: Biomass processing and biorefinery) Biologie, 2. Semester, Wahl Food Biotechnology, 2. Semester, Wahl Food Science and Engineering, 2. Semester, Wahl Promotionsstudiengang Naturwissenschaften, 2. Semester, Wahl
Prüfungsdauer (in Minuten)	20
Präsenzstudium (in Stunden)	90
Selbststudium (in Stunden)	135
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	After the completion of the module participants - are able to design of media and lay-out feed compositions and strategies - are able to explain all functions of bioreactors - explain kinetics of bioprocesses and modelling thereof - are able to express expectations on the scale-up of bioprocesses - have experienced and adapted to an interdisciplinary field. - have enhanced their scientific written and verbal skills
empfohlene Vorkenntnisse	-
Anmerkungen	Places: 9 | Registration via ILIAS
Modulprüfung und Gewichtung	Seminartalk 25%, oral exam 75%

Studienleistung und Gewichtung	self-study of lecture material
Bioproduction (1510-421)	
Person(en) verantwortlich	Rudolf Hausmann
Lehrform	Vorlesung mit Seminar und Praktikum
SWS	5
Inhalt	Lecture: Design of media and laying-out of feed strategies and compositions Functions of bioreactors Kinetics of bioprocesses and modelling thereof Scale-up of bioprocesses Practical: Exemplary production of an heterologous protein in E.coli high cell density bioreactor cultivation Keeping of a labjournal / protocol Documentation and evaluation of bioreactor cultivation Working under sterile conditions On and off line analysis of key cultivation parameters (pO2, pH, xO2, xCO2, cell density, substrate and product concentration) Bioreactor set-up: functions and peripherals Independently plan and carry out operations on the bioreactor Application of feed and induction strategies
Literatur	- J. Villadsen, J Nielsen and G Lidén (2011): Bioreaction Engineering Principles, Springer - P. M. Doran (2013): Bioprocess Engineering Principles, Academic Press - S Liu (2013): Bioprocess Engineering: Kinetics, Biosystems, Sustainability, and Reactor Design, Elsevier

	- S. K. Niazi and J. L. Brown (2016): Fundamentals of Modern Bioprocessing, CRC Press - N. S. Mosier and M. R. Ladisch (2009): Modern Biotechnology: Connecting Innovations in Microbiology and Biochemistry to Engineering Fundamentals, Wiley/AICHE - Henkel et al. (2015): Teaching bioprocess engineering to undergraduates: Multidisciplinary hands-on training in a one-week practical course, in: Biochemistry and Molecular Biology Education, Vol. 43, Iss. 3, pp 189–202 (http://dx.doi.org/10.1002/bmb.20860)
Anmerkungen	Attendance and active participation in the laboratory course is mandatory. Due to the fact that every group has full responsibility for performing their own experiment, in-lab times will be flexible but require reasonable planning on the main experimental days.

Modul: Integrated Bioprocess Engineering - Bioseparation Process Science (Downstream Processing) (1510-430)

Modulverantwortung	Rudolf Hausmann
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 3)
Studiengänge	Biologie (Master, PO vom 01.10.2010) 3. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 3. Semester, Wahl Food Science and Engineering (Master, PO vom 01.10.2013) 3. Semester, Wahl Bioeconomy (Master, PO vom 01.10.2014) 3. Semester, Wahl Promotionsstudiengang Naturwissenschaften (Promotionsstudiengänge, PO vom 14.02.2015) 1. Semester, Wahl Bioeconomy (ab WS 16/17) (Master, PO vom 01.04.2017) 3. Semester, Wahl (Profil: Biomass processing and biorefinery)
Prüfungsdauer (in Minuten)	20
Präsenzstudium (in Stunden)	90
Selbststudium (in Stunden)	135
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The participants should obtain a theoretic overview of all relevant process steps used in the purification of industrial bioproducts. At the end of the module they should be able to outline a product-specific scheme of purification. In a hands-on training the participants will have performed and analyzed some selected methods. After the completion of the module the participants - have experienced and adapted to an interdisciplinary field. - have enhanced their scientific written and verbal skills.
empfohlene Vorkenntnisse	-

Anmerkungen	Available places: 12 Registration for module via ILIAS Criteria for admission is granted: Mostly after first-served basis.
Modulprüfung und Gewichtung	seminar presentation (25%), oral exam (75%)
Studienleistung und Gewichtung	Regular and active participation in the online lecture, the lecture, the exercises and the holding of a seminar talk
Integrated Bioprocess Engineering Bioseparation Process Science (Downstream Processing) (1510-431)	
Person(en) verantwortlich	Rudolf Hausmann
Lehrform	Vorlesung mit Seminar und Praktikum
SWS	4
Inhalt	The module comprises a lecture, a seminar and a lab hands-on training in which the purification of bioproducts from the original state as a component of a fermentation broth through progressive purification steps to a final product are the topic. Outline: 1) Introduction 2) Solid-Liquid Separation 3) Cell Disruption 4) Precipitation and Crystallization 5) Preparative Chromatography 6) Membrane Separation 7) Extraction 8) Refolding 9) Summery.
Literatur	R. G. Harrison, P. Todd, S. R. Rudge, D. P. Petrides (2003): Bioseparations Science and Engineering, Oxford University Press
Anmerkungen	-

Modul: Integrated Bioprocess Engineering - Genetic Engineering Methodology (1510-600)

Modulverantwortung	Rudolf Hausmann
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Basics in Microbiology, Bioechmistry and Genetics are mandatory.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester (Block 4)
Studiengänge	M.Sc. Food Biotechnology, 2. Semester, Wahl M.Sc. Food Science and Engineering, 2. Semester, Wahl M.Sc. Biologie, 2. Semester, Wahl M.Sc. Bioeconomy, 2. Semester, Wahl
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	112
Selbststudium (in Stunden)	113
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	After completing the module, students are able to explain and apply fundamental aspects of biotechnology and molecular biology, as well as applications of gene manipulation technology. The students are able to apply the knowledge gained in the lecture for planning and designing a working project before the laboratory work (in silico) using Softwares like Serial Cloner, Mega, Geneious and SnapGene. The project designed by the students in the lecture will be applied in the laboratory bench, using techniques of genetic cloning like Gibson Assembly and GoldenGate cloning (in vivo).
empfohlene Vorkenntnisse	It is recommended to accomplish Recombinant Proteins (1506-430) first.
Anmerkungen	Available places: 9 Registration: via ILIAS until the last working day before the start of the module. Place allocation: according to previous knowledge
Modulprüfung und Gewichtung	presentation (100%)
Studienleistung und Gewichtung	exercises, seminar and laboratory work
Integrated Bioprocess Engineering - Genetic Engineering Methodology (1510-601)	

Person(en) verantwortlich	Rudolf Hausmann
Lehrform	Vorlesung mit Seminar und Laborübungen
SWS	8
Inhalt	Lecture & seminar: - Overview of the genetic engineering concepts, nucleic acids, gene and genome organization, data banks. - Gene manipulation and cloning techniques - Use of molecular biology softwares (Serial Cloner, Mega, Geneious and SnapGene) Screening of mutants (Next generation sequencing, PCR, RT-qPCR, blotting techniques) Lab: Construct a plasmid as planned in the seminars using one of the techniques taught in the lectures (Enzyme restriction, Gibson Assembly or GoldenGate)
Literatur	-
Anmerkungen	-

Modul: Integrated Bioprocess Engineering - Upstream Processing (1510-440)

Modulverantwortung	Rudolf Hausmann
Bezug zu anderen Modulen	Completion of the module "Recombinant Proteins (1506-430)" is recommended.
Teilnahmevoraussetzung	Basic knowledge in microbiology, bioechmistry and genetics
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 2)
Studiengänge	Biologie (Master, PO vom 01.10.2010) 3. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 3. Semester, Wahl Food Science and Engineering (Master, PO vom 01.10.2013) 3. Semester, Wahl Bioeconomy (Master, PO vom 01.10.2014) 3. Semester, Wahl Promotionsstudiengang Naturwissenschaften (Promotionsstudiengänge, PO vom 14.02.2015) 1. Semester, Wahl Bioeconomy (ab WS 16/17) (Master, PO vom 01.04.2017) 3. Semester, Wahl (Profil: Biomass processing and biorefinery)
Prüfungsdauer (in Minuten)	20
Präsenzstudium (in Stunden)	90
Selbststudium (in Stunden)	135
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	After the completion of the module participants, - are able to theoretically report on products of industrial biotechnology. - are able to evaluate advantages and disadvantages of different biological systems. - are able to give an overview in current methods of upstream processing using bio-molecular methods. - have practically developed skills of the strain construction with a simple example.

	- are able to analyze biosynthetic pathways in respect to the involved enzymes and corresponding genes with the help of internet-based databases. - have practiced written and oral expression in scientific English. - have practiced communication and cooperation skills in planning the lab experiments.
empfohlene Vorkenntnisse	-
Anmerkungen	Available places: 9 Registration for module via ILIAS: Criteria for admission is granted: Mostly after first-come, first-served basis.
Modulprüfung und Gewichtung	seminar presentation (25%), oral exam (75%)
Studienleistung und Gewichtung	Regular and active participation in the online lecture, the exercises and the holding of a seminar talk.
Industrial Biotechnology (1510-441)	
Person(en) verantwortlich	Rudolf Hausmann
Lehrform	Vorlesung mit Übung und Seminar
SWS	2
Inhalt	- Overview of the products of industrial biotechnology with a focus on food additives and ingredients (for example, citric acid, glutamate, vitamin B2, etc ...) - In-depth theoretical knowledge of the use of biological, in particular microbial systems for the production of economically valuable biochemical. - Biosynthetic understanding of the primary and the secondary metabolism and fermentation products. - Represent theoretically optimal biosynthetic pathways and to calculate and establish the corresponding maximum yield coefficients.
Literatur	- P. M. Doran (2013): Bioprocess Engineering Principles, Academic Press - Shijie Liu (2013): Bioprocess Engineering: Kinetics, Biosystems, Sustainability, and Reactor Design, Elsevier - S. K. Niazi and J. L. Brown (2016): Fundamentals of Modern Bioprocessing, CRC Press

	- N. S. Mosier and M. R. Ladisch (2009): Modern Biotechnology: Connecting Innovations in Microbiology and Biochemistry to Engineering Fundamentals, Wiley/AICHE
Anmerkungen	-

Genetics and strain construcion (1510-442)	
Person(en) verantwortlich	Rudolf Hausmann
Lehrform	Vorlesung mit Praktikum
SWS	4
Inhalt	Options for different prokaryotic expression system have been discussed. These include: expression systems, promotor and induction systems, restriction endonucleases and respective recognition sites, genetic markers, preparation of vector, DNA-preparation, ligation, transformation, screening, molecular tags. A focus is on Bacillus subtilis as a basic biotechnological production organism. Practical skills in specialized online-databases and programs were practiced.
Literatur	- M. Green and J. Sambrook (2012): Molecular Cloning: A Laboratory Manual (Fourth Edition), CSH Press - Cornel Mülhardt (2013) Der Experimentator Molekularbiologie / Genomics, Springer
Anmerkungen	-

Modul: Internship FB (Industrial placement) (12 weeks, 15 ECTS) (1500-610)

Modulverantwortung	Herbert Schmidt
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Admission to the Master’s programme has to be present when beginning the internship. The internship can be completed at a national or international research center or at a research and development department of a company in Germany or abroad that is related to the Life Sciences: food, pharma-ceutical as well as their supplying industries, plant design and engineer-ing and process technology.
Lehrsprache	englisch
ECTS	15
Angebotshäufigkeit	jedes Semester
Dauer des Moduls	n. V.
Studiengänge	Food Biotechnology (Master, PO vom 01.10.2016) 3. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	450
Lern- und Qualifikationsziele	Upon completion of this module students - have gained relevant professional experience, including its social and economic/managerial aspects - have gained insight into organizing research projects - have established first contacts with potential employers - have sharpened their critical thinking skills when developing practical solutions - have learned to work in a goal-oriented manner and within a team - improve their team and communication skills in a professional workplace

empfohlene Vorkenntnisse	-
Anmerkungen	Students choose a supervisor related to the subject-area prior to beginning their internship. The supervisor decides whether the internship placement is appropriate and assesses the report. This module does not count towards the final grade. Please note: whereas only 15 ECTS can be awarded, the duration of the in-ternship is not limited to 12 weeks.
Modulprüfung und Gewichtung	Internship report, presentation of the research done during the internship (the presentation is done in consultation with the supervising professor)
Studienleistung und Gewichtung	-
Internship FB (Industrial placement) (12 weeks, 15 ECTS) (1500-611)	
Person(en) verantwortlich	Herbert Schmidt
Lehrform	Praktikum
SWS	-
Inhalt	-
Literatur	-
Anmerkungen	-

Modul: Internship FB (Industrial placement) (6 weeks, 7,5 ECTS) (1500-600)

Modulverantwortung	Herbert Schmidt
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Admission to the Master's programme has to be present when beginning the internship. The internship can be completed at a national or international research center or at a research and development department of a company in Germany or abroad that is related to the Life Sciences: food, pharma-ceutical as well as their supplying industries, plant design and engineering and process technology.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes Semester
Dauer des Moduls	n. V.
Studiengänge	Food Biotechnology (Master, PO vom 01.10.2016) 3. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	225
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Upon completion of this module students - have gained relevant professional experience, including its social and economic/managerial aspects - have gained insight into organizing research projects - have established first contacts with potential employers - have sharpened their critical thinking skills when developing practical solutions - have learned to work in a goal-oriented manner and within a team - improve their team and communication skills in a professional workplace

empfohlene Vorkenntnisse	-
Anmerkungen	Students choose a supervisor related to the subject-area prior to beginning their internship (Prof. Dr. Lutz Fischer, Prof. Dr. Herbert Schmidt, Prof. Dr. Ralf Kölling, Prof. Dr. Uwe Beifuß, Prof. Dr. Andreas Kuhn, Prof. Dr. Armin Huber). The supervisor decides whether the internship placement is appropriate and assesses the report.rnrnThis module does not count towards the final grade.rnrnPlease note: whereas only 7,5 ECTS can be awarded, the duration of the in-ternship is not limited to 6 weeks.
Modulprüfung und Gewichtung	Internship report, presentation of the research done during the internship (the presentation is done in consultation with the supervising professor)
Studienleistung und Gewichtung	-
Internship FB (Industrial placement) (6 weeks, 7,5 ECTS) (1500-601)	
Person(en) verantwortlich	Herbert Schmidt
Lehrform	Praktikum
SWS	-
Inhalt	-
Literatur	-
Anmerkungen	-

Modul: Introduction to Machine Learning in Python (4407-480)

Modulverantwortung	Christian Krupitzer Anthony Stein
Bezug zu anderen Modulen	The module provides basic knowledge on machine learning that well prepare the students for participation in subsequent AI modules, i.e., 4407-440 "Einführung in die Künstliche Intelligenz", 4407-470 "Artificial Intelligence for Agriculture", 4407-490 "Bildanalyse mit Deep Learning" or 4407-810 "Machine Learning Reading Club".
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	Agricultural Sciences - Advisory and Innovation Services in Agri-Food Systems (Master) 2. Semester, elective Agricultural Sciences - Animal Science (Master) 2. semester, elective Agrarwissenschaften - Agrartechnik (Master), 2. Semester, semi-elective All Master's programs of the Faculty of Agricultural and Natural Sciences, 2. semester, elective Information Systems (Master), elective Earth and Climate System Sciences (Master) 2. Semester, elective (Profile: Earth System Processes – Observation and Simulation) Bioeconomy (Master), 2. Semester, elective (Profil: Data Science and Artificial Intelligence)
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	0
Selbststudium (in Stunden)	225
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	After completing this module, students are able to critically assess the performance of different machine learning approaches and to choose the best approach for a specific use case. Therefore, this module will provide essential theoretical knowledge of the foundations of programming in Python and machine learning algorithms and approaches.Further, students acquire practically-applicable knowledge

	how to apply machine learning to solve real world problems. The online format, regular assignments as well as the self-study character of the module supports the students' organizational skills and trains their ability to work independently. Further, the module supports analytical thinking, i.e., how to structure a problem and find appropriate solutions to it by means of machine learning. Since the course materials and the teaching language are completely in English, the students further train their foreign language skills.
empfohlene Vorkenntnisse	Module 4407-480 is a Master's program module, but can already be taken as an elective in Bachelor's degree programs in agricultural sciences. No prior programming skills are assumed. The necessary basic concepts of Python programming are taught in the first third of the course. In order to prepare for later AI modules in the Master's programs, it is recommended to take this course already during the specialization phase in the Bachelor's programs.
Anmerkungen	The maximum number of participants is limited to a semester-specific amount. In case the threshold is exceeded, a waiting list will be maintained.
Modulprüfung und Gewichtung	Computer-based online exam (50%)
Studienleistung und Gewichtung	Integrated online quizzes and programming assignments to be solved individually by the students (50%)
Introduction to Machine Learning in Python (4407-481)	
Person(en) verantwortlich	Anthony Stein Christian Krupitzer
Lehrform	E-Learning
SWS	5
Inhalt	-
Literatur	-
Anmerkungen	• Completely asynchronous E-Learning module • To be completed during the summer semester

Modul: Klinische Mikrobiologie und Gesundheitswesen (Lehramt Biologie) (1909-420)

Modulverantwortung	
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	-
Lehrsprache	deutsch
ECTS	7,5
Angebotshäufigkeit	
Dauer des Moduls	4 Wochen
Studiengänge	-
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	-
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Präsentation (100%)
Studienleistung und Gewichtung	Seminarvortrag

Modul: Masterarbeit (1500-400)

Modulverantwortung	Herbert Schmidt
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Successful completion of modules in the amount of 75 credits.
Lehrsprache	englisch
ECTS	30
Angebotshäufigkeit	jedes Semester
Dauer des Moduls	1 Semester
Studiengänge	M.Sc. Biotechnology, 4. Semester, Pflicht
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	900 h
Lern- und Qualifikationsziele	After successful completion of the Master's thesis, students have acquired detailed knowledge and in-depth skills in the subject area of their Master's thesis. After successful completion of the Master's thesis, students are able to carry out independent scientific work. They have proven that they can think critically and analytically, can write a scientific paper and are able to present the obtained results.
empfohlene Vorkenntnisse	-
Anmerkungen	Registration for the module on an individual basis in consultation with the supervising professor. The Master’s thesis is graded by two professors, one of which has to be in charge of at least one compulsory module of the programme in Biotechnology
Modulprüfung und Gewichtung	Master's thesis
Studienleistung und Gewichtung	-

Modul: Mathematics and Computational Sciences of the Earth System II (1102-410)

Modulverantwortung	Georg Zimmermann
Bezug zu anderen Modulen	Continuation of Module 1102-400.
Teilnahmevoraussetzung	Successful completion of module 1102-400.
Lehrsprache	englisch
ECTS	6
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	M.Sc. Food Biotechnology, 2. Semester, Wahl M.Sc. Food Science and Engineering, 2. Semester, Wahl M.Sc. Earth and Climate System Science, 2. Semester, Wahl (Profil: Earth System Processes – Observation and Simulation)
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	The aim of this module is that the students can recognise ordinary and partial differential equations as such. They shall also recognise some special types of differential equations. They know how to solve certain types of differential equations, some explicitly, others numerically. They can recognise autonomous systems, find stationary solutions and determine their stability properties. The aim of this module is for students to understand differential equations in the sense that they recognise which effects are modelled by each term. They know stability properties and how to determine them.
empfohlene Vorkenntnisse	Successful participation in module 1102-400
Anmerkungen	Maximum number of participants: - Registration: in consultation with the lecturer at the beginning of the semester
Modulprüfung und Gewichtung	Exam (100%)
Studienleistung und Gewichtung	Submission of exercises (at least 50% of the total score must be achieved)
Mathematics and Computational Sciences of the Earth System II (1102-411)	

Person(en) verantwortlich	Georg Zimmermann
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	Ordinary differential equations: difference versus differential equations, solution methods, autonomous systems and the stability of their stationary solutions, existence and uniqueness of solutions; numerical methods. Partial differential equations: quasilinear PDEs, wave equation, heat equation; numerical methods.
Literatur	Lecture notes provided by the lecturer. Additional, if so desired: Any standard book on mathematics for physicists or engineers. Examples: in English: basic (undergraduate level): M. L. Boas, Mathematical Methods in the Physical Sciences advanced (graduate level): G. B. Arfken, Mathematical Methods for Physicists in German: H. Fischer / H. Kaul, Mathematik für Physiker 1 & 2
Anmerkungen	-

Modul: Metal Coordination Chemistry in Biomolecules (1301-450)

Modulverantwortung	Julia Fritz-Steuber Moritz Kühnel
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	English and German language skills.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 3)
Studiengänge	Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Science and Engineering (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	After having completed the module, the students should be able to explain important concepts (e. g., metal complex formation) and cause-and-effect relations in metal coordination chemistry of biomolecules. They know metal ion-containing/ dependent and metal ion-transporting biomolecules and can recall the relevant facts (e. g., structural and functional details). The students can also explain experimental observations and associated physical methods and theoretical models. They can compare different models. The students should be able to exemplify classes of molecules important in bioinorganic chemistry and functions of specific metal ions in biochemical processes. They know (i) the role of essential metal ions in the generation and utilization of the electrochemical potential of the cell, (ii) key methods specific to the field (e. g., the „synthetic analogue“ approach),

	(iii) how metal ions and biological ligands mutually affect their properties, and (iv) how cellular concentrations of essential and toxic metal ions are regulated. Furthermore, students should be able to deal with interdisciplinary problems by combining the methods and ways of thinking of various scientific disciplines.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 14
Modulprüfung und Gewichtung	Written exam
Studienleistung und Gewichtung	Regular attendance and active participation.
Bioinorganic Chemistry (1301-451)	
Person(en) verantwortlich	Moritz Kühnel
Lehrform	Vorlesung mit Übung
SWS	1,5
Inhalt	Molecular foundations of the biological functions of metals; overview of biologically important metal ions and ligands; some principles of metal coordination chemistry; toxic metal ions; biological electron transfer: cytochromes, iron-sulfur proteins, blue copper proteins; „synthetic analogues“ concept; biological Lewis acid catalysis: carboxypeptidase, carboanhydrase, aconitase; transport of molecular oxygen: hemoglobin, hemerythrin, hemocyanine; structural functions of metal ions: calmodulin, zinc finger proteins; transport and storage of metal ions; physical methods for the structural analysis of metal ion-containing biomolecules; experimental demonstrations (spectroscopy of metal complexes and metalloproteins).
Literatur	Kaim, W., Schwederski, B., Klein, A.: Bioinorganic Chemistry - Inorganic Elements in the Chemistry of Life, 2nd edition, Wiley, Chichester, 2013.
Anmerkungen	This lecture is suited as additional course for students of scientific Bachelor‘s programmes (from the 4th semester onwards) and other scientific Master‘s programmes.
Ion Transporters (1301-452)	
Person(en) verantwortlich	Julia Fritz-Steuber
Lehrform	Vorlesung mit Übung
SWS	1,5
Inhalt	The molecular basis for the biological function of ion transporters will be discussed. A focus is on systems for active and passive transport of Na+, K + and Ca2+. Topics: the electrochemical membrane

	potential; physiological relevance of Na+, K+ and Ca2+; primary producers of the electrochemical potential (cation pumps); how channels work/ how to study channels; voltage- versus ligand-gated channels; structure#function analysis of ion transporters; comparison of transport rates and ion selectivities of different systems.
Literatur	Nicholls, D.G., Ferguson, S.J.: Bioenergetics, 4th edition, Academic Press, London, 2013.
Anmerkungen	This lecture is suited as additional course for students of other scientific Master‘s programmes.
Principles of Coordination Chemistry (1301-453)	
Person(en) verantwortlich	Wolfgang Einholz
Lehrform	Vorlesung
SWS	2
Inhalt	The lecture covers the main principles of the formation of metal complexes as well as physical methods for the study of, especially, biologically important metal complexes. The following topics will be treated: electronic structures of metal cations; electronic, magnetic and optical properties of metal complexes; theories of the formation of metal complexes; physical principles relevant to the investigation of metal complexes; introduction to state-of-the-art spectroscopic methods for the study of biologically relevant metal complexes.
Literatur	Riedel, E., Janiak, C.: Anorganische Chemie, 9. Auflage, de Gruyter, Berlin, 2015. Cotton, F.A., Wilkinson, G., Murillo, C.A., Bochmann, M.: Advanced Inorganic Chemistry, 6th edition, Wiley, New York, 1999. Huheey, J.E., Keiter, E.A., Keiter, R.L.: Inorganic Chemistry: Principles of Structure and Reactivity, 4th edition, Harper Collins, New York, 1993.
Anmerkungen	-

Modul: Methods for Analyzing Protein Complexes in Model Bacteria (1908-610)

Modulverantwortung	Fabian Commichau
Bezug zu anderen Modulen	The module is a challenging advanced module for Master students with an interest in bacterial genetics and protein biochemistry.
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester (Block 1)
Studiengänge	M.Sc. Biologie, 2. Semester (Wahlpflicht) M.Ed. Biologie inkl. Erweiterungsmaster, 2. Semester (Wahl) M.Sc. Food Biotechnology, 2. Semester (Wahl)
Prüfungsdauer (in Minuten)	45
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Students have advanced theoretical knowledge of the mechanisms of gene regulation in selected model bacteria - of those mechanisms already described in textbooks as well as of novel mechanisms. They have extended theoretical and practical knowledge of the genetic manipulation of bacteria. The students can purify protein complexes chromatographically and analyze the isolated proteins using various protein biochemical methods (e.g. SDS PAGE, silver staining, western blotting). They can investigate the regulation of gene expression in bacteria using an enzyme assay. The students can remove a gene from the genetic material of the bacterium and phenotypically characterize the bacterial mutants produced. Students learn to analyse and critically interpret experimental data. They learn how to plan a complex

	scientific experiment and how to sensibly link different experimental techniques.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 8 Registration: via ILIAS until 4 weeks before the course starts Criteria according to which places are allocated: interest/motivation
Modulprüfung und Gewichtung	protocol (75%) and oral presentation (25%)
Studienleistung und Gewichtung	-
Methods for analyzing protein complexes in model bacteria (1908-611)	
Person(en) verantwortlich	Fabian Commichau
Lehrform	Vorlesung mit Übung
SWS	5
Inhalt	Vorlesung: Regulation der Genexpression und von Proteinaktivitäten im Grundstoffwechsel von prokaryotischen Modellbakterien Übung: - Klonierung, Sequenzierung, Überexpression - Genetische Manipulation von Bakterien - Analyse der Proteinüberproduktion, Charakterisierung der isolierten Proteine - Analyse von Proteinkomplexen - Enzymassay zur Analyse einer kovalenten Proteinmodifikation
Literatur	Brock Biology of Microorganisms, 15th Edition (2019) ISBN-10: 1292235101. Thorsness & Koshland 1987 J Biol Chem 262: 10422 – 10425. Hurley et al., 1990 Science 249: 1012-1026. Praktikumsskript
Anmerkungen	-

Modul: Microbiome in Animals and Humans (4613-420)

Modulverantwortung	Amélia Camarinha da Silva
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Basic knowledge in microbiology and molecular biology
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	geblockt
Studiengänge	Agrarbiologie (Master) 2. semester, semi-elective Food Biotechnology (Master) 2. semester, elective
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	70
Selbststudium (in Stunden)	155
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	By the end of the module, students will understand and be able to explain the core concepts of microbiome analysis. They will learn about the latest methods for characterising microbiomes and understand the microbiome of different animals and humans. The module covers the structure, function and diversity of microbiomes. The practical course and seminar enable students to: - Plan, perform and interpret experiments; - Learn routine techniques in microbiome analysis; - Improve their oral and written communication, as well as their critical thinking. Through lectures and exam preparation, students learn to acquire and structure knowledge and information. In the lectures they learn to work independently and to think critically and analytically. During the internship, students have the opportunity to apply, what they have learned in the lectures, strengthen their knowledge, work independently in the laboratory and on the computer with specific

	software, improve their critical thinking and problem solving skills. The written skills are trained in the extended abstract and their oral presentation skills in the oral presentation of a specific scientific publication.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 10. Students of M.Sc. Agrarbiologie have priority. Registration: The registration via ILIAS in mandatory Registration period: before the semester start Criteria, according to which places are allocated: You need to submit an application for admission to join the course. Describe why you want to join in the message field. Once your application has been accepted or rejected, you will receive a notification.
Modulprüfung und Gewichtung	Written examination (50%) and written report (50%)
Studienleistung und Gewichtung	-

Microbiome in Animals and Humans (4613-421)

Person(en) verantwortlich	Florian Fricke Amélia Camarinha da Silva
Lehrform	Vorlesung mit Seminar und Praktikum
SWS	5
Inhalt	Human Microbiome – composition and function Livestock Microbiome – composition and function Microbiome Health and Disease Microbiome and Diet Molecular Microbiome Analysis
Literatur	The Gut Microbiome in Health and Disease The Human Microbiota and Microbiome Improving gut health in poultry

	The Hologenome Concept: Human, Animal and Plant Microbiota
Anmerkungen	10 participants; registration via ILIAS

Modul: Modulation von Signalkaskaden (1906-420)

Modulverantwortung	Armin Huber
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	B.Sc. Biologie, Biochemie oder vergleichbar, deutsche Sprachkenntnisse
Lehrsprache	deutsch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 1)
Studiengänge	Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl Biologie (Master, PO vom 01.10.2010) 2. Semester, Wahlpflicht
Prüfungsdauer (in Minuten)	30
Präsenzstudium (in Stunden)	75
Selbststudium (in Stunden)	150
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Ziel des Moduls ist, dass die Studierenden nach dessen Abschluss in der Lage sind, - an den Beispielen Proteinkinase, Arrestin, Rhodopsin, Ionenkanal und G-Protein zu erläutern wie Signalkaskaden moduliert werden können. - elektrophysiologische Ableitungen von Drosophila-Augen durchzuführen und zu inter-pretieren. - Gewebeschnitte anzufertigen und Proteine mittels Immunzytochemie zu lokalisieren. - ein Fluoreszenzmikroskop selbständig zu bedienen Ziel des Moduls ist, dass die Studierenden nach dessen Abschluss in der Lage sind, - wissenschaftliche Originalarbeiten zu lesen und in einem Vortrag zu präsentieren. - wissenschaftliche Daten kritisch zu diskutieren

	- anspruchsvolle wissenschaftliche Experimente durchzuführen. - eigene Versuchsergebnisse präzise zu dokumentieren und zu präsentieren
empfohlene Vorkenntnisse	-
Anmerkungen	Anzahl Teilnehmerzahl: 12 Anmeldung zum Modul: ILIAS Anmeldezeitraum: Beginn der Vorlesungszeit im Wintersemester Kriterien, nach denen Studienplätze vergeben werden: Reihenfolge der Anmeldung Modulnummer bis Sommersemester 2022: 2303-420
Modulprüfung und Gewichtung	Seminarvortrag (66%), Protokoll (33%)
Studienleistung und Gewichtung	Regelmäßige und aktive Teilnahme
Modulation von Signalkaskaden, Seminar (1906-421)	
Person(en) verantwortlich	Armin Huber
Lehrform	Seminar
SWS	1
Inhalt	Es werden Originalpublikationen zur Regulation von Signalmolekülen referiert und diskutiert.
Literatur	-
Anmerkungen	-
Modulation von Signalkaskaden (1906-422)	
Person(en) verantwortlich	Armin Huber
Lehrform	Übung
SWS	3
Inhalt	Es werden praktische Experimente durchgeführt: - Aufnahme und Auswertung von Elektroretinogrammen von Drosophila melanogaster - Anfertigen von Kryoschnitten und Immuncytochemie von Fliegenaugen - Wasserimmersionsmikroskopie zur Verfolgung eines wandernden Proteins

Literatur	-
Anmerkungen	-

Modul: Molekulare Sinnesphysiologie (1922-430)

Modulverantwortung	Michael Föller
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Bachelorabschluss mit biologischem Profil
Lehrsprache	deutsch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 2)
Studiengänge	Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 3. Semester, Wahl Food Science and Engineering (Master, PO vom 01.10.2013) 3. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 3. Semester, Wahl Biologie (Master, PO vom 01.10.2010) 1. Semester, Wahlpflicht
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	75
Selbststudium (in Stunden)	150
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Ziel des Moduls ist, dass die Studierenden nach dem Abschluss des Moduls in der Lage sind, durch vertieftes Wissen in Bereichen der Sinnesphysiologie eine Präsentation zu aktuellen Forschungsergebnissen vorzustellen und diese im Kreise der Mitstudierenden zu diskutieren. Nach Abschluss des Moduls sind die Studierenden in der Lage, die erhaltenen Methodenkenntnisse zu nutzen und die dabei erworbene Praxis bei der experimentellen For-schungsarbeit im Labor umzusetzen.
empfohlene Vorkenntnisse	-
Anmerkungen	Anzahl Teilnehmerplätze: 8 Anmeldung zur Teilnahme am Modul über ILIAS/ Auswahlverfahren Modulnummer bis Sommersemester 2022: 2301-430

	- Für die Durchführung des Seminars ist Ihre Anwesenheit erforderlich
Modulprüfung und Gewichtung	Klausur (100%) oder mündliche Pürfung, wird den Studierenden mitgeteilt
Studienleistung und Gewichtung	Regelmäßige Teilnahme, Vortrag im Grundlagenseminar und Vorstellung einer wissenschaftlichen Publikation
Molekulare Sinnesphysiologie (1922-431)	
Person(en) verantwortlich	Jörg Strotmann Michael Föller
Lehrform	Seminar
SWS	4
Inhalt	- Sinnesorgane, Sinneszellen: strukturelle und molekulare Spezialisieungen - Perirezeptor.Prozesse - Transduktionsmechanismen, Cross-talk, Regelkreise - Desensitisierung, Adaption, Inaktivierung sensorischer Reize - Neuronale "Verdrahtung" sensorischer Systeme - Integration multimodaler Information - Grundlagen für die Erfassung verschiedener Sinnesmodalitäten - Vorträge der Studierenden und Diskussionsrunden zu gezielten Fragestellungen - Experimentelle Übungen zur molekularen Sinnesphysiologie
Literatur	-
Anmerkungen	-

Modul: Nutrigenomik (1405-400)

Modulverantwortung	Florian Fricke
Bezug zu anderen Modulen	Das Modul baut inhaltlich auf dem Modul "Einführung in die Nutrigenomik" der ernährungswissenschaftlichen Bachelor-Studiengänge auf, legt aber den Schwerpunkt auf laborexperimentelle und bioinformatische Übungen.
Teilnahmevoraussetzung	Eine Belegung des Moduls ist nach erfolgreichem Abschluss des Moduls "Molekularbiologische Grundlagen" und "Einführung in die Nutrigenomik" sinnvoll, bzw. setzt die darin vermittelten Grundlagen der Molekularbiologie und Personalisierten Medizin zugrunde
Lehrsprache	deutsch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 1)
Studiengänge	M.Sc. Molekulare Ernährungswissenschaft, 2. Semester, Pflicht M.Sc. Molekulare Ernährungswissenschaft (ab Studienbeginn WS23/24), 2. Semester, Pflicht M.Sc. Ernährungsmedizin, 2. Semester, Wahlpflicht
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	60
Selbststudium (in Stunden)	165
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Ziel des Moduls ist, dass die Studierenden nach dessen Abschluss in der Lage sind, molekularbiologische, bioinformatische und statistische Grundlagen der Nutrigenomik, Sequenzanalyse, Mikrobiomforschung und angewandten Bioinformatik zu diskutieren, kritisch zu hinterfragen und für eigene Arbeiten anzuwenden. Ziel des Moduls ist, dass die Studierenden nach dessen Abschluss in der Lage sind, den technischen, wissenschaftlichen und gesellschaftlichen Diskurs zu relevanten Zukunftsthemen der personalisierter Medizin mitzugestalten.
empfohlene Vorkenntnisse	-
Anmerkungen	Anzahl Teilnehmerplätze: 40 Anmeldung zum Modul: über ILIAS

	Anmeldezeitraum: ab ca. 8 Wochen vor Beginn Kriterien, nach denen Studienplätze vergeben werden: Alle MolEW-Studierende werden aufgenommen (Pflichtmodul). Von den verbliebenen Plätzen werden ca. 75% EM-Studierenden zugesprochen (Wahlpflicht), in der Reihenfolge ihrer Anmeldung in ILIAS. Die restlichen Plätze werden je nach Nachfrage und Anmeldezeitpunkt in ILIAS Studierenden anderer Studiengänge und Erasmus-Studierenden zugeteilt.
Modulprüfung und Gewichtung	Klausur (100%)
Studienleistung und Gewichtung	Graphical Abstract
Nutrigenomik (1405-401)	
Person(en) verantwortlich	Florian Fricke
Lehrform	Vorlesung mit Übung
SWS	4
Inhalt	In diesem Modul werden praktische Einblicke in die molekularbiologischen, rechnergestützten, bioinformatischen und statistischen Grundlagen der Nutrigenomik, Sequenzanalyse, Mikrobiomforschung und angewandten Bioinformatik vermittelt. Das Modul ist inhaltlich in folgende Schwerpunktbereiche aufgeteilt: Theoretische Grundlagen der Laborarbeit - Arbeit im S2-Labor, DNA-Isolation aus Mikrobiomproben, PCR, quantitative Mikrobiom-Analysen; Bioinformatische Übungen - Vorstellung bioinformatischer Tools, Grundlagen von Linux und R mit praktischen Übungen; Vorlesungen und Seminararbeit- Personalisierte Medizin, Ethik und Erstellung von ‘graphical abstracts'
Literatur	[nicht vorgeschrieben für Teilnahme am Modul] Haller, Dirk (Ed.) The Gut Microbiome in Health and Disease. 2018. Springer Verlag
Anmerkungen	-

Modul: Online Dairy Science and Technology (1505-450)

Modulverantwortung	Jörg Hinrichs
Bezug zu anderen Modulen	The module complements analytically or process-engineering oriented modules with the background of processing of milk to sophisticated milk products, e.g. milk concentrates and their application up to powders
Teilnahmevoraussetzung	Scientific background and basics in food microbiology, chemistry, engineering, and soft matter science. Participation at Online Dairy Science and Technology is only possible if 1505-440 has not been accomplished.
Lehrsprache	englisch
ECTS	5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester
Studiengänge	M.Sc. Food Science and Engineering, 2. Semester, Wahl M.Sc. Food Biotechnology, 2. Semester, Wahl M.Sc. Food Systems, 2. Semester, Wahl M.Sc. Lebensmittelchemie, 2. Semester, Wahl M.Sc. Bioeconomy, 2. Semester, Wahl (Profil: Transforming Food Systems) Promotionsstudiengang Naturwissenschaften; 1./2. Semester, Wahl
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	94
Arbeitsaufwand (in Stunden)	150
Lern- und Qualifikationsziele	The students learn to understand the sophisticated processing of milk in relation to the physical, chemical and microbiological properties of the raw material and the final product properties. Thereby analytical tools to characterize composition and structure of milk products are studied in order to understand material-process-function relationships. It also teaches the concept of mass and energy balance, the estimation of microbiological risk of milk products and the hazard associated with the various processing steps

	Theoretical knowledge is deepened in composition, analytics, hygiene and aseptic of membrane filtration/ fractionation, evaporation, powder processing. Finally, trouble shooting on practical issue will be done in groups and an outlook will be given to running research projects addressed on future developments and innovations
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 10 (first-in)
Modulprüfung und Gewichtung	Oral exam (20 minutes) or written exam
Studienleistung und Gewichtung	protocol
Online Dairy Science and Technologies (1505-451)	
Person(en) verantwortlich	Jörg Hinrichs
Lehrform	Vorlesung mit Seminar
SWS	4
Inhalt	The topics are: 1) Physcis, chemistry milk components 2) Chemical and physical analytics 3) Hygiene and Aseptic processing 4) Vacuum evaporation and milk concentrates 5) Membrane materials and processing 6) Drying basics 7) Milk drying 8) Trouble shooting methods 9) Research innovations and outlook During the seminar: Rework lecture and questions, evaluation, discussion and deepening knowledge of the lecture.
Literatur	Scientific literature, doctoral theses, publications from the department, textbooks in the departmental library.

	Kessler H.G.: Food & Bio-Process Engineering – Dairy Technology. Verlag A. Kessler, München 2011 Belitz H.D., Grosch W., Schieberle P. Food Chemistry. Springer Verlag Lecture handouts For the seminar, you will additionally need Scientific literature, doctoral theses, publications from the department, textbooks in the departmental library. Lecture handout
Anmerkungen	-

Modul: Online – Soft Matter Science I – Food Rheology and Structure (1505-510)

Modulverantwortung	Jörg Hinrichs
Bezug zu anderen Modulen	The module complements analytically or process-engineering oriented modules with the analysis of macrostructural properties, e.g. flow behavior and texture propertise of food
Teilnahmevoraussetzung	The module Online - Soft Matter Science I (1505-510) can only be chosen, if Soft Matter Science I (1505-500) is not already completed or about to be completed.
Lehrsprache	englisch
ECTS	5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 3)
Studiengänge	M.Sc. Bioeconomy; 3. Semester, Wahl (Profil: Transforming Food Systems) M.Sc. Food Biotechnology; 1./3. Semester, Wahl M.Sc. Lebensmittelchemie; 3. Semester, Wahl M.Sc. Molekulare Ernährungswissenschaft; 3. Semester, Wahl M.Sc. Ernährungsmedizin; 3. Semester, Wahl M.S. Food Systems; 1./3. Semester, Wahl Promotionsstudiengang Naturwissenschaften; 1./2. Semester, Wahl
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	94
Arbeitsaufwand (in Stunden)	150
Lern- und Qualifikationsziele	The students learn the basic principles of food structure and rheology. They gain an awareness of the various measurement technologies used to define the structure of complex food matrices. They learn about process modelling. They become familiar with the evaluation of scientific literature regarding food structure and learn to present their work through oral presentations.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 10 (first-in, first-served) Registration via ILIAS is necessary

Modulprüfung und Gewichtung	Exam (80 % of total), Online Presentation via Zoom (20 % of total)
Studienleistung und Gewichtung	-
Online Food Systems: Looking Beyond Rheology and Structure (1505-511)	
Person(en) verantwortlich	Mario Jekle Jörg Hinrichs
Lehrform	Vorlesung
SWS	2
Inhalt	Principles of structural, mechanical, and dynamic characteristics of food systems. Basic information and fundamental terms in rheology, measurement techniques for different food matrices, mechanical strain, dynamic rheology. Measuring systems and principles, methods in structure analysis, analysis of measurement data and modelling.
Literatur	Scientific literature, doctoral theses, publications from the department, textbooks in the departmental library. Metzger T.G. Angewandte Rheologie, Anton Paar ISBN 978-3-200-03652-9 Lecture handout
Anmerkungen	Online version of the course 1505-501 within the module 1505-500
Online Literatur Seminar: Structural Models for Food Systems (1505-512)	
Person(en) verantwortlich	Jörg Hinrichs
Lehrform	Seminar
SWS	2
Inhalt	- Evaluation of publications and research contributions - Analysing scientific literature, presenting and discussing one topic
Literatur	Scientific literature, doctoral theses, publications from the department, textbooks in the departmental library.
Anmerkungen	Online version of the course 1505-502 within the module 1505-500

Modul: Portfolio Modul Sprachen (1502-420)

Modulverantwortung	Lutz Fischer
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Studierende/r des Studiengangs Food Biotechnology.
Lehrsprache	deutsch
ECTS	7,5
Angebotshäufigkeit	jedes Semester
Dauer des Moduls	n. V.
Studiengänge	Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 3. Semester, Wahl
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Ziel dieses Moduls ist der Erwerb von Kenntnissen in Fremdsprachen. Studierende können am Sprachenzentrum der Universität Hohenheim erlangte Scheine von erfolgreich abgeschlossenen Sprachkursen in diesem Modul zusammenfassen. Auf diesem Weg können Sprachkurse zur Erlangung des Abschlusses beitragen. Voraussetzung für die Anerkennung von Sprachscheinen (es darf sich nicht um die Muttersprache der bzw. des Studierenden handeln) im Rahmen des Portfolio Modul Sprachen ist, dass die Scheine in Summe mindestens 7,5 ECTS Credits ergeben. Die Anerkennung der Sprachscheine obliegt dem Modulverantwortlichen.
empfohlene Vorkenntnisse	-
Anmerkungen	Die Anerkennung der Sprachscheine erfolgt in der Sprechstunde von Herrn Prof. Dr. Lutz Fischer.
Modulprüfung und Gewichtung	Erfolgreich abgeschlossene Sprachkurse am Sprachenzentrum der Universität Hohenheim
Studienleistung und Gewichtung	-
Portfolio Modul Sprachen (1502-421)	
Person(en) verantwortlich	Lutz Fischer
Lehrform	Projekt/Projektarbeit
SWS	-
Inhalt	

	-
Literatur	-
Anmerkungen	-
Portfolio Modul Sprachen (1502-421)	
Person(en) verantwortlich	Lutz Fischer
Lehrform	Kurs
SWS	-
Inhalt	-
Literatur	-
Anmerkungen	-

Modul: Process Driven Product Design: Cereals and Sweets (1503-510)

Modulverantwortung	Reinhard Kohlus
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Completion of the modules “Food Process Design I (1503-520)” and “Food Process Design II (1503-500)” is beneficial to understand the topic but not required.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 2)
Studiengänge	Food Science and Engineering (Master, PO vom 01.10.2013) 3. Semester, Wahl Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 3. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 3. Semester, Wahl
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The students will learn to design a process based on product on product requirements in the field of sugar based, products. They know key product process interactions for the discussed product groups and how to uses these. The learned skills focus on applicable knowledge which is based on strong basic / theoretical foundations allowing to apply it in a wide context. Key competencies addressed in this module are critical problem as-sessment and analytical thinking. Systematic problem solving.
empfohlene Vorkenntnisse	-

Anmerkungen	Maximum number of participants: 24 Registration via ILIAS is open until October 11th
Modulprüfung und Gewichtung	Oral examination
Studienleistung und Gewichtung	-
Process Driven Product Design: Cereals and Sweets (1503-511)	
Person(en) verantwortlich	Reinhard Kohlus
Lehrform	Vorlesung mit Übung und Seminar
SWS	4
Inhalt	The interplay between product quality generation and process design is discussed on three examples in detail. These are sugar articles, breakfast cereals and ice cream. In all three raw material composition and targeted product attributes require specific pro-cess conditions. The approach for each product group will be worked out. Typical equipment is explained and process parame-ter are discussed. Product design aspects are including storage, packaging and quality parameter are covered as well. In detail twin screw extruder, sugar cooker and freezer technology will be introduced. This allows to discuss the examples of breakfast cereals ex cooking extrusion, hard and soft caramel, marshmallows and ice cream.
Literatur	-
Anmerkungen	Zucker und Zuckerwaren; H. Hoffmann, W. Mauch, W. Untze; Behrs Verlag 1985, Science of Ice cream; C. Clark, The Royal Society of Chemistry 2004 Snack Foods Processing, R. Lusas, L. Rooney, CRC Press, Boca Raton, 2001

Modul: Process Optimization (1509-530)

Modulverantwortung	Alexander Schaum
Bezug zu anderen Modulen	This module complements Process dynamics and control, Advanced Process Technologies for Cereal Processing, Industry 4.0 technologies, etc. Moreover, it complements the module 1101-410 Applied Mathematics for the Life Sciences II. Participation in Process Optimization is also possible without participation in the modules listed here.
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	1 Semester (Block 4)
Studiengänge	M.Sc. Agriculutral Biology, 3rd semester, elective M.Sc. Biology, 3rd semester, elective M.Sc. Bioeconomy, 3rd semester, elective (profile: Artificial Intelligence and Data Science) M.Sc. Biotechnology, 3rd semester, elective M.Sc. Food Biotechnology, 3rd semester, elective M.Sc. Food Science and Technology, 3rd semester, elective M.Sc. Food Science and Enginnering, 3rd semester, elective M.Sc. Food Systems, 1st semester, elective M.Sc. Food Chemistry, 3rd semester, elective
Prüfungsdauer (in Minuten)	30
Präsenzstudium (in Stunden)	70
Selbststudium (in Stunden)	155
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	After completing this module, students are able to differentiate between model-based and model-free optimization techniques, explain the most important optimization approaches, to implement basic algorithms in Matlab or Python, as well as use standard tools in one of these software packages to solve static optimization problems with constraints. Further they understand the basic approaches for dynamic optimization and how to solve them, and can explain the connections between optimization and artificial intelligence.

empfohlene Vorkenntnisse	-
Anmerkungen	Available places: 15 Registration: ILIAS Place allocation: First-come, first-serve
Modulprüfung und Gewichtung	Oral exam (100%)
Studienleistung und Gewichtung	-
Process Optimization (1509-531)	
Person(en) verantwortlich	Alexander Schaum
Lehrform	Vorlesung mit Übung
SWS	5
Inhalt	Basics of static optimization Implementation of basic optimization algorithms in Python or Matlab Model-based and model-free optimization approaches Optimization under constraints Dynamic optimization Applications to artificial intelligence
Literatur	Bryson, Arthur Earl. Applied optimal control: optimization, estimation and control. Routledge, 2018. Arora, Rajesh Kumar. Optimization: algorithms and applications. CRC press, 2015. Antoniou, Andreas, and Wu-Sheng Lu. Practical optimization: algorithms and engineering applications. Vol. 19. New York: Springer, 2007. Demetriou, Ioannis C., and Panos M. Pardalos. Approximation and Optimization. Springer International Publishing, 2019.
Anmerkungen	-

Modul: Project Work (compulsory) (1500-530)

Modulverantwortung	Lutz Fischer
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	M.Sc. Food Science and Engineering, M.Sc. Food Biotechnology
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes Semester
Dauer des Moduls	4 Wochen (n. V.)
Studiengänge	Food Science and Engineering (Master, PO vom 01.10.2013) 3. Semester, Pflicht Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 2. Semester, Pflicht Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 3. Semester, Pflicht Food Science and Engineering (Master, PO vom 01.10.2013) 2. Semester, Pflicht Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Pflicht Food Biotechnology (Master, PO vom 01.10.2016) 3. Semester, Pflicht
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The student will learn to elaborate a scientific assignment. The module is designed to introduce to the later work in frame of the master thesis. It is structured in three parts: - preparation of a literature based exposé or report about the chosen topic or the experimental results respectively - experimental work in the laboratory repeating selected experiments of the literature (ca. 10 -14 working days) - oral presentation of the topic (15-25 minutes)

	The topic of the project work is discussed and given by the head of a department (member of the compulsory modules). The supervision will be conducted by a postgraduate of the department. The module is successfully performed, when all three parts were passed. Grades will be informally given to the student in oral form. The module is scored passed/failed without an official grade.
empfohlene Vorkenntnisse	-
Anmerkungen	The project work may be integrated into the course of studies flexibly during the first three semesters. However, it has to be completed before beginning to work on the Master's thesis at the latest. This module does not count towards the final grade.
Modulprüfung und Gewichtung	Project work
Studienleistung und Gewichtung	Synopsis, report, presentation
Project Work (compulsory) (1500-531)	
Person(en) verantwortlich	Mario Jekle Herbert Schmidt Jochen Weiss Lutz Fischer Jörg Hinrichs Reinhard Kohlus Rudolf Hausmann Yanyan Zhang Monika Gibis Christian Krupitzer Alexander Schaum
Lehrform	Projekt/Projektarbeit
SWS	4
Inhalt	-
Literatur	-
Anmerkungen	-

Modul: Project Work (Elective) (1500-520)

Modulverantwortung	Lutz Fischer
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	M.Sc. Food Science and Engineering, M.Sc. Food Biotechnology
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes Semester
Dauer des Moduls	n. V.
Studiengänge	Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Science and Engineering (Master, PO vom 01.10.2013) 2. Semester, Wahl Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 3. Semester, Wahl Food Science and Engineering (Master, PO vom 01.10.2013) 3. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 3. Semester, Wahl
Prüfungsdauer (in Minuten)	-
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	This module serves to introduce students to doing a research project independently, which also prepares them for working on their Master's thesis. The topic is chosen with the supervisor on the basis of the contents of a compulsory or elective module of the programme. The supervisor (postgraduate) is assigned by the department and the execution of There are two options for completing this module. Option A: Literature-based project work

	- Writing a synopsis of the research topic using relevant scientific literature on the topic (10-15 pages). This paper is handed in and discussed with the supervisor. - Experimental reproduction of selected relevant data found in the literature (maximum of 3-5 laboratory days; in consultation with the supervisor). Writing a protocol (5-10 pages). The report is handed in and discussed with the supervisor. - Oral presentation of the topic (25-30 minutes on the synopsis and own data). Option B: Experimental project work - Writing a report (15-25 pages) outlining the experimental task, the materials used as well as methods and results of the experiments (approximately 15 laboratory days). - Analysis of the data in writing.
empfohlene Vorkenntnisse	-
Anmerkungen	Registration on an individual basis in consultation with the supervisor. Please refer to the professor in charge of the module most closely related to your desired research topic. This module does not count towards the final grade.
Modulprüfung und Gewichtung	Submission of a report and oral presentation of the results.
Studienleistung und Gewichtung	-
Project Work (elective) (1500-521)	
Person(en) verantwortlich	Mario Jekle Herbert Schmidt Jochen Weiss Lutz Fischer Jörg Hinrichs Reinhard Kohlus Rudolf Hausmann Yanyan Zhang Monika Gibis Christian Krupitzer Alexander Schaum
Lehrform	Projekt/Projektarbeit
SWS	-

Inhalt	-
Literatur	-
Anmerkungen	-

Modul: Recombinant Proteins (1506-430)

Modulverantwortung	Ralf Kölling-Paternoga
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 3)
Studiengänge	Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 1. Semester, Pflicht Food Biotechnology (Master, PO vom 01.10.2016) 1. Semester, Pflicht
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	80
Selbststudium (in Stunden)	145
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	On successful completion of the module, you are able to explain the steps leading to the expression of a functional protein. You know how to differentiate the mechanisms of gene expression in prokaryotic and eukaryotic microorganisms. You will appreciate how mechanistic concepts are derived from experimental data. You will be able to apply the knowledge gained in the lecture to understand original research articles and to critically evaluate the results presented in these articles. You learned to give a presentation and to participate actively in class discussions. You improved your skills in performing experiments at the lab bench.
empfohlene Vorkenntnisse	-
Anmerkungen	-
Modulprüfung und Gewichtung	Written examination
Studienleistung und Gewichtung	Regular attendance and active participation, practical report

Recombinant Proteins, Lecture (1506-431)

Person(en) verantwortlich	Ralf Kölling-Paternoga
Lehrform	Vorlesung
SWS	2
Inhalt	In the lecture, the different steps leading to successful expression of a recombinant protein in microorganisms are presented. We closely

	examine the mechanisms and the control of gene transcription, mRNA translation and protein folding and other aspects connected to heterologous protein expression, like protein turnover and protein secretion. The prokaryotic model organism Escherichia coli will be contrasted with the eukaryotic model organism Saccharomyces cerevisiae. Similarities and differences in gene expression between the two will be explored. Special emphasis will be given to the practical aspects of gene expression, like gene cloning, choosing the right vector system and usage of protein tags.
Literatur	-
Anmerkungen	Molecular Biology of the Cell, Alberts, Wiley-VCH (2007)
Recombinant Proteins, Seminar (1506-432)	
Person(en) verantwortlich	Ralf Kölling-Paternoga
Lehrform	Seminar
SWS	1
Inhalt	You will present a research article about a topic related to recombinant protein expression in a 30-minute talk. Knowledge obtained from the lecture will be applied to analyze and understand the original research articles.
Literatur	Specific articles will be provided; in addition, it is advisable to perform an individual literature search.
Anmerkungen	-
Recombinant Proteins, Practical (1506-433)	
Person(en) verantwortlich	Ralf Kölling-Paternoga
Lehrform	Praktikum
SWS	2
Inhalt	The following experiments will be performed: - detection of a gene cassette insertion into the yeast genome by PCR - agarose gel electrophoresis - localization of cellulase activities in yeast by cell fractionation - SDS-PAGE

	- Western Blotting - affinity-purification of 6His-tagged proteins from E. coli
Literatur	Molecular Biology of the Cell, Alberts, Wiley-VCH (2007)
Anmerkungen	-

Modul: Rekombinante Expression von Signalmolekülen (1906-410)

Modulverantwortung	Armin Huber
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	-
Lehrsprache	deutsch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 3)
Studiengänge	Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 3. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 3. Semester, Wahl Biologie (Master, PO vom 01.10.2010) 1. Semester, Wahlpflicht
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	58
Selbststudium (in Stunden)	167
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Ziel des Moduls ist, dass die Studierenden nach dessen Abschluss in der Lage sind, - verschiedene Expressionssysteme und transgene Organismen aufzuzählen und vergleichend zu bewerten. - die Photorezeption als Beispiel eines G Protein-gekoppelten Signalwegs zu beschreiben. - die rekombinante Expression von Signalproteinen des visuellen Systems durchzuführen - die Reinigung rekombinant exprimierter Proteine durchzuführen. - Fluoreszenzmarker und photoaktivierbare Fluoreszenzproteine in Experimenten einzusetzten. - Sehfarbstoffe spektralphotometrisch zu charakterisieren. - transgene Drosophila herzustellen.

	Ziel des Moduls ist, dass die Studierenden nach dessen Abschluss in der Lage sind, - anspruchsvolle wissenschaftliche Experimente durchzuführen. - Versuchsergebnisse präzise zu dokumentieren und zu präsentieren
empfohlene Vorkenntnisse	-
Anmerkungen	Anzahl Teilnehmerplätze: 12 Anmeldung zum Modul: über ILIAS Anmeldezeitraum: Beginn der Vorlesungszeit im Wintersemester Kriterien, nach denen Studienplätze vergeben werden: Reihenfolge der Anmeldung Modulnummer bis Sommersemester 2022: 2303-410
Modulprüfung und Gewichtung	Klausur (100%)
Studienleistung und Gewichtung	Protokoll
Rekombinante Expression von Signalmolekülen, Vorlesung (1906-411)	
Person(en) verantwortlich	Armin Huber
Lehrform	Vorlesung mit Übung
SWS	1
Inhalt	Die Vorlesung vermittelt die theoretischen Grundlagen für die in den Übungen durchgeführten Experimente: - Expressionssysteme und transgene Organismen - Photorezeption als Beispiel eines G Protein-gekoppelten Signalwegs - Reinigung rekombinant exprimierter Proteine - Fluoreszenzmarker und photoaktivierbare Fluoreszenzproteine
Literatur	-
Anmerkungen	-

Rekombinante Expression von Signalmolekülen, Übung (1906-412)	
Person(en) verantwortlich	Armin Huber
Lehrform	Übung
SWS	4
Inhalt	Es werden praktische Experimente durchgeführt: - Heterologe Expression eines Proteins in E. coli und Aufreinigung über His-Tag - Transiente Transfektion von S2-Zellen und Expression eines photoaktivierbaren fluoreszierenden Proteins - in vitro-Translation - Immunpräzipitation - Herstellung transgener Drosophila - spektralphotometrische Charakterisierung von Sehfarbstoffen
Literatur	-
Anmerkungen	-

Modul: Soft Matter Science I - Food Rheology and Structure (1505-500)

Modulverantwortung	Jörg Hinrichs
Bezug zu anderen Modulen	Requirement for participation in the elective module “Innovative Dairy Technology”
Teilnahmevoraussetzung	Scientific background in mathematics, physics and chemistry.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 Wochen (Block 4)
Studiengänge	Food Science and Engineering (Master, PO vom 01.10.2013) 1. Semester, Pflicht Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 3. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 3. Semester, Wahl Food Systems (Master, PO vom 01.10.2016), 1. Wahl
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	96
Selbststudium (in Stunden)	129
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	The students learn the basic principles of food structure and rheology. They gain an awareness of the various measurement technologies used to define the structure of complex food matrices. They design and conduct experiments, including standard methods, and perform data analysis. They work in small groups to characterise food systems and also learn about process modelling. They become familiar with presenting their work through written laboratory reports and oral presentations.
empfohlene Vorkenntnisse	-
Anmerkungen	Maximum number of participants: 45
Modulprüfung und Gewichtung	Exam (80 % of total), seminar (20% of total) and practical seminar (to pass)
Studienleistung und Gewichtung	attendance in practical course, laboratory reports, seminar presentation
Food Systems: Looking Beyond Rheology and Structure (1505-501)	
Person(en) verantwortlich	Mario Jekle Jörg Hinrichs
Lehrform	Vorlesung

SWS	2
Inhalt	Principles of structural, mechanical, and dynamic characteristics of food systems. Basic information and fundamental terms in rheology, measurement technology for different food matrices, mechanical strain, dynamic rheology. Measuring systems and principles, methods in structure analysis, analysis of measurement data and modelling.
Literatur	Scientific literature, doctoral theses, publications from the department, textbooks in the departmental library.
Anmerkungen	-
Literature Seminar: Structural Models for Food Systems (1505-502)	
Person(en) verantwortlich	Mario Jekle Jörg Hinrichs
Lehrform	Seminar
SWS	2
Inhalt	Evaluation of publications and research contributions. Analysing scientific literature, presenting and discussing one topic.
Literatur	Scientific literature / library – additional literature, research journals
Anmerkungen	Lecture, including principles, methods, conclusion.
Practical Course on Rheology and Structure (1505-503)	
Person(en) verantwortlich	Mario Jekle Jörg Hinrichs
Lehrform	Übung
SWS	2
Inhalt	Practical course on food rheology and structure.
Literatur	Scientific literature, collection of methods, scientific publications and research articles
Anmerkungen	Student groups of 3 to 6 people

Modul: Soft Matter Science II - Food Physics (1507-510)

Modulverantwortung	Jochen Weiss
Bezug zu anderen Modulen	Second part to Soft Matter I - Food Rheology and Structure
Teilnahmevoraussetzung	Admission to a Master's program. Basic knowledge in physical chemistry and mathematics.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 1)
Studiengänge	Food Science and Engineering (Master, PO vom 01.10.2013) 2. Semester, Pflicht Food Microbiology and Biotechnology (Master, PO vom 01.10.2013) 2. Semester, Wahl Bioeconomy (Master, PO vom 01.10.2014) 2. Semester, Wahl Food Biotechnology (Master, PO vom 01.10.2016) 2. Semester, Wahl Bioeconomy (ab WS 16/17) (Master, PO vom 01.04.2017) 2. Semester, Wahl (Profil: Transforming Food Systems) Food Systems (Master, PO vom 01.10.2019) 2. Semester, Wahl
Prüfungsdauer (in Minuten)	120
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	169
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Upon completion of this online module, students are expected to have gained knowledge of physical phenomena that play a role in food systems. The students are able to demonstrate an understanding of (i) molecular material science approach to food systems, and (ii) structure-function relationships in matrices composed of proteins, lipids, and carbohydrates, and (iii) the operating principles of advanced physical analytical techniques as well as their use in the analysis of complex food structures. The students are able to apply principles of molecular mass transport,

	solution thermodynamics, phase transitions, and molecular interactions to solve problem-oriented case studies in foods. Furthermore, the students are able to explain, evaluate, and communicate concepts and results. Furthermore, students are able to develop stronger communication skills and develop their skills of applying digital tools by completing assignments and designing clear and well-organized presentatations, posters and flash talks. The students are expected to apply critical and analytical thinking to solve food physics-related challenges. Students are able to improve their written and oral English skills.
empfohlene Vorkenntnisse	-
Anmerkungen	Sign-up for module: in ILIAS Maximum number of participants: 50 Some lectures of this course might be held online.
Modulprüfung und Gewichtung	Written exam (75%) Oral or online exam optional. Three-minute-talk (10%) Poster and its presentation (15%)
Studienleistung und Gewichtung	Laboratory work, Laboratory presentation, Peer review
Soft Matter Science II - Food Physics (1507-511)	
Person(en) verantwortlich	Jochen Weiss
Lehrform	Vorlesung mit Übung und Praktikum
SWS	4
Inhalt	This module reviews fundamental concepts of food physics, and aims to deliver knowledge of principles of physical phenomena (e.g., mass transport, solution thermodynamics, molecular and particle interactions, and phase transitions) in complex food matrices. Case studies highlight the connection between the theory and practical relevance. Student assignments aim to promote knowledge transfer and enable the students to apply the scientific concepts and scientific literature. These assignments involve calculation exercises, virtual lab projects, and generating individual flash talks and poster

	presentations based on current papers in the area of food physics.
Literatur	Principles of Colloid and Surface Chemistry, CRC Press,1997, ISBN: 978-0824793975 Polymer Chemistry, CRC Press, 2007, ISBN: 978-1574447798 Phase Transitions in Foods (1. Ed), Academic Press,1995, ISBN: 978-0125953405 Phase Transitions in Foods (2. Ed) Academic Press, 2016, ISBN: 978-0124080867 Biophysics: An introduction, Springer, 2012, ISBN: 978-3-642-25211-2 Biophysics, Springer, 2002, ISBN: 978-1-4020-0218-2
Anmerkungen	The module is taught online. Online live sessions are designed to answer student questions about the teaching material, and present student assignments in a mini-conference.

Modul: Technologie pflanzlicher Lebensmittel (1504-450)

Modulverantwortung	Mario Jekle
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Zum erfolgreichen Abschluss des Moduls benötigen Studierende Kompetenzen in Deutsch und Englisch, Mathematik, Statistik und Labor, die nicht im Rahmen dieses Moduls vermittelt werden sowie lebensmitteltechnologische Grundkenntnisse B.Sc. in Lebensmittelwissenschaft & Biotechnologie, Ernährungswissenschaften o. Lebensmittelchemie o. vgl. To successfully complete the module, students need competences in German and English, mathematics, statistics and laboratory, which are not taught as part of this module, as well as basic knowledge of food technology B.Sc. in Food Science & Biotechnology, Nutritional Sciences or Food Chemistry or similar.
Lehrsprache	deutsch/englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	1 Semester (Block 3)
Studiengänge	M.Sc. Bioeconomy, 2. Semester, Wahl (Profil: Transforming Food Systems) M.Sc. Biotechnology (Studiengebinn ab WS 2024/25), 2. Semester, Wahl M.Sc. Food Biotechnology, 2. Semester, Wahl M.Sc. Food Science and Technology (Studiengebinn ab WS 2024/25), 2. Semester, Wahl M.Sc. Food Science and Engineering, 2. Semester, Wahl M.Sc. Food Systems, 2. Semester, Wahl
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	70
Selbststudium (in Stunden)	155
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Ziel des Moduls ist, dass die Studierenden nach dessen Abschluss in der Lage sind, • Strategien für die integrierte, nachhaltige Verwertung und geeignete Verarbeitungstechnologien auf die thematisierten pflanzlichen Rohstoffe

	selbstkritisch anzuwenden auf der Basis von vertieftem Wissen über Rohware, Technologien und Lieferketten • lebensmitteltechnologische Prozesse zur Verarbeitung pflanzlicher Lebensmittel von der Rohware bis zum fertig verpackten Produkt mit prozessbegleitender Analytik verstehen, durchführen und beurteilen zu können, • die hierfür notwendigen Maschinen und Apparate zu verstehen After completing this module, students are able • to apply strategies for integrated, sustainable processing and suitable process technologies to the thematized plant-based raw materials self-critically on the basis of in-depth knowledge of raw materials, technology, and supply chains • to understand, perform and evaluate processing of plant-based foods from the raw material until the finally packed product, including process-controlling analysis • to understand the necessary machines and apparatus
empfohlene Vorkenntnisse	-
Anmerkungen	Anzahl Teilnehmerplätze | Available places: 30 Anmeldung zum Modul | Registration: ILIAS Kriterien, nach denen Studienplätze vergeben werden | Place allocation: Modulbeitrittsverfahren Food Master via ILIAS. Module allocation via ILIAS. Please note: For this module you will need German AND English language skills.
Modulprüfung und Gewichtung	Klausur (100%)
Studienleistung und Gewichtung	Protokoll, Prüfungsgespräch und aktive Teilnahme an den praktischen Übungen
Technologie pflanzlicher Lebensmittel: Obst, Gemüse, koffeinhaltige Getränke & New Foods (1504-451)	
Person(en) verantwortlich	Mario Jekle
Lehrform	Vorlesung mit Übung
SWS	5

Inhalt	Vorlesung - Verwertungsstrategien für Obst und Gemüse - Verwertungsstrategien für Kaffee, Tee, Kakao und andere koffeinhaltige Lebensmittel wie Guaraná, Maté etc. - Lebensmittel-3D-Druck Lecture: - Processing strategies for fruit and vegetables - Processing strategies for coffee, tea, cacao and other caffeinated foods such as guarana, maté etc., - 3D food printing — Lebensmitteltechnologische Übungen Durchführung lebensmitteltechnologischer Versuche unter industrienahen Bedingungen im Technikum des Fachgebiets, inklusive prozessbegleitender Analytik, zu folgenden Themen: - Haltbarmachung durch Erhitzen (Pasteurisation, Sterilisation) & Gefrieren (Nasskonserven, Tiefkühlprodukte) - Alkoholfreie Getränke aus unterschiedlichen Rohwaren (Fruchtsaft, -nektar) - Gewinnung und Raffination von Speiseöl - Gelierprodukte (Konfitüren) und strukturgebende industrielle Halbwaren (Fruchtzubereitungen) - Lebensmittel-3D-Druck practical course in food technology

	Performing of food technological experiments under industry-like conditions in the pilot plant of the department, including process-controlling analyses, on the following subjects: - Preservation by heating (pasteurisation, sterilisation) & freezing (canning, frozen foods) - Non-alcoholic beverages from different raw materials (fruit juices, fruit nectars) - Recovery and refinement of edible oils - Gelled products (jams and marmelades) & structure-forming industrial intermediates (fruit preparations) - 3D food printing
Literatur	Skripte zu Inhalten und zu den lebensmitteltechnologischen Übungen mit speziellen Literaturempfehlungen für die einzelnen Themengebiete Lecture notes and manual of the advanced practical course in food technology, including recommended literature for the different topics
Anmerkungen	-

Modul: The Bacterial Genome, from Culture to Functional Reconstruction (4611-440)

Modulverantwortung	Michael Kube
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	-
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes WS
Dauer des Moduls	4 weeks (in March)
Studiengänge	Agricultural Biology (Master) 3. semester, semi-elective Agricultural Sciences - Crop Production Systems (Master) 1. or 3. semester, elective Crop Sciences - Plant Breeding and Seed Science (Master) 1. or 3. Semester, elective Crop Sciences - Plant Nutrition and Protection (Master) 1. or 3. Semester, elective Agricultural Sciences - Animal Science (Master) 3. semester, elective Biology (Master) 3. semester, semi-elective Food Biotechnology (Master) 3. semester, elective
Prüfungsdauer (in Minuten)	90
Präsenzstudium (in Stunden)	56
Selbststudium (in Stunden)	124
Arbeitsaufwand (in Stunden)	180
Lern- und Qualifikationsziele	Students who have completed this module successfully will be able to plan a bacterial genome project, identify and apply the critical steps in determining a bacterial genome sequence and perform a functional annotation. They will also have acquired extensive knowledge of sequencing technologies, data processing and the vocabulary of annotation. They can independently apply gene prediction and functional assignment techniques, reconstruct selected functional elements and metabolic processes, identify virulence factors, predict candidate genes and perform extensive sequence comparisons. Scientific working, organisational skills, independent work, critical/analytical thinking, application of algorithms, application of standard and special software, ability to communicate and cooperate.

empfohlene Vorkenntnisse	-
Anmerkungen	Registration via ILIAS required, number of participants limited to 16
Modulprüfung und Gewichtung	Written exam (70%)
Studienleistung und Gewichtung	Presentation (30%)
The Bacterial Genome, from Culture to Functional Reconstruction (4611-441)	
Person(en) verantwortlich	Michael Kube
Lehrform	Vorlesung mit Übung und Seminar
SWS	5
Inhalt	Starting from a bacterial culture, students first perform the decisive steps for determining a complete genome sequence, then subsequently analyse the encoded genetic repertoire in annotation and functional reconstruction. The lecture comprise state of the art techniques for genome sequencing and analysis. In exercises, techniques from molecular biology and bioinformatics are applied by the students.
Literatur	-
Anmerkungen	Please keep in mind, continuous participation is necessary. The exercise part includes work in the laboratory.

Modul: UNIcert III English for Scientific Purposes (1000-040)

Modulverantwortung	Lutz Fischer
Bezug zu anderen Modulen	-
Teilnahmevoraussetzung	Scoring at least 85 points in the Language Center's entrance examination OR a UNIcert II certificate or equivalent proof of English language proficiency OR being enrolled in an English-language Master's program at the Faculty of Natural Sciences.
Lehrsprache	englisch
ECTS	7,5
Angebotshäufigkeit	jedes Semester
Dauer des Moduls	2 Semester
Studiengänge	M.Sc. Biologie, 1.-4. Semester, Wahlpflicht B.Sc. Biologie 3.-6. Semester, Wahlpflicht M.Sc. Earth System Science, 1.-4. Semester, Wahl M.Sc. Earth & Climate System Science, 1.-4. Semester, Wahl B.Sc. Ernährungsmanagement und Diätetik, 3.-6. Semester, Wahl B.Sc. Ernährungswissenschaft, 3.-6. Semester, Wahl B.Sc. Lebensmittelwissenschaft und Biotechnologie, 3.-6.Semester, Wahl M.Sc. Ernährungsmedizin, 3. Semester, Wahl M.Sc. Medizinische Ernährungswissenschaft, 3. Semester, Wahl M.Sc. Molekulare Ernährungswissenschaft, 3. Semester, Wahl M.Sc. Molekulare Ernährungswissenschaft (ab Studienbeginn WS 23/24), 3. Semester, Wahl M.Sc. Food Microbiology and Biotechnology, 1.-4. Semester, Wahl M.Sc. Food Biotechnology 1.-4. Semester, Wahl M.Sc. Food Science and Engineering (Master, PO vom 01.10.2013) 1.-4. Semester, Wahl M.Sc. Lebensmittelchemie (Master, PO vom 01.10.2015) 3. Semester, Wahl Promotionsstudiengang Naturwissenschaften, 1./2. Semester, Wahl
Prüfungsdauer (in Minuten)	240
Präsenzstudium (in Stunden)	-
Selbststudium (in Stunden)	-
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Upon successful completion of this module, the English language proficiency of the students

	corresponds to the level C1 of the Common European Framework of Reference for Languages. For details on the competencies you acquire beyond language proficiency, please read the individual course descriptions at https://spraz.uni-hohenheim.de/kurse?&L=1.
empfohlene Vorkenntnisse	-
Anmerkungen	You need to register for the UNIcert III courses. Information on how to register is available at https://spraz.uni-hohenheim.de/anmeldung?&L=1
Modulprüfung und Gewichtung	UNIcert III examination (240 minutes total): 180 minutes written exam, 30 minutes listening comprehension, 30 minutes oral exam
Studienleistung und Gewichtung	Regular attendance, active participation, other (see individual course descriptions at https://spraz.uni-hohenheim.de/kurse)
UNIcert III English for Scientific Purposes (1000-041)	
Person(en) verantwortlich	Lutz Fischer
Lehrform	Vorlesung
SWS	-
Inhalt	For details on the competencies you acquire beyond language proficiency, please read the individual course descriptions at https://spraz.uni-hohenheim.de/kurse?&L=1.
Literatur	-
Anmerkungen	-

Modul: Von Genen und Genregulation zu Transgenen und editierten Genomen in Pflanzen (3411-430)

Modulverantwortung	Sandra Schmöckel
Bezug zu anderen Modulen	Das Modul hat starke Überlappung mit 3411-420 (Englisch) und kann gegenseitig anerkannt werden.
Teilnahmevoraussetzung	-
Lehrsprache	deutsch/englisch
ECTS	7,5
Angebotshäufigkeit	jedes SS
Dauer des Moduls	4 Wochen (Block 4)
Studiengänge	Agrarbiologie (Master), 2. Semester, Wahlpflicht Food Biotechnology (Master), 2. Semester, Wahl
Prüfungsdauer (in Minuten)	20
Präsenzstudium (in Stunden)	75
Selbststudium (in Stunden)	150
Arbeitsaufwand (in Stunden)	225
Lern- und Qualifikationsziele	Studierende, die dieses Modul erfolgreich absolviert haben, haben Grundkenntnisse in den Bereichen DNA, RNA, Proteine, Regulation von Transkriptions- und Translationsprozessen, Genomeditierung von Pflanzen, Forward und Reverse Genetik, Anwendungsbeispiele von Transgenen und deren Evaluierung mittels verschiedener Methoden wie Transcriptomics, Genomics und Proteomics. Studierende werden theoretische Grundlagen für Methodenanwendungen kennen und zum Teil selbst in einigen Labortätigkeiten anwenden. Es wird eine Exkursion zu einer biotechnologisch ausgerichteten Firma geben. Einige Teile des Moduls werden auf Englisch angeboten, dabei erwerben die Studierenden Fremdsprachenkompetenz. Grundkenntnisse werden in wissenschaftlichen Kontext dargestellt, dabei erlernen die Studierenden kritisches und analytisches Denken und mündliche Ausdrucksfähigkeit.
empfohlene Vorkenntnisse	-
Anmerkungen	Das Modul hat starke Überlappung mit 3411-420 (Englisch und semesterbegleitend) und kann gegenseitig anerkannt werden.
Modulprüfung und Gewichtung	Prüfungsgespräch (100 %)

Studienleistung und Gewichtung	-
Von Genen und Genregulation zu Transgenen und editierten Genomen in Pflanzen (3411-431)	
Person(en) verantwortlich	Uwe Ludewig Sandra Schmöckel
Lehrform	Vorlesung mit Übung und Exkursion
SWS	5
Inhalt	Die Vorlesung vermittelt Kenntnisse zu folgenden Themen: Organisation und Funktion von Genen und Genomen, Pflanzengewebekultur und Gewebedifferenzierung, Sequenzierungstechnologien, Bioinformatik, Genisolierung und transgene Anwendungen, Mutationen und Mutanten, Genomweite Datengenerierung und -nutzung. Praktische Aspekte werden vertieft beim Üben von Pflanzentransformationen und während der Exkursion in eine biotechnologisch ausgerichtete Firma.
Literatur	Literatur wird im Kurs besprochen.
Anmerkungen	-