TUM School of Life Sciences
Technische Universität München

Module Catalog

M.Sc. Nutrition and Biomedicine

TUM School of Life Sciences
Technische Universität München

www.tum.de/
www.wzw.tum.de/index.php?id=2&L=1

Module Catalog: General Information and Notes to the Reader

What is the module catalog?
One of the central components of the Bologna Process consists in the modularization of university curricula, that is, the transition of universities away from earlier seminar/lecture systems to a modular system in which thematically-related courses are bundled together into blocks, or modules.
This module catalog contains descriptions of all modules offered in the course of study.
Serving the goal of transparency in higher education, it provides students, potential students and other internal and external parties with information on the content of individual modules, the goals of academic qualification targeted in each module, as well as their qualitative and quantitative requirements.

Notes to the reader:

Updated Information
An updated module catalog reflecting the current status of module contents and requirements is published every semester. The date on which the module catalog was generated in TUMonline is printed in the footer.

Non-binding Information
Module descriptions serve to increase transparency and improve student orientation with respect to course offerings. They are not legally-binding. Individual modifications of described contents may occur in praxis.
Legally-binding information on all questions concerning the study program and examinations can be found in the subject-specific academic and examination regulations (FPSO) of individual programs, as well as in the general academic and examination regulations of TUM (APSO).

Elective modules
Please note that generally not all elective modules offered within the study program are listed in the module catalog.

Index of module handbook descriptions (SPO tree)

Alphabetical index can be found on page 144

Required Courses | Pflichtmodule

Module Description

WZ3201: Basics Nutrition and Food | Basics Nutrition and Food [Basics]

Version of module description: Gültig ab winterterm 2021/22

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 3	**Total Hours:** 90	**Self-study Hours:** 30	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The progress of the students will be tested in a written exam (two hours) roughly six weeks after the end of the lecture. Because of the “crash course” character of the lecture no grade will be given for the exam. Passing of the exam will require a broad overview over the subjects presented in the lectures, rather than remembering all the details. Students need to demonstrate that they have acquired all the skills that are necessary for a successful continuation in the master program. These skills include, for example, the correct use of the scientific vocabulary, the recognition of the chemical structures of molecules that line the main metabolic pathways and the foundations of how energy is generated and used in biological systems and the classes and chemical structures of nutrients and other biomolecules. In the exam, students are allowed to bring a calculator (for simple calculations) and a dictionary (English into their mother tongue).

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Formally, this course is at the very entry level for the MSc program Nutrition and Biomedicine. Students are strongly advised to refresh their knowledge from relevant subjects (cell biology, physiology, biochemistry, human anatomy) from their BSc studies.

Content:
The individual aspects covered include:
anatomy and function of the nervous system, the gastrointestinal tract, the adipose tissue, muscles, the liver and the kidneys
basic function of the immune system
use of macronutrients as energy source, energy metabolism

inter-conversion between macronutrient classes
regulation of metabolism after a meal / in hunger / during exercise
vitamins and their relevance for enzymatic processes as precursors of cofactors
classes, production and biological function of hormones
basic molecular biology (DNA, transcription and translation).

Intended Learning Outcomes:
Learning outcomes will be a deeper understanding of metabolic pathways related to nutritional sciences, their regulation and also a comprehensive understanding of the function and interplay of individual organs. The students will achieve a basic understanding of metabolic and physiological processes that are relevant to the area of nutrition. They will also be able to define and correctly apply technical terms as applicable to the area of nutrition and will be able to critically reflect information on diverse aspects of nutrition that comes from a diversity of scientific and non-scientific sources. The intention of this module is to bring all students to a similar level of understanding, which is considered the prerequisite for all modules that will follow.

Teaching and Learning Methods:
This module is designed to level the students, who come from various scientific and cultural backgrounds and to provide a first glance into the broad field of nutrition and biomedicine. It consists of a lecture that covers the first two weeks of the winter term. No other lectures will be held in this time so that the students can entirely focus on this lecture. The lecture covers basic knowledge from biological and nutritional sciences in a compressed form. It is a primer that is intended to bring all students to a similar entry level for the other lectures to come. The main body of the module is a lecture in PowerPoint format given by several lecturers. The exercise units will take place in the time between the lecture and the exam. These will allow students to ask questions that may have appeared during the self-study time. The exercise provides more space for the interaction with other students as well as with the lecturers and helps to identify areas that need more attention.

Media:
The lecture will mainly be based on PowerPoint presentations. There is time for questions and discussions during the lectures. A blackboard or whiteboard may be used in the exercises to explain individual aspects in greater depth

Reading List:
Stipanuk, MH and Caudill, MA: Biochemical, Physiological, and Molecular Aspects of Human Nutrition. Elsevier/Saunders, 2013.
Bender, David A: Introduction to Nutrition and Metabolism, Boca Raton: CRC Press, 2014.

Responsible for Module:
Stolz, Jürgen; PD Dr. rer. nat. habil.

Courses (Type of course, Weekly hours per semester), Instructor:
Basics Nutrition And Food (Vorlesung, 4 SWS)

Stolz J [L], Bader B, Bast-Habersbrunner A, Fromme T, Haller D, Klingenspor M, Oeckl J, Schemann M, Spanier B, Stolz J
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3211: Research Internship | Research Internship [RI]

Version of module description: Gültig ab summerterm 2021

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter/summer semester
Credits:* 10	**Total Hours:** 300	**Self-study Hours:** 75	**Contact Hours:** 225

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The student's performance is evaluated, as documented in the lab notebook and the internship report (max. 20 pages), by the following criteria:
-understanding of the research question and ability to develop the project
-ability to learn and apply new methods
-skills in self-directed experimental design
-precision and accuracy in data acquisition and data management
-ability to study and work autonomously
-data analyses and evaluation

Repeat Examination:

(Recommended) Prerequisites:
Module Research Methods
Module Basics in Computational Biology
Module Integrated Lab Course

shedule:

1. The students search themselves one TUM internal supervisor from the given list of classes no matter if the planned research Internship is going to be TUM internal or TUM external. They do so by contacting a chair of TUM School of Life Sciences that already has a class connected to each one of the offer-nodes within the module-node of WZ3211 in TUMonline. If a preferred supervisor's classes and exam is already listed a topic or supervisor needs no further approval by the Examination Board.

If there should be another potential TUM internal supervisor whose chair is not yet part of the list of classes and/or exams, the students can ask for an extension of the list by the preferred supervisor writing a conclusive e-mail to recognition.co@ls.tum.de.

2. The students decide whether they want to do an internal OR an external internship and register for the supervisor's class connected to the respective offer-node (internal/external).

3. It will be the TUM internal supervisor who will (re-)read the report and finally submits the grade and the title.

Content:
The scientific questions addressed by laboratories on the TUM campus or at external research facilities hosting our master students for the research internship deal with nutrition-related research, either on the fundamental or applied level, using biochemistry, molecular biology, nutrition physiology, metabolism, microbiology, food chemistry, nutrition medicine, genetics, clinical studies, epidemiology and public health. The internship is the first opportunity for our students to apply their theoretical and practical knowledge acquired during the first two semesters to a specific research question in the framework of a project in the host laboratory.

Intended Learning Outcomes:
After successful finalization of the module, our students have acquired theoretical and practical skills to tackle scientific questions and conduct research tasks under guidance by a supervisor. They have gained hands-on experience in the design of experiments in life science laboratories, or the development of study protocols in clinical study units. They are experienced in sensible and reproducible application of known and new methods, understand the technical background of the applied technologies and gained insights into quality control procedures in scientific research. They have learned to document the day-by-day progress of their work in a comprehensible manner that allows independent recapitulation of the applied methods, the acquired data and the results obtained. In a written report, outlined as a scientific manuscript, they can explain the scientific context of their research project, explain the detailed application of methods, document and analyze the acquired data, judge upon the reliability and reproducibility of the results, and evaluate and interpret these results in relation to published work. They are able to explain the goals, experimental design and essential outcome of their research internship to their peers and supervisor in short and concise oral presentations, and in written reports.

Teaching and Learning Methods:
The internship is composed of three elements with theoretical and practical aspects: Phase 1- Developing and planning of a scientific project, Phase 2- Implementation of a research plan devised in Phase 1, and Phase 3– writing a scientific report about the research project. In the practical course, students are trained to identify and specify a selected basic or applied research problem related to nutrition science and biomedicine. The research internship embeds in a defined research context at the respective chair hosting the student. High intensity supervision of students by experienced scientific personnel supports the training success. Students document their research work in a dedicated lab notebook, with a focus on detailed description of applied

methodologies, data acquisition and data analyses. They report to their supervisor on the progress of their work in regular meetings (examination colloquium) and summarize the goals of their research project and the main findings in short oral presentations, using PowerPoint or equivalent presentation tools. Within this setting, the project progress is discussed and plans to further develop the project in the given time frame are developed.

Media:

Reading List:
Review articles and original research articles related to the topic of the research internship. The supervisor assists the student to find the relevant papers and recommends specialized textbooks.

Responsible for Module:
Klingenspor, Martin; Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
External: Research Internship (6 weeks) Food and Bioprocess Engineering (Prof. Kulozik) - Master (Forschungspraktikum, 1 SWS)
Ambros S, Kalinke I, Kürzl C, Reiter M

Research Internship (6 weeks) Food and Bioprocess Engineering (Prof. Kulozik) - Master (Forschungspraktikum, 15 SWS)
Ambros S, Kalinke I, Kürzl C, Reiter M

Research Internship (6 weeks) Human Biology (Prof. Schemann) - Master (Forschungspraktikum, 15 SWS)
Annahazi A

External: Research Internship (6 weeks) Nutritional Medicine (Prof. Hauner) - Master (Forschungspraktikum, 1 SWS)
Bader B, Skurk T

Research Internship (6 weeks) Nutritional Medicine (Prof. Hauner) - Master (Forschungspraktikum, 15 SWS)
Bader B, Skurk T

External: Research Internship (6 weeks) Brewing and Beverage Technology (Prof. Becker) - Master (Forschungspraktikum, 1 SWS)
Becker T [L], Becker T

Research Internship (6 weeks) Brewing and Beverage Technology (Prof. Becker) - Master (Forschungspraktikum, 15 SWS)
Becker T [L], Becker T

Research Internship (6 weeks) Livestock Biotechnology (Prof. Schnieke) - Master (Forschungspraktikum, 15 SWS)
Fischer K, Flisikowska T, Flisikowski K, Schnieke A

External: Research Internship (6 weeks) Molecular Nutritional Medicine (Prof. Klingenspor) - Master (Forschungspraktikum, 1 SWS)
Fromme T, Klingenspor M

Research Internship (6 weeks) Nutrition and Immunology (Prof. Haller) - Master (Forschungspraktikum, 15 SWS)
Haller D [L], Aguanno D, Coleman O, Ecker J, Haller D, Kießling S, Metwaly A, Omer H, Rath E, Schmöller I, Schwamberger S

External: Research Internship (6 weeks) Nutrition and Immunology (Prof. Haller) - Master (Forschungspraktikum, 1 SWS)
Haller D [L], Aguanno D, Coleman O, Haller D, Metwaly A, Omer H, Schmöller I, Schwamberger S

Research Internship (6 weeks) Nutritional Medicine (Praktikum, 15 SWS)
Hauner J [L], Bader B

External: Research Internship (6 weeks) Nutritional Medicine (Praktikum, 1 SWS)
Hauner J [L], Bader B

Research Internship (6 weeks) Molecular Nutritional Medicine (Prof. Klingenspor) - Master (Forschungspraktikum, 15 SWS)
Klingenspor M [L], Fromme T, Li Z, Oeckl J

Research Internship (6 weeks) Bewegung, Ernährung und Gesundheit (Forschungspraktikum, 15 SWS)
Köhler K

Research internship (6 weeks) Neuroproteomik (Prof. Lichtenthaler)-Master (Praktikum, 15 SWS)
Lichtenthaler S [L], Lichtenthaler S

Research Internship (6 weeks) Biothermodynamics (Prof. Minceva) - Master (Forschungspraktikum, 15 SWS)
Schmieder B

External: Research Internship (6 weeks) Livestock Biotechnology (Prof. Schnieke) - Master (Forschungspraktikum, 1 SWS)
Schnieke A

Research Internship (6 weeks) Nutritional Systems Biology (Prof. Somoza) - Master (Forschungspraktikum, 15 SWS)
Somoza V

Research Internship (6 weeks) Metabolic Programming (Prof. Uhlenhaut) - Master (Forschungspraktikum, 15 SWS)
Uhlenhaut N [L], Greulich F, Spanier B, Strickland B, Xing Z

External: Research Internship (6 weeks) Metabolic Programming (Prof. Uhlenhaut) - Master (Forschungspraktikum, 1 SWS)
Uhlenhaut N [L], Greulich F, Spanier B, Uhlenhaut N
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3210: Disease Pathologies and Nutrition | Disease Pathologies and Nutrition

Version of module description: Gültig ab summerterm 2021

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 8	**Total Hours:** 240	**Self-study Hours:** 150	**Contact Hours:** 90

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Aufgrund des Pandemiegeschehens hat der/die Studierende auch die Möglichkeit, an einer beaufsichtigten elektronischen schriftlichen Fernprüfung (Aufsicht mit Proctorio, 120 min.) teilzunehmen (Onlineprüfung: WZ3210-1o). Diese schriftliche Prüfung wird parallel in Präsenz angeboten (WZ3210-1).

The students have to present their group work (2 to 3 students per group, 60 min) comprising the analysis of specific published disease/nutrition-related human studies and/or animal models by the group members followed by the discussion (20 min) with the seminar audience.

The students overall achievements in the module are assessed by a graded written exam (120 min). The exam tests the students understanding of the basics in pathophysiologies and their underlying molecular and metabolic mechanisms. The grade of the test equals the final grade for the module.

Repeat Examination:

(Recommended) Prerequisites:
Basics in nutrition, metabolism, physiology and nutritional medicine.

Content:
The module deals with the pathophysiology of selected common nutrition-related chronic diseases such as obesity, diabetes type 2, cardiovascular diseases, allergy, inflammatory bowel disease,

cancer (colorectal cancer, breast cancer, alcohol-associated cancer) and neurodegenerative diseases among others.
In the lectures, presented by different lecturers (see above), the understanding of specific pathologies, their causes and the underlying molecular and metabolic mechanisms of the disease processes are taught, and nutritional influences (e.g. diets, nutrients, nutritional components, active ingredients) are particularly addressed.
For the seminar students have to analyze (self-study hours) published data from original scientific publications. Specific topics on chronic diseases are chosen that build on the theoretical knowledge of the students. For example, how nutrition relates to the potential cause of, or contribution to, the disease and the efficacy of specific diets or nutrients for the prevention or treatment of a disease. In the seminar the groups present their work as oral presentation and discuss the results of their analysis with the students in the audience.

Intended Learning Outcomes:
Upon successful completion of the module students are able to understand the basic pathophysiology of nutrition-related chronic diseases, their underlying molecular and metabolic mechanisms and the correlations between nutrition and pathological processes. The students can apply their theoretical knowledge to analyze published studies and concepts on the prevention and treatment of nutrition-related chronic diseases using evidence-based medical standards. Furthermore, the students are able to present complex scientific studies in a concise way. They can lead a scientific debate and defend their standpoint in a scientific discussion.

Teaching and Learning Methods:
Lecture:
lecturers will give their oral presentations on their topics by means of PowerPoint presentations
Seminar:
individual students receive specific original publications (e.g. research articles, observational and prospective studies, systematic reviews or meta-analyses) to be analyzed and presented in the seminar
the students transfer their theoretical knowledge to actual medical cases and practical scientific research
students search for additional literature where it is necessary for their analysis and presentation
the groups present their work as oral presentation (approx. 60 min) using PowerPoint followed by the discussion (approx. 20 min) with the students in the audience

Media:
PDFs from the PowerPoint presentations of the lecture and seminar, as well as other study materials (PDFs from publications) and informations are distributed via TUM-Moodle.

Reading List:
Specific original literature and publications will be appointed to each student individually by the lectures.

Responsible for Module:
Hauner, Johann; Univ.-Prof. Dr.

Courses (Type of course, Weekly hours per semester), Instructor:
Disease Pathologies and Nutrition (Vorlesung, 4 SWS)
Hauner J [L], Bader B, Fromme T, Haller D, Hauner J, Oeckl J, Pfluger P, Schemann M, Skurk T, Traidl-Hoffmann C, Witt H

Seminar Disease Pathologies and Nutrition (Seminar, 2 SWS)
Hauner J [L], Bader B, Hauner J
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3208: Energy Balance and Regulation | Energy Balance and Regulation

Version of module description: Gültig ab summerterm 2021

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Students give short oral presentations (10 min) reporting the results of their group work and discuss these results in the plenum. These presentations train the students' capability to apply the theoretical knowledge addressed in the lecture on actual scientific research results. In the presentation and discussion, the students acquire skills to present complex scientific data in a concise way and to explain it to their peers. Furthermore, the oral presentation addresses relevant issues related to experimental design of research, methodology, graphical display and statistical analyses of data, interpretation of results and identification of strengths and weaknesses of the study. The students develop their ability to answer questions from their peers and defend their standpoint in a rigorous scientific debate.
A written exam (120 min) will assess whether the student has attained an advanced level of knowledge and understanding of the theoretical background in energy balance regulation. In preparation for the exam students will be provided with an original research article dealing with a specific aspect of energy balance regulation that was discussed in the lecture. The exam will test whether they have understood the science behind the paper, can recapitulate the applied methods, identify the main outcomes, are able to evaluate the impact of the study and identify findings contrasting to state-of-the-art knowledge presented in the lecture. In particular, the questions will test whether the student can
- repeat and classify elements of energy balance physiology in the correct context.
- apply this knowledge to a new problem in this field of research.
- evaluate the influence of genetic and environmental factors on energy balance.
- predict the outcome of defined experimental interventions altering energy intake, energy storage or energy expenditure.
They may use an English-German Dictionary or Thesaurus and they must bring a hardcopy of the original research paper which is subject of the examination. The final grade for the module depends exclusively on the written exam.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Basic knowledge in mammalian physiology, cell biology, biochemistry, genetics and molecular biology.

Content:
In the context of energy balance, the module conveys advanced knowledge in metabolic physiology, endocrinology, neurobiology and molecular genetics. In particular the following topics are covered:
1. Components of energy homeostasis
2. Exogenous factors (diet, exercise, ambient temperature, photoperiod)
3. Endogenous factors (allelic variation, neuronal and endocrine communication, metabolites)
4. Body composition and impact on energy storage and energy expenditure.
5. Biochemical mechanisms of thermogenesis
6. Gastrointestinal nutrient sensing in the control of food intake
7. Neuroanatomy and neuroendocrine regulation of food intake and energy expenditure
8. Orexigenic and anorexigenic signaling in the brain
9. Neuropeptides and transmitters
10. Nutrient sensing in the brain
11. Chronobiology of energy balance

Intended Learning Outcomes:
After successful completion of the module, students have acquired an advanced level of understanding of established and novel concepts in integrative energy balance physiology. They gained a solid foundation of exo- and endogenous factors that influence energy balance regulation in a physiological context. They know the biochemical basis for sensing and signaling of food intake and energy consumption as well as energy storage. Students are able to elaborate open questions and unsolved problems in this discipline of life sciences. They know how to address these questions according to experimental design and applied methodology. They are able determine the essential biological parameters required for these experiments and select adequate methods for valid measurement and statistical assessment of these parameters.
The students are able to critically assess state of the art research on energy balance regulation in animal models and humans and to present these results in a concise way. They can weigh the positives and negatives of experimental design, address limitations in study designs, data presentation as well as data interpretation. Most importantly, the students can debate in depth with their peers about scientific approaches and defend their own stand point against criticism of a peer group.

Teaching and Learning Methods:
The lecture part conveys the scientific foundation for the work on actual research during the seminar part. Using beamer presentations and white board illustrations landmark research findings and their impact on the incremental advance of understanding are presented. Review articles and

textbook chapters on animal and human physiology round up the theoretical background of energy balance regulation.
The seminar translates the theoretical knowledge into actual state-of-the-art research. Students are independently analyzing and interpreting research findings reported in original research articles and discuss the assigned scientific publications in groups. These articles are preselected to match and expand on the topics of the lecture. Thereby, knowledge presented in the lecture is consolidated and extended. The students learn to dissect research articles in a stepwise manner, starting with understanding the methods applied for the research, identifying the most relevant research results, and understanding and evaluating the interpretation of results as presented by the authors in the discussion section of their article. Students are encouraged to search for other original research articles with confirmatory or conflicting results. Furthermore, they will present the results of their group work to the plenum. Dissemination of their results to the plenum triggers discussions of the topic within the groups as well as in the plenum. These discussions serve to deepen the knowledge of students in energy balance regulation, identify the strengths and weaknesses of scientific research. Most importantly, the students practice scientific debate in front of a peer group audience.

Media:
PowerPoint presentations; additional reading of original research papers and reviews; case studies; all materials are made available on Moodle; occasional white board illustrations;

Reading List:
Original Research and Review Articles are made available on the Moodle platform.
Textbooks for background in Energy Balance Physiology
Biochemical, Physiological, and Molecular Aspects of Human Nutrition. Martha H. Stipanuk and Marie A. Caudill, Elsevier
Introduction to Nutrition and Metabolism. David A. Bender, CRC Press
Metabolic Regulation – A Human Perspective. Keith N. Frayn, Blackwell Publishing

Responsible for Module:
Klingenspor, Martin; Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
Energy Balance and Regulation (Vorlesung, 2 SWS)
Klingenspor M

Energy Balance and Regulation (Seminar, 2 SWS)
Klingenspor M, Bast-Habersbrunner A
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3225: Research Methods | Research Methods

Version of module description: Gültig ab summerterm 2021

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 105	**Contact Hours:** 45

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The exam at the end of the winter term is a written test (120 min). This exam will check if the students can use the correct technical terms and are familiar with the advantages and disadvantages of the various lab techniques, experimental strategies and model organisms that are commonly used. The students will have to demonstrate that they know the current standards of how to make a clinical investigation and how to categorize and critically evaluate results of observational and interventional studies based on their design.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
For the lecture Research Tools some basic knowledge in the core biological areas cell biology, classical genetics, molecular biology and biochemistry and in some classical analytical methods (such as SDS-PAGE, Western Blot, Northern Blot), is necessary. This is partially covered in the module Basics Nutrition and Food.
For the lecture Clinical Studies the pathophysiology of important metabolic disorders (e.g. diabetes mellitus type 2, dyslipidemia) is necessary. Also, basic statistical knowledge is necessary for calculating effect size and power of the study, etc. Basic principles of “Good Clinical Practice” (GCP) should be known.

Content:
Research Methods is comprised of two parts, both held in winter term.
The lecture Research Tools (2 SWS) will cover
- the (molecular) biology of model organisms used in nutrition research
- the advantages and disadvantages of the individual model organisms for research
- gene expression analysis by DNA arrays and sequencing approaches

- basics in human genetics and association of genetic variation with phenotypic traits such as disease susceptibility
- detection and functional analysis of genetic variation (coding and non-coding variants)
- techniques for proteome analyses and their limitations when applied to biomedical problems
- techniques for metabolome analyses, limitations encountered in the analysis of body fluids
- approaches for the analysis and visualization of complex data.

The lecture Clinical Studies (1 SWS)
- exemplifies how a study protocol is developed
- provides definitions of study inherent activities
- explains the differences between the different study designs and their advantages and limitations
- covers legal and ethical aspects that need to be considered when human subjects are studied
- outlines dissemination strategies of scientific results and their use for guideline development
- covers standardization of literature search strategies, publications and authorship
- introduces basics in quality management and evidence based medicine

Intended Learning Outcomes:
The participants will be able to understand and evaluate modern analytical techniques that are designed for parallel analyses of biological samples. They will be able to judge the advantages and disadvantages of these techniques and have an advanced understanding of the opportunities and challenges, possibilities, drawbacks and limitations of existing techniques and experimental systems. This will include some basic knowledge of biological model organisms that are employed in nutrition research as well as a first idea of what it takes to perform a study on human subjects. They will be capable to distinguish between the various study designs as well as to evaluate the degree of scientific evidence that can be derived.
The students will be aware of legal implications of the work on animals and humans. They will be able to compile all necessary documents for initiating a clinical study as well as to write publications based on currently accepted standards. Concomitantly, the students will also learn the meaning and correct use of technical terms that are inherent to the various scientific areas.

Teaching and Learning Methods:
The module uses lectures to familiarize the students with the materials and concepts. The PowerPoint presentations include data from original publications for discussions as well as recaps. Exercises will be used to strengthen the students use of the correct technical wording.
Templates will be used for discussion to provide knowledge on study protocol development and study application with relevant authorities and the ethical commission.

Media:
PowerPoint presentations, use of topical publications, white board. Contents of teaching will be exemplified with case studies; computer work supports their application.

Reading List:
Basis for the development of clinical studies are legal tests as the „Good Clinical Practice” – guideline.

https://ec.europa.eu/health//sites/health/files/files/eudralex/vol-10/3cc1aen_en.pdf

Responsible for Module:
Stolz, Jürgen; PD Dr. rer. nat. habil.

Courses (Type of course, Weekly hours per semester), Instructor:
Clinical Studies (Vorlesung, 1 SWS)
Skurk T [L], Brandl B, Skurk T

VL Research Methods 1 (Vorlesung, 2 SWS)
Stolz J [L], Bader B, Ludwig C, Spanier B, Stolz J, Witting M
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3205: Integrated Lab-Course | Integrated Lab-Course [ILC]

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**Language:** English	**Duration:** two semesters	**Frequency:** winter/summer semester
Credits:* 10	**Total Hours:** 300	**Self-study Hours:** 180	**Contact Hours:** 120

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
In total, the students participate in 13 practical courses. Each practical course starts with a colloquium in which the lecturer confirms that students have acquired the theoretical background to conduct the lab work in a safe manner. Students that do not fulfill this safety requirement cannot not participate in the course and can repeat the course on another day. Students are required to protocol the experimental steps during the course. For this purpose, each student will have a personal lab notebook. Based on their notes and the data collected, students generate a protocol of each lab course. At the start of the lab course, all students receive instructions in the writing of experimental lab protocols and receive a written guideline. Lecturers evaluate and grade the protocols in due time, and provide criticism and recommendations to the students. The grading of the protocol is based on the knowledge in the colloquium and hands-on performance of students during the lab course (20%) and the quality of the lab protocol (80%).

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Principles of laboratory safety and good laboratory practice; basics in physics and biochemistry; basics innutrition and food science, basic scientific writing skills.

Content:
Students acquire practical knowledge in a broad spectrum of experimental methods applied in research laboratories for nutrition and food science and in biomedical research:
A. Western blot analysis (LS Ernährungsmedizin, Hauner)
B. Mycotoxins in the food chain (LS Tierhygiene, komm. Langosch)
C. Neurogastroenterology (LS Humanbiologie, Schemann)
D. Flow cytometry for cell cycle studies (LS Ernährung und Immunologie, Haller)
E. Electrophoretic mobility shif assay (EMSA) (Professur Pädiatrische Ernährungsmedizin, Witt)

F. Isolation, identification and sensory evaluation of volatiles (LS Allgemeine Lebensmitteltechnologie, Engel)
G. Functional genomics in animals (LS Tierzucht, Fries)
H. Analysis of substances in beer and hop (LS Analytische Lebensmittelchemie, Rychlik)
I. Behavioral analysis and anatomy of brain and gut in the Drosophila model (Professur für Neuronale Kontrolle des Metabolismus, Grunwald Kadow)
J. LC-MS-Analysis of plant extracts (LS Biotechnologie der Naturstoffe, Schwab)
K. Investigation of peptide transporters (LS Ernährungsphysiologie, Daniel)
L. Tumormetastasis in mouse models (Experimentelle Onkologie und Therapieforschung, Krüger)
M. Mitochondrial respiration (LS Molekulare Ernährungsmedizin, Klingenspor)

Intended Learning Outcomes:
After successful completion students know a broad spectrum of experimental methods applied in experimental nutrition and food sciences and biomedical research. They are familiar with the theoretical background, technical details and potential pitfalls of these methods, and have first hands-on experience in their application. Students are able to generate laboratory protocols of their experimental work, documenting data acquisition, processing and analysis. They can evaluate results obtained in a self-contained manner. Students understandthe principles of experimental design and apply suitable methods in the framework of a research project.

Teaching and Learning Methods:
For each individual lab course, students mustdownload and study the specificlab instructions from Moodle in advance. Students must read and understand these lab instructions before they attend the practical course. In particular, they need to attend the safety instructions. Practical training in laboratory skills and techniques takes place in small groupsduring the course

Media:
Experimental instructions will be made available onMoodle.

Reading List:
In their lab instructions, lecturers specify text books and other literature sources required to prepare for the course.

Responsible for Module:
Klingenspor, Martin; Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
Integrated lab-course I (Übung, 8 SWS)
Bader B, Ewers M, Fromme T, Grunwald I, Hoffmann T, Klingenspor M, Krüger A, Li Z, Oeckl J, Reil G, Rychlik M, Schaten S, Schmöller I, Spanier B, Strickland B, Wurmser C
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3204: Recent Topics | Recent Topics [RT]

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**Language:** English	**Duration:** two semesters	**Frequency:** winter/summer semester
Credits:* 6	**Total Hours:** 180	**Self-study Hours:** 120	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The students will write scientific abstracts on one of the topics presented in the module(written and graphical abstracts, one page each). The topics will be randomly assigned to the students at the end of the summer term. Their task is to search and select recently published work from peer-reviewed journals for their abstracts. Ideally, they identify papers with opposing opinions or conflicting results / conclusions. In their abstract they provide a short introduction to the topic highlighting the research goal, describe the applied experimental approaches and methods, present the main results of the selected publications with a focus on novelty aspects, and discuss and interpret the relevance of these findings in the context of state-of-the-art in nutrition and biomedicine. Distinct guidelines for the abstracts are provided determining format, length, number of characters, requirements for figures and tables and references. Moreover, the catalogue of criteria for the assessment of the abstracts by the examiner are delivered to the students prior to assignment of the essay. The abstracts must be submitted within 4 months after assignment of the topic. The abstracts must be delivered in electronic format (PDF) and as a hardcopy. A new topic will be assigned if the student fails to meet this deadline.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
No prerequisites. Participation in the examination requires that students have passed the module Basics in Nutrition and Food

Content:
The lecture communicates the relevance of interdisciplinary knowledge in the area of nutrition and biomedical research. Students are exposed to a selection of current research topics. In preparation of each lecture they are provided with original research articles and reviews dealing with the topic of the day. The students gain practical experience in the evaluation and discussion of

scientific matters with experts in nutrition and biomedicine. Original papers addressing most recent developments in nutritional biomedicine research are discussed and evaluated.

Intended Learning Outcomes:
Students have gained insight into current research topics in nutrition science and biomedical research at the TUM campus and beyond (external guest lecturers). They can apply their abilities in reading and understanding of original research papers as well as in the critical assessment of data. They can discuss and evaluate research results together with their peers. In a self-contained manner, they identify unsolved scientific questions and can outline new research ideas. They are able to apply this knowledge in short scientific abstracts. In an abstract writing exercise the students have improved their proficiency to solve a scholarly complex task by applying scientific methods independently based on the knowledge and skills acquired in the course of their master study course Nutrition and Biomedicine.

Teaching and Learning Methods:
Lectures with subsequent discussions

Media:
- PowerPoint presentations
- Review articles and original research papers provided beforehand on Moodle

Reading List:
Topics of this module change annually, scientific literature is individually appointed to each student.

Responsible for Module:
Martin Klingenspor mk@tum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Recent Topics I (Vorlesung, 2 SWS)
Annahazi A, Ecker J, Kießling S, Klingenspor M, Rath E, Schwab W, Traidl-Hoffmann C, Uhlenhaut N

Recent Topics II (Vorlesung, 2 SWS)
Klingenspor M [L], Deline M, Ewers M, Greulich F, Grunwald I, Keppler S, Klingenspor M, Li Y, Metwaly A, Omer H, Stark T, Uhlenhaut N, Zehn D
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3235: Advanced Metabolism | Advanced Metabolism [Adv. Metabolism]

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** summer semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 105	**Contact Hours:** 45

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Written exam (120 min). In the exam the students have to demonstrate that they have achieved a general understanding of various anabolic and catabolic processes as well as their regulation. The students should be able to outline complex metabolic pathways and logically connect them to the central pathways presented in the module Basics Nutrition and Food. The students will be able to elaborate on various mechanisms that control physiological processes and analyse pathophysiological situations.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
It is essential that the students have previously visited the module Basics Nutrition and Food. Many of the materials presented in Advanced Metabolismbuild upon and logically connect to the contents of the module Basics Nutrition and Food.

Content:
The aspects covered in this lecture will include
biosynthesis and degradation of fatty acids, phospholipids, phospholipid-derived hormones
biosynthesis of sphingolipids and sterols
degradation of ethanol, sugar alcohols and the carbohydrates fructose, galactose and lactose
generation of lactose, glycolipids, proteoglycans and glycoproteins
protein synthesis and degradation, oxidation of amino acids, amino acids as metabolic precursors
hormones and the regulation of physiological processes
classical hormones originating from the hypothalamus, pituitary gland, thyroid gland, adrenal gland
hormones originating from the gastro-intestinal tract, adipose tissue and the musculature
physiology and nutritional relevance of growth hormones

Intended Learning Outcomes:
In the lecture Advanced Metabolism,the students will understandthe various levels of metabolic regulation processes and of inter-organ metabolism. This includes an in-depth understanding of biological signal transduction processes that are triggered by hormones that are produced in many different tissues and have a plethora of diverse consequences on human physiology. After successful participation the students will also appreciate the complexity of chemical reactions that constitute human metabolism, such as the biosynthesis of cholesterol, triglycerides and membrane lipids. They will understand in detail how dietary carbohydrates other than glucose are metabolized and how their carbon skeletons are introduced into central biochemical pathways. The students will understand that carbohydrates have additional functions such as building materials in the extracellular matrix or in the synthesis of glycoproteins and glycolipids. Altogether, the lecture has many links to Basics Nutrition and Foodbut brings the participants to a higher level of complexity and understanding.

Teaching and Learning Methods:
The main body of the module consists of PowerPoint presentations. The lectures will include time for questions to clarify or deepen individual aspects.

Media:
PowerPoint presentations.

Reading List:
Jeremy M. Berg, Lubert Stryer, John L. Tymoczko and Gregory J. Gatto: Biochemistry (8thedition, 2015)Stipanuk, MH and Caudill, MA: Biochemical, Physiological, and Molecular Aspects of Human Nutrition. Elsevier/Saunders, 2013.Bender, David A: Introduction to Nutrition and Metabolism, Boca Raton: CRC Press, 2014.

Responsible for Module:
Jürgen Stolz nutrition@tum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Vorlesung Advanced Metabolism (Vorlesung, 3 SWS)
Uhlenhaut N [L], Scheundel R, Spanier B, Uhlenhaut N
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3226: Basics in Computational Biology | Basics in Computational Biology

Version of module description: Gültig ab summerterm 2018

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** summer semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 105	**Contact Hours:** 45

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The learning outcome will be verified in a written exam (90 min) where the student has to demonstrate that she/he knows the appropriate tools to address bioinformatics problems, can apply and combine these web-based analysis tools to solve the respective problems, and can also interpret the results delivered by these tools. Students may use their lab notebooks to solve the problems in the exam. For example, students may be asked to download specific gene sequences from online databases, generate alignments, identify identity and similarity, find cleavage sites for restriction enzymes, select primer pairs for PCR experiments, develop cloning strategies, or construct phylogenetic trees using a set of protein sequences and interpret the results obtained.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
none

Content:
Public databases, open source and commercial software for the analysis of sequences related to nutritional biomedicine and biological sciences. Topics: Genomes, sequence archives, alignments, polymerase chain reaction, cloning, molecular phylogeny, primary structures of proteins, functional domains und 3D-structures, promoter analysis, polymorphisms.

Intended Learning Outcomes:
Students have acquired basic skills in biological computing. At the end of the module they can apply basic knowledge in bioinformatics to solve new problems related to nutrition science and biomedical research. They are able to use their knowledge to solve practical problems occurring in everyday life of a molecular biologist in the laboratory. Students will be able to run the required

software on their own computer, and can apply the software in their research internship and master thesis.

Teaching and Learning Methods:
The lecture provides the theoretical basics and hands-on instructions to apply selected methods in computational biology. Students write lab notebooks to protocol step-by-step procedures in computational biology. To recapitulate the practical parts, exercise sheets are distributed regularly. The correct answers will be released on the learning platform and discussed in the course. Exercises in Computational Biology are offered to solve the exercise sheets with support of student tutors. For the successful completion of exercises, self-study hours are required to get familiar with web-based bioinformatics tools and to explore different analytical options without social pressure.

Media:
Presentations with PowerPoint, exercise sheets, web links available on Moodle platform.

Reading List:
The lecturer recommends textbooks covering molecular genetics, biochemistry and evolutionary biology at start of term. Initial sequencing and analysis of the human genome (409;860-921; Nature 2001) Initial sequencing and comparative analysis of the mouse genome (420;520-562; Nature 2002)

Responsible for Module:
Klingenspor, Martin; Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
Basics in Computational Biology (Vorlesung mit integrierten Übungen, 3 SWS)
Fromme T, Klingenspor M, Oeckl J, Stolz J
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3233: Food and Health | Food and Health

Version of module description: Gültig ab winterterm 2021/22

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** summer semester
Credits:* 8	**Total Hours:** 240	**Self-study Hours:** 150	**Contact Hours:** 90

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
A written exam (120 min, open questions and multiple choice) will assess all the skills that the students have obtained in the module. The students have to show detailed knowledge about the functionality of food, food components and different forms of nutrition on the human health and nutrition-related diseases. For the exam, no supporting material is allowed.
Additionally, the students have to give an ungraded oral presentation (PowerPoint) during the seminar, reporting the results of the group work. In the presentation and the following debate, the students must demonstrate that they are able to investigate independently the legal and scientific substantiation of a new functional or medical food by literature research. They have to show, that they are able to defend their results in a subsequent discussion.

Repeat Examination:
End of Semester

(Recommended) Prerequisites:
Basic knowledge of the biofunctionality of food and food components as well as nutritional science.

Content:
The lecture series “Food and Health” gives an overview about functional-, medical- and novel food. It deals with the interplay of food and food components like polyphenols, antioxidants, folates and different types of diets (e.g. ketogenic diet, vegan lifestyle) with health benefits and nutrition-related diseases. Additionally, biomedical background knowledge will be taught. The main focus is on how functionality can be proven by clinical studies.
The seminar, which consists of a practical exercise (teamwork), deepens the knowledge communicated in the lecture series. Here, the students have to hypothetically develop a new functional- or medical food and have to go through the regulations on the scientific requirements for health claims related to e.g. oxidative damage, cardiovascular health, immune system or the areas of the gastrointestinal tract.

Intended Learning Outcomes:
After successful completion of the module, students will comprehend the effects of food, bioactive food components and different forms of nutrition on the human health and the development, prevention or treatment of nutrition-related diseases. At the end of the module students are able to evaluate clinical studies and put them into a scientific context. Additionally, students are able to independently acquire information needed to apply for health claims. They can present the results of their investigation in a concise way to their peers and defend their point of view in a rigorous scientific debate.

Teaching and Learning Methods:
The theoretical part of the course will be taught in the lecture series. In the seminar, students will work in teams (4-5 students) to deepen their knowledge by developing a new functional or medical food on their own. By independent literature research students have to show the scientific substantiation necessary to obtain a health claim or get approval for the European market.

Media:
PowerPoint presentations; original research papers and reviews

Reading List:
Register of nutrition and health claims made on foods (European Commission).
Various scientific Opinions on the substantiation of health claims related to various food(s)/food constituents(s) (published by EFSA).

Responsible for Module:
Haller, Dirk; Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
Food and Health (Seminar) (Seminar, 2 SWS)
Haller D [L], Haller D, Aguanno D, Schmöller I

Food and Health (Lecture) (Vorlesung, 4 SWS)
Haller D [L], Haller D, Schmöller I, Blum-Sperisen S, Klingenspor M, Stolz J, Hauner J, Skurk T, Bader B, Oeckl J, Uhlenhaut N
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3207: Nutrition and Microbe-Host Interactions | Nutrition and Microbe-Host Interactions

Version of module description: Gültig ab winterterm 2021/22

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** summer semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The examination requirements of the module "Nutrition and Mirobe-host Interactions" consist of a written examination (90 min, open questions and multiple choice). The examination can be based on any subject of the lectures and the corresponding seminar. The written exam will assess whether the student has attained an advanced level of knowledge about the diversity and functions of the mammalian gut microbial ecosystem and the role of dietary and microbial triggers in regulation of host health. No supporting material is allowed. The seminar (course work), consisting of theoretical input and practical exercises (teamwork), pertains to the sequence-based analysis of microbial communities.

Repeat Examination:
End of Semester

(Recommended) Prerequisites:
Basic knowledge in physiology, microbiology, bio functionality and immunology.

Content:
This lecture and seminar series teaches deep insight into the diversity and functions of the mammalian gut microbial ecosystem (intestinal microbiota) in close interaction with the host and with dietary factors. Particular attention will be drawn to the development of the microbiota throughout life as well as underlying cross-talk mechanisms with the mucosal immune system with a particular focus on chronic inflammatory disorders, enteric infections and metabolic disorders.

Intended Learning Outcomes:
After successful participation in the lecture and the seminar, students comprehend the diversity and functions of the mammalian gut microbial ecosystem and are able to estimate the role of

dietary and microbial triggers in regulation of host health. They are able to use this knowledge to critically assess recent findings.

Teaching and Learning Methods:
Lecture (reiteration and extension of topics of the lecture by studying independently), seminar (teamwork, practical implementation of theoretical knowledge)

Media:

Reading List:
Microbial Inhabitants of Humans: Their Ecology and Role in Health and Disease. Cambridge University Press, 2005, ISBN: 0 521 84158 5

Responsible for Module:
Haller, Dirk; Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
Microbe-host interaction and nutrition in health and disease (seminar) (Seminar, 2 SWS)
Haller D [L], Coleman O, Haller D, Metwaly A, Schmöller I

Microbe-host interaction and nutrition in health and disease (lecture) (Vorlesung, 2 SWS)
Haller D [L], Haller D, Schmöller I
For further information in this module, please click campus.tum.de or here.

Master's Thesis | Master's Thesis

Module Description

WZ3212: Master's Thesis | Master's Thesis [THESIS]

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter/summer semester
Credits:* 30	**Total Hours:** 900	**Self-study Hours:** 750	**Contact Hours:** 150

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The student actively participates in the examination colloquium. She/he writes a master thesis (50-70 pages), which
must be submitted within 6 months after start of the THESIS module. The master thesis is graded by the supervisor,
taking into account in equal parts theoretical and hands-on practical skills as well as quality of the written thesis.

Repeat Examination:

(Recommended) Prerequisites:
Work on the master’s thesis should commence after successful completion of all module examinations.

Content:
Research conducted by the institutions hosting our master students deal with nutrition-related science in different
life science disciplines, including for example biochemistry, molecular biology, nutrition physiology, metabolism,
microbiology, food chemistry, nutrition medicine, genetics, clinical studies and epidemiology. Within this framework,
the supervisor assigns the student to a selected aspect of ongoing research in the host institution.

Intended Learning Outcomes:
After successful completion, the theoretical and practical training received in the THESIS module enables our
students to investigate defined scientific questions on their own, with support from an experienced supervisor.
Exposed to a scientific question, they can analyze and evaluate state-of-the art knowledge, identify possible
solutions and answers, and subsequently plan and conduct experiments / studies addressing the scientific question
with appropriate research methods and techniques. The students know the most important facts and theories
related to their research topic and can critically discuss and evaluate their own results in relation to the state-of-theart
knowledge. In conducting their art of science they follow the rules of good scientific practice.

Teaching and Learning Methods:
Theoretical and practical training by a scientific supervisor of the host institution. The master student is guided in
comprehensive analyses and study of the available literature related to the research topic, establishment of a work
plan, experimental design, acquirement of hands-on skills in specific methodology and techniques, documentation
and evaluation of data, scientific writing, description and critical discussion of results in relation to work published in
the field. At start, the student and the scientific supervisor jointly develop the work plan of the master thesis and
define goals achievable within the given timeframe of six months. In the course of the master thesis, pending
results, the student and the supervisor mutually agree to adjust this work plan, accordingly. Students actively
participate in the examination colloquium, which takes place in regular intervals and can be offered in different
formats (seminar, lab meeting, individual discussions), following the conditions at different institutions. In the
colloquium, students get together with scientists at different levels of qualification to present progress reports and
discuss with their peers and supervisors. In this forum, students train to talk about their research project, explain the
question and goals, discuss experimental plans, present results and problems, and elaborate on the outline and
writing of their thesis.

Media:

Reading List:

Responsible for Module:
Martin Klingenspor mk@tum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Practical Course
Master thesis
8 SWS

Seminar/Examination Colloquium
Progress reports
2 SWS
Lecturers approved by the examination committee of the Study Program Division Nutrition.
For further information in this module, please click campus.tum.de or here.

Elective Courses | Wahlmodule

Module Description

WZ3061: Applied Food Law | Applied Food Law

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**Language:** English	**Duration:** two semesters	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The oral examination takes 20 min for each student and will take place in groups of 2-3 students. The students apply their knowledge by evaluating product samples presented to them and discussing the related legal questions. The legal texts can be used.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Food law lecture in B.Sc. study recommended, but no prerequisite

Content:
Law of the EU: Principles, general food law, jurisdiction, categories of products, use of substances, food safety, novel food, GMOs, labeling, consumer information, responsibility, advertising, health and nutrition claims. Independent working with law texts, understanding of the principles of food law.

Intended Learning Outcomes:
At the end of the module, students are able to apply the principles of food law. Especially, they are able to evaluate the use of ingredients in food and the advertising for foodstuffs. The students examine the various legal prerequisites for the marketing of different categories of food, e.g. novel food, food supplements and eco food, including their specific labelling requirements.

Teaching and Learning Methods:
The module consists of a lecture, including expert input

Media:
Presentations with PowerPoint

Reading List:

Responsible for Module:
Meisterernst, Andreas; Hon.-Prof.

Courses (Type of course, Weekly hours per semester), Instructor:
Applied Food Law (Vorlesung, 2 SWS)
Meisterernst A
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3097: Basics in Chronobiology | Basics in Chronobiology

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**Language:** English	**Duration:** two semesters	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The examination consists of a written exam at the end of the summer semester (lecture) and a presentation during the winter semester (seminar).In the written exam, students demonstrate their ability to remember the molecular components, the structure and organization of the circadian system including its functions. Important steps, figures and key findings in circadian research should be ranked chronologically and according to relevance. Students show that they understand the functional interrelation of the components of the circadian system and that they are able to transfer their knowledge to exemplary situations / pathologies. The written examination comprises 90 minutes; the questions asked include open questions as well as multiple choice tests.

During the seminar, the knowledge acquired by the lecture is applied on a specific topic of Chronobiology and liked to a pathology / mutation with the use of a scientific study. The examination during the winter semester (seminar) consists of a group presentation (35 min), a subsequent discussion (10 min) and preparation of an abstract. Additionally, a qualified peer-feedback is mandatory as coursework. By the delivery of the presentation students show (I) that they are able to illustrate the interrelation between circadian functions and pathologies with the help of scientific studies and (II) that they are able to analyze and evaluate relevant scientific literature. Additionally, students demonstrate their ability to present a subject to an audience and to stand a discussion about the presented content. By the written abstract, the ability is tested to summarize the major facts and the conclusion of a presentation in clear and concise manner.The final grade is an average grade from the written exam (70%) and the seminar (30%).Further informationPrerequisites (recommended)MediaPower Point Presentation, MoodleReading ListCircadian Physiology; Roberto Refinetti, PhD.; CRC Press: ISBN 9780849322334
Module

Repeat Examination:

(Recommended) Prerequisites:

Content:
The module disseminates the basics in Chronobiology. The circadian system in organisms is presented with a focus on different circadian clocks in various tissues and organs. Students learn how these periferal systems orchestrate the central clock in the brain and how disruption of the system leads to various diseases and pathologies. Based on this knowledge, students develop an understanding of circadian-related pathologies. Using selected examples, the impact of circadian disturbances, e.g. during Jetlag or shift work, on distinct pathologies is exemplified. By applying and transferring the knowledge acquired to a circadian science-associated question, the relevance is illustrated and evaluated.
• History of the science of Chronobiology• Properties of biological oscillators
• Hierarchy of the circadian system: the central circadian clock, peripheral circadian clocks and their synchronization
• Molecular mechanisms of the circadian clock
• Signals of the circadian system
• Disruption of the circadian system and associated diseases
• Analysis of scientific studies with regard to study design
• Presentation of scientific topics related to circadian science.

Intended Learning Outcomes:
Upon completion of the module, students are able to:
• memorize important steps, figures and key findings in circadian research and rank them chronologically and according to relevance.
• describe the molecular components, the structure and organization of the circadian system as well as its functions.
• describe the functional interrelation of the components of the circadian system.
• recognize and characterize the basic principles of circadian response-regulation.
• recognize the circadian aspects of acute diseases.
• analyze and evaluate scientific studies with regard to study design.
• prepare and present the interrelation of circadian functions, given disease and selected pathologies or mouse phenotypes.
• evaluate peer presentations based on given criteria.

Teaching and Learning Methods:
The lecture disseminates basic knowledge on the circadian system and the interrelation of the different components, under normal and diseased conditions or in mutants. The lecture is given with a teacher-centered approach. During the seminar, the knowledge acquired by the lecture is applied on a specific topic and linked to a disease pathology with the use of a scientific study. The seminar consists of a few attendance periods which serve to introduce the task/topic and to organize the seminar and extensive self-studying phases, in which students gather the topic and prepare a presentation and an abstract. Finally, group presentations are held and mutual feedback is given to practice the analysis and evaluation of scientific topics.

Media:
Power Point Presentation, Moodle

Reading List:
Circadian Physiology; Roberto Refinetti, PhD.; CRC Press: ISBN 9780849322334

Responsible for Module:
Dirk Haller dirk.haller@tum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Basics in Chronobiology (Seminar, 2 SWS)
Haller D [L], Kießling S, Schmöller I

Basics in Chronobiology (Vorlesung, 2 SWS)
Haller D [L], Kießling S, Schmöller I
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3098: Basics of Metabolomics | Basics of Metabolomics

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** summer semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 105	**Contact Hours:** 45

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The examination consists of an oral presentation of 3-5 minutes (elevator pitch) (60% of final mark) and submission
of an maximum 6 page long abstract (40% of final mark) on the group work focusing on a specific problem.

Repeat Examination:
End of Semester

(Recommended) Prerequisites:
- basic knowledge of biochemistry
- basic statistical knowledge, e.g. t-test, etc.
- basic laboratory skills

Content:
Biochemical, analytical and data analytical basics of metabolomics are illustrated using relevant examples.
The following individual topics are covered:

biochemical basics
- Definition of systems biology and its disciplines (omics)
- Definition and aims of metabolomics and its role in systems biology
- relation of metabolomics to other omics-technologies

analytical basics
- basics of mass spectrometry (MS) and coupling of chromatographic methods
- application of MS in metabolomics
- basics of nuclear magnetic resonance (NMR) and its application in metabolomics

Metabolomics experiments
- experimental design
- sample preparation
- implementation of measurements
- quality control
- metabolite identification

data analytical basics
- basic statistical evaluation, e.g. HCA, PCA, PLS
- bioinformatic approaches

relevant applications
- in medicine, nutrition, food chemistry
- to model organisms
- in plant research and biotechnology

Intended Learning Outcomes:
The students are able to define the term of systems biology and to state its different disciplines. Furthermore, they know different omics technologies and can separate them from each other. The students are able to compare analytical methods used in metabolomics based on their advantages and
disadvantages and select a fitting method to solve a specific question. Moreover, they are able to apply basic
statistical data analysis methods on a given dataset and interpret the results in biochemical context. Additionally,
students are competent to perform problem-based literature research in relevant media.
On the basis of selected problems, students are able to question the current status of metabolomic research and
state possibilities for improvement.
They can draft plans and execution of metabolomics experiments and are able to comment on them.

Teaching and Learning Methods:
The module consists of a lecture, including expert input, single- and group work, case studies and student
presentations.

Media:
Script; slides

Reading List:
Metabolomics in Practice - Successful Strategies to Generate and Analyze Metabolic Data, 2013, 1. Auflage,

Wiley-VCH, ISBN: 9783527330898
- The Handbook of Metabonomics and Metabolomics, 2007, 1. Auflage, Elsevier, ISBN: 978-0-444-52841-4
- verschieden Original- und Übersichtsarbeiten

Responsible for Module:
Witting, Michael; Dr. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
Basics of Metabolomics (Vorlesung, 3 SWS)
Witting M
For further information in this module, please click campus.tum.de or here.

Module Description

WZ0219: Chemosensory Perception | Chemosensory Perception

Version of module description: Gültig ab winterterm 2021/22

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 6	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
In the written examination (90 min) students demonstrate by answering questions without helping material the theoretical knowledge of the biology of taste, smell, and chemestetic perception as well as extra-sensory processes involving chemoreceptors. To answer the questions, own wordings are necessary and sketches of biomolecules and signaling pathways.
The successful preparation and presentation of a publication in the seminar is another requirement for passing the examination.

Repeat Examination:
End of Semester

(Recommended) Prerequisites:
Basic knowledge in molecular biology, biochemistry, cell biology and physiology is required.

Content:
The basics of aroma- and taste recognition, evaluation, and analysis on a molecular level are communicated.
In detail, the following topics are discussed:- basics of human taste recognition (molecules,anatomy, morphology and function of gustatory and olfactory structures, receptors, genetic variability and its influence on sensory sensitivity, establishment of preferences and aversions, the connection between sensory perception and food preferences, extra-sensory functions of taste and odorant receptors, oral somatosensory perception, basic taste modalities, signal transduction).

Intended Learning Outcomes:
Upon completion of the module, students understand the molecular bases of taste and smell perception. The students will be able to separate those percepts from other chemosensory cues such as chemesthesis or pheromone detection. Moreover, students are familiar with the putative

physiological relevance of extra-sensory chemosensory stimuli. The importance of the chemical senses for food preferences and consumption is known.

Teaching and Learning Methods:
The content of the lecture is presented by means of powerpoint presentations. There will be practical demonstrations on taste and smell that accompany the lecture. Students are motivated to broaden their knowledge by reading complementary literature relevant to the topic.

The seminar will give the students the chance to follow the rapid development of chemosensory research directly by reading and discussing recent publications. Students will choose a paper and critically present it to their peers. Additional literature research for a solid introduction into the field of research is requested. A handout summarizing the key findings of the presentation should be prepared. The fellow students are motivated to discuss the presentations. This will deepen the understanding of the contents presented during the lecture and enable the students to critically evaluate novel results.

Media:
PowerPoint presentations will be used. The content of the lectures will be made available for download as pdf-files.

Reading List:

Responsible for Module:
Behrens, Maik; Dr. rer. nat. habil.

Courses (Type of course, Weekly hours per semester), Instructor:
Chemosensory Perception (Seminar, 2 SWS)
Behrens M

Chemosensory Perception (Vorlesung, 2 SWS)
Behrens M
For further information in this module, please click campus.tum.de or here.

Module Description

WZ0406: Cell Membrane Lipids | Cell Membrane Lipids [Cell Membrane Lipids]

Version of module description: Gültig ab winterterm 2020/21

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 3	**Total Hours:** 90	**Self-study Hours:** 60	**Contact Hours:** 30

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The module examination consists of a 10-min oral presentation and a following 15-min discussion of a selected publication at the last day of the block. The overall performance of the student will be graded by the lecturer. 50% of the grade depends on the quality of the presentation and the remaining 50% on the discussion part. The module is passed, when the student has actively participated in the lecture and seminar/journal club, and the grade of the oral presentation including discussion is at least 4.0.

Repeat Examination:
End of Semester

(Recommended) Prerequisites:
Basic knowledge on nutrition and metabolism are obligatory.

Content:
Major topics explained and discussed will be:
• The nomenclature of lipids
• The diversity of cell membrane lipids and their cell, tissue and organelle-specific occurrence, i.e. phospholipids and cholesterol
• Nutritional sources of lipids and dietary lipid composition
• Lipid synthesis and metabolism pathways
• Transcriptional, translational and post-translational regulation of lipid synthesis
• Influence of dietary fatty acids, i.e. n-3 fatty acids, on cell membrane lipid composition
• Physical and chemical properties of lipids
• The link between membrane lipid composition and cellular function

• Pathophysiological relevance of membrane lipids
• Key techniques suitable for robust lipid analyses (“Lipidomics”)

Intended Learning Outcomes:
After successful completion of the module students are familiar with the diversity of cell membrane lipids originating from various pathways. Further, they understand the influence of dietary fatty acids on membrane lipid composition and their physiological and patho-physiological relevance. Through discussion of recent papers students are able to evaluate the quality of scientific research papers in the nutrition and lipid metabolism fields, and know basics necessary to develop reasonable and structured biological research strategies and experiments.

Teaching and Learning Methods:
The module is organized as one block in one week that will be hosted via a Video (Zoom) Conference.
At the beginning of the day a lecture will be given on the topics summarized above. It will be presented as PowerPoint presentation featuring many examples, pictures and schemes of own research studies. Open questions can be discussed during and after the lecture.
In the journal club, specific and related papers will be provided to the students before their scientific quality and biological relevance will be discussed with the whole group. Depending on the number of participants, students will work on the publications alone or in groups of two.
Finally, the knowledge gained in the journal club will be applied to create experimental research strategies for biological investigations.

Media:
Zoom, Pubmed, eJournals

Reading List:
Standard textbook on basics of lipids such as “Molecular biology of the cell” by Bruce Alberts (5th or 6th edition).
Various journal articles will be made available during the course.

Responsible for Module:
Josef Ecker, josef.ecker@tum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Cell Membrane Lipids (Vorlesung, 1 SWS)
Ecker J

Cell Membrane Lipids (Seminar, 1 SWS)
Ecker J
For further information in this module, please click campus.tum.de or here.

Module Description

POL67001: Digital Sustainability Transformation of, by and for the TUM | Digital Sustainability Transformation of, by and for the TUM

Version of module description: Gültig ab summerterm 2021

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 3	**Total Hours:** 90	**Self-study Hours:** 60	**Contact Hours:** 30

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Students have to actively contribute to the lecture by participating in the discussions and writing two policy briefs of ~5 pages each. Each policy brief has to focus on a different thematic area of the lecture (see below). Each policy brief counts 50% to the final grade.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
This course is aimed at all students enrolled in a Master program at the TUM; it is thus designed as an interdisciplinary venue which brings together a range of scientific perspectives. No specific prior knowledge is required. We are highly encouraging students from other schools and departements at TUM to participate in the lecture series in order to ensure a diverse, interdisciplinary approach.

Content:
Sustainability and digitization are two of the key challenges of our time. Both transformations must be actively shaped, whereby it is crucial to think "sustainability" and "digitization" not only as two separate megatrends but examine their intersections and interplays. Universities like the TUM have a central role to play in shaping the digital and sustainable transformation: they are learning venues for sustainable/digital development with the goal to educate people; they serve as fora for public discussions and as hubs to connect important stakeholders; they are important incubators for innovations; and they (should) also function as role models for the society.

This course consists of a virtual lecture series that examines the question of digitainable transformations across four issue areas: 1) common good AI in smart cities, 2) intelligent sustainable mobility, 3) circular economy & smart waste management, and 4) green finance.
We will devote three session to each thematic area, and explore it from various angles including

participatory workshops, roundtables with experts from academia, stakeholders and/or political actors. Each session will be organized in cooperation with stakeholders from Munich and beyond in order to discuss the mutual opportunities and challenges of sustainability and digitization at various levels. While the focus will be on projects in Munich and Bavaria, topics will also be addressed at a national, supranational and global level.

Intended Learning Outcomes:
After successful participation in this course, students are able:
- to understand and to critically discuss key aspects linked to sustainable and digital transformations;
- to analyze how they can actively shape big transformations in their immidiate vicinity.

Teaching and Learning Methods:
The lecture combines (pre-recorded) videos and online presentations, with podcasts and interviews. To facilitate active participation with the content of the lectures, Q&A sessions, online discussions will be combined with offline workshops. Depending on the development of the Corona-pandemic, it is planned to hold 1/3 of the classes in person as participatory workshops, and 2/3 of the classes as online discussions.

Media:
The course is planned as a hybrid event combining online tools and in-person sessions (depending on the development of the Covid-19 pandemic). Depending on the development of the Corona-pandemic, it is planned to hold 1/3 of the classes in person as participatory workshops, and 2/3 of the classes as online discussions.

Reading List:
Sterling, St. et al. 2013. The Sustainable University. London: Routledge.
Filho, W. L. & P. Pace 2016. Teaching Education for Sustainable Development at University Level. Cham: Springer International.
Filho, W. L. et al. (eds.). 2019. Universities as Living Labs for Sustainable Development. Cham: Springer International.
Heinrichs, H. et al. (eds.). 2016. Sustainability Science. An Introduction. Cham: Springer International.

Responsible for Module:
Wurster, Stefan; Prof. Dr. rer. pol.

Courses (Type of course, Weekly hours per semester), Instructor:
(POL67000, POL67001) Digital Sustainability Transformation of, by and for the TUM (Ringvorlesung) (Seminar, 2 SWS)
Wurster S (Mohammed N), Siewert M
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3223: Design and Analysis of Experiments | Design and Analysis of Experiments

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The learning outcome from this module is evaluated based on a 30 minute oral group examination with two
examinees. Students demonstrate their abilities to discuss pros and cons of various experimental concepts in
relation to predefined scientific problems; to understand general statistical concepts; to understand concrete
statistical problems; to develop proper approaches for solving predefined statistical problems; to analyze given data
using the computer software R and suitable descriptive as well as inferential statistical approaches; to evaluate the
obtained statistical output in a correct manner; to communicate statistical information in comprehensible fashion
using proper terminology. Students may use a sheet of paper with personal notes as auxiliary means (1 sheet of
paper, max. page size DIN A4, double sided).

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Basics in statistics

Content:
Design of experiments: principles, randomization, statistical power and sample sizes, completely randomized

designs, block designs, factorial designs; Analysis of variance: prerequisites, analysis of residuals, contrasts, posthoc-test,
nonparametric alternatives, bootstrapping; Correlations: Pearson, Spearman, Kendall, partial correlation;
Linear Regression

Intended Learning Outcomes:
Upon successful completion of the module, students are able to understand pros and cons of various experimental
concepts, to apply suitable experimental designs in accordance to predefined scientific problems, to analyze
respective experimental data using suitable statistical methods and the software R, and to evaluate the obtained
statistical output in a correct manner.

Teaching and Learning Methods:
Lecture, group work, discussions, exercises, examples, demonstrations, computer hands-on training, student
presentations, homework, students' self-dependent study of relevant literature

Media:
The following media will be used as and when required:
Reader, (white)board, exercise sheets, PowerPoint, moodle online course

Reading List:
Collins C & Seeney F (1999): Statistical Experiment Design and Interpretation. Chichester etc. : Wiley
Crawley MJ (2005): Statistics - An Introduction using R. West Sussex : Wiley
Crawley MJ (2007): The R Book. West Sussex : Wiley
Field A & Hole G (2003): How to Design and Report Experiments. Los Angeles etc. : Sage
Field A, Miles J & Field Z (2012): Discovering Statistics using R. Los Angeles etc. : Sage
Hatzinger R, Hornik K & Nagel H (2011): R - Einführung durch angewandte Statistik. München etc. : Pearson Studium
Hinkelmann K & Kempthorne O (2008): Design and Analysis of Experiments. Volume 1 - Introduction to Experimental Design.
2nd ed. New York etc. : Wiley
Kirk RE (2013): Experimental Design. 4th ed. Thousand Oaks etc. : Sage
Rasch D, Pilz J, Verdooren R, Gebhardt A (2011): Optimal Experimental Design with R. Boca Raton etc. : CRC Press
Ryan TP (2007): Modern Experimental Design. New Jersey : Wiley
Ugarte MD et al. (2009): Probability and Statistics with R. Boca Raton : CRC Press

Responsible for Module:
Kurt Gedrich KGedrich@tum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Design and Analysis of Experiments (Vorlesung, 2 SWS)
Gedrich K [L], Gedrich K

Introduction to R (Übung, 1 SWS)
Gedrich K [L], Gedrich K

Design and Analysis of Experiments (Übung, 2 SWS)
Gedrich K [L], Gedrich K
For further information in this module, please click campus.tum.de or here.

Module Description

WZ2404: Introduction to Mammalian Cell Culture | Einführung in die Kultivierung von Säugetierzellen

Version of module description: Gültig ab winterterm 2011/12

Module Level: Master	**Language:** German/English	**Duration:** one semester	**Frequency:** winter/summer semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 75	**Contact Hours:** 75

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Time allowed (in min.): 40 oral and 150 written tests.
The manuscript for the internship serves as preparation for the internship. In addition to the practical course and lectures, seminars are held with the students in which they have to work out and present practical topics of the cultivation of mammalian cells using literature. 5 certificates (graded, 5 x 30 minutes) as well as two 20-minute presentations (graded) serve to test the theoretical skills learned in the lecture, seminar and practical course. Here students show whether they are able to structure the knowledge they have acquired and present the essential aspects. They should be able to describe and interpret the acquired information, combine it meaningfully and transfer it to similar situations. The overall grade of the module is determined by the results for the individual certificates and presentations, as well as the practical work.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Bachelor degree in biology or molecular biotechnology

Content:
The lectures will provide basic knowledge about the isolation, characterization and genetic manipulation of mammalian cells. Contents are among others: Sterile working, microscopy, culture conditions, establishment and conservation of cell lines and primary cultures, determination of cell numbers, transfection methods, isolation and expansion of cell clones, application and detection of marker genes. In the lecture of the practical course, especially the background and theoretical knowledge of the experiments carried out will be taught. In the course of the practical course, basic methods for practical work with mammalian cells are taught. In the corresponding seminar the students present relevant literature concerning cell culture.

Intended Learning Outcomes:
After participating in the module courses, students will have the basic theoretical understanding and expertise for the cultivation and genetic manipulation of mammalian cells. Furthermore, they have learned and practiced basic cell biological working techniques. They understand cell biological questions and working techniques and can apply the acquired knowledge to more in-depth questions.
Students have also developed problem-solving skills and gained insights into cell biology and cell biological problems.

Teaching and Learning Methods:
Type of event/teaching technique: Lecture, practical course, seminar Teaching method: Lecture; in practical course, instructional talks, demonstrations, experiments, partner work, discussion of results.
Learning activities: study of lecture notes, lecture notes, practical course script and literature; practice of laboratory skills and cell biological work techniques; cooperation with practical course partners; preparation of protocols and presentations.

Media:
Presentations using PowerPoint,
Internship script (downloadable lecture material) Publications on cell culture specific topics

Reading List:
There is no textbook available that covers all contents of this module. It is recommended as a basis or as a supplement: Sabine Schmitz; The Experimentator: Cell Culture; R. Ian Freshney: Culture of Animal Cells: A Manual of Basic Technique

Responsible for Module:
Angelika Schnieke (schnieke@wzw.tum.de)

Courses (Type of course, Weekly hours per semester), Instructor:
Einführung in die Kultivierung von Säugetierzellen (Zellkultur - Praktikum) (Praktikum, 3 SWS)
Schnieke A [L], Bauer B, Fischer K, Flisikowska T

Zellbiologische Fragestellungen (Zellkultur - Seminar) (Seminar, 2 SWS)
Schnieke A [L], Fischer K
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3214: Experimental Immunology and Pathology | Experimental Immunology and Pathology

Version of module description: Gültig ab winterterm 2020/21

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 75	**Contact Hours:** 75

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Aufgrund des Pandemiegeschehens wird die alternative Prüfungsform "unbeaufsichtigte schriftl. Fernprüfung" (WZ3214o) angeboten.

Students have to hand in 6 lab reports (appx. 20 pages) covering the topics presented in the lab course including
mouse dissection, histopathology, genotyping, immune phenotyping, gene expression analysis and microbiological
analysis. The students demonstrate with the reports that they have gained deeper knowledge and understanding of
the specific methodologies, lab equipment and measurement methodologies and can analyse data with the use of
appropriate software tool as well as statistics. They show that they are able to complete extensive laboratory tasks,
know how to evaluate and interpret data and results and identify possible sources of error.
In the written examination students demonstrate theoretical knowledge on the methodologies used in the lab and
underlying medical, biochemical and analytical processes by answering questions without helping material.
The final grade is an averaged grade from the written examinations (8.34 % each/ overall 50%) and from the lab
reports (8.34 % each/ overall 50%).

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Basic knowledge in immunology

Content:
The practical lab course demonstrates the use of an animal model of intestinal inflammation in biomedical research.
Starting with mouse dissection, different techniques and methodologies to analyze disease-associated alterations at
the organ- and cellular level are applied including: histopathology, genotyping, immune phenotyping, gene
expression analysis and microbiological analysis.

Intended Learning Outcomes:
Students acquire detailed and differentiated knowledge on the laboratory work with animal models of diseases and
are able to assess the possibilities and limits of these techniques. They apply relevant research methodologies and
are able to link scientific questions on disease outcomes to research technologies and immunological/ physiological
alterations.
Upon completion of the module, students have improved their practical laboratory working and scientific writing
skills.

Teaching and Learning Methods:
Within the module, students attend short lectures on the background of the methods used in the lab course, prior to
their practical work in the lab. Within the practical lab course the students work in teams of two students. Each part
of the internship is supervised individually.

Media:

Reading List:

Responsible for Module:
Haller, Dirk; Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
Experimental Immunology and Pathology (Übung, 5 SWS)
Haller D [L], Aguanno D, Coleman O, Kisling S, Krammel T, Metwaly A, Omer H, Rath E, Schmöller I, Schwamberger S

For further information in this module, please click campus.tum.de or here.

Module Description

WZ5050: Development of Starter Cultures | Entwicklung von Starterkulturen

Version of module description: Gültig ab winterterm 2017/18

Module Level: Master	**Language:** German	**Duration:** one semester	**Frequency:** summer semester
Credits:* 3	**Total Hours:** 150	**Self-study Hours:** 120	**Contact Hours:** 30

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Regelmäßige, aktive Teilnahme an der Vorlesung wird erwartet. Die in der Vorlesung zu erlernenden Sachkenntnisse und Kompetenzen werden durch eine mündliche Prüfung (20 min) geprüft. Hierbei demonstrieren die Studierenden, ob sie in der Lage sind, das erlernte Wissen zu strukturiert darzulegen und die wesentlichen Aspekte darzustellen. Die mündliche Prüfung beinhaltet Sach-, Verständnis-, und Transferfragen über alle Themen, die in der Vorlesung angesprochen und ausgeführt wurden. Die Studierenden sollen die erarbeiteten Informationen beschreiben, interpretieren, sinnvoll kombinieren und auf ähnliche Sachverhalte übertragen können. Hierbei dient die Foliensammlung nur als Grundlage. Prüfungsgegenstand ist das gesprochene Wort. Die mündliche Prüfung dient der Überprüfung der in der Vorlesung erlernten theoretischen Kompetenzen. Kreditpunkte werden für das erfolgreiche Ablegen der Modulprüfung vergeben.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
keine

Content:
Gegenstand des Moduls "Entwicklung von Starterkulturen" sind: Allgemeine Sicherheit und Anforderungen an Starterkulturen, Nachweis und Identifizierung von Starterstämmen, Analyse und Verfolgung der Mikrobiotadynamik in Lebensmittelfermentationen, Biochemie der Milchsäurebakterien, Stoffwechsel von Kohlenhydraten, Citrat, Malat, Aminosäuren, Bildung von Exopolysacchariden, Rolle der Bakteriophagen in fermentierten Lebensmitteln, Bakteriozine und weitere besondere Eigenschaften von Milchsäurebakterien und deren Bedeutung für die Anwendung in Lebensmitteln.

Intended Learning Outcomes:
Nach der erfolgreichen Teilnahme an diesem Modul besitzen die Studierenden ein grundlegendes theoretisches Verständnis und Fachwissen zur Entwicklung von Starterkulturen. Sie haben die Fähigkeit zur Bewertung der Eignung von Milchsäurebakterien für bestimmte Anwendungen in fermentierten Lebensmitteln, kennen Kriterien für die Auswahl von Starterstämmen, und können den Einfluss des Stoffwechsels von Milchsäurebakterien auf deren Wettbewerbskrraft, Aromabildung und Textureffekte in Lebensmitteln, sowie Rolle des Redoxhaushalts auf die Metabolitbildung in Milchsäurebakterien bewerten. Sie sind in der Lage makroskopisch und sensorisch wahrnehmbare Eigenschaften fermentierter Lebensmittel durch biochemische Grundlagen und Stoffwechselvorgänge in Starterkulturen zu erklären.

Teaching and Learning Methods:
Die Inhalte der Vorlesung werden mittels einer Powerpoint-Präsentation vermittelt, auf der umfassende Erläuterungen basieren. Die Studierenden werden angehalten selbständig Vorlesungsmitschriften anzufertigen sowie die Foliensammlung und geeignete Literatur zu studieren. Sie werden angehalten, die Vorlesungsinhalte in Lerngruppen zu diskutieren und dadurch ihre Fähigkeiten zur mündlichen Darstellung von Sachverhalten zu üben.

Media:
Für diese Veranstaltung steht eine digital abrufbare Foliensammlung zur Verfügung, welche maßgeblich prüfungsrelevant ist.

Reading List:
Wissenschaftliche Literatur zu diesem Themenbereich ist nur in Originalpublikationen und Review Artikeln verfügbar.

Responsible for Module:
Rudi Vogel, Prof. Dr. rer.nat. rudi.vogel@wzw.tum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Vorlesung Entwicklung von Starterkulturen (2 SWS)

Rudi Vogel, Prof. Dr. rer.nat.
rudi.vogel@wzw.tum.de
For further information in this module, please click campus.tum.de or here.

Module Description

WI000948: Food Economics | Food Economics

Version of module description: Gültig ab summerterm 2021

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 6	**Total Hours:** 180	**Self-study Hours:** 120	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Students prove their achievement of learning outcomes in e-test of 60 minutes with open questions. The exam is designed to test whether students understand the discussed topics and publications, whether they can describe and explain them in a meaningful and exact way, and whether they can critically reflect on assumptions, methodology, results, and political and societal implications of research in food economics. An e-test with open questions is the most suitable format to account for the discursive and reflective nature of the abilities examined.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
The course applies microeconomic theory to study questions of food demand and supply. Students should feel comfortable with the material in microeconomic courses at introductory level.

Content:
The course is intended to provide students with in-depth coverage of food economics with an emphasis on trends and phenomena of food markets and value chains, food labelling, food safety, food consumption, nutrition and food policy. Taking examples from these domains the course introduces a variety of economic models that are being used in food-economic research.

Intended Learning Outcomes:
At the end of the module, the students are able to (1) outline important trends and phenomena in food markets in Germany, Europe and the world, (2) analyse consumer and firm behavior in food markets based on economic theory, (3) assess the effectiveness of food policy instruments, (4) acquaint themselves with scientific literature in the area of food economics and discuss and evaluate crucial assumptions, choice of methodology and implications of results.

Teaching and Learning Methods:
The module is designed as an interactive lecture where both lecturers and students provide input for discussion. In order to set up a common basis for participants, lecturers present information on major features and trends on food markets and economic concepts used to analyze them. To familiarize themselves with economic research, students read selected journal articles from the field of agricultural and food economics and prepare a short presentation of 15 minutes and a short report of about 2 pages once per semester, summarising the main hypotheses, methods applied, results obtained and implications derived. Subsequent discussions in classroom on assumptions, limitations of data and methods, as well as on different ways to interprete results deepen students' understanding of the potential and restrictions of research in food economics.

Media:
Slides, textbooks, journal articles, blackboard, collection of summaries of publications.

Reading List:
Lusk, J. L., Roosen, J, & Shogren, J. F. (eds.) (2011). The Oxford handbook of the economics of food consumption and policy. Oxford University Press: New York.
Additional references are provided in the course.

Responsible for Module:
Roosen, Jutta; Prof. Dr. Ph.D.

Courses (Type of course, Weekly hours per semester), Instructor:
Food Economics (WI000948) (Vorlesung, 4 SWS)
Menapace L, Roosen J
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3231: Food Design and Food Industry | Food Design and Food Industry

Version of module description: Gültig ab winterterm 2021/22

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 105	**Contact Hours:** 45

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Student achievement will be tested in a written examination (120 min). The test will be comprised of 56-60 open
and/or multiple choice questions. This is the easiest way to see whether students have an understanding/knowledge
of the presented material. Each question will have a pre-assigned number of points (3-6) which can be achieved
with the correct answer. With half of the totally achievable points the student will have passed the test. Maximal
points will get the grade 1. Scaling in grades of 0.3 from 1-4.3 will be done in steps of 3-4 points.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Students should have a basic understanding of food chemistry, nutrition and statistics

Content:
The course covers the role of the Food Industry in society and as a major player in ensuring food security as described by “farm to fork”.
The impact of the Food Industry on the ecological footprint and how “Circular Systems” are being applied to address the sustainability challenge.
The size, structure and strategies of the major players in the Industry’s Value Chain (Agri-Food, manufacturers, retail trade and restaurants) are reviewed.
The methods used in product development and commercialisation are described. Case studies are used to illustrate consumer driven product development in the context of business expectations

and society trends. The impact of legislation with regard to product labelling and claims is reviewed and illustrated by examples.

Intended Learning Outcomes:
The students will be given an introduction to the Food Industry covering the Value Chain, economic performance as well as the challenges driven by society trends and consumer behaviour.
The students will learn about how Food Companies have worked with Governments, Non-Government Organisations (NGOs) and academia to address these challenges (successfully and unsuccessfully). In addition, students will gain knowledge about the working methods used to meet consumer demands for safe, convenient, healthy and affordable food that tastes good.

Teaching and Learning Methods:
Lectures using PowerPoint with commentary giving examples of practical experience in the Food Industry. The students will be given seminar topics to research and present. Tutorials are used to give guidance on the seminar work.

Media:
Material for the lectures will be posted on the Moodle platform 2 days before the lecture date

Reading List:

Responsible for Module:
Pearson, Stephen

Courses (Type of course, Weekly hours per semester), Instructor:
Food Industry (Vorlesung, 1,5 SWS)
Pearson S

Food Design (Vorlesung, 1,5 SWS)
Pearson S
For further information in this module, please click campus.tum.de or here.

Module Description

WZ0306: Genomics | Genomik und Gentechnik

Version of module description: Gültig ab winterterm 2012/13

Module Level: Bachelor	**Language:** German/English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 3	**Total Hours:** 50	**Self-study Hours:** 20	**Contact Hours:** 30

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Examination duration: 60 minutes

Repeat Examination:
Next semester

(Recommended) Prerequisites:
basic knowledge of genetics and biochemistry

Content:
The modul Genomik consists of the lecture Genomics (V02, 3CP)
Topics of the lecture are

Sequencing strategies,
Genome Projects,
Data base resources,
Transcriptomics,
Proteomics,
Metabolomics,
Quantitative Genetics,
Association-Mapping,
Model systems.

Intended Learning Outcomes:
The students got insight into modern genetic concepts. The students are familiar with modern methods in genetics.

Teaching and Learning Methods:
Lecture; materials available within the download-area on the web sites of the involved institutions.

Media:

Reading List:
will be announced by the lecturer

Responsible for Module:
Monika Frey monika.frey@mytum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Genomik (Vorlesung, 2 SWS)
Adamski J, Beckers J, Hrabé de Angelis M, Kieser A, Wurst W
For further information in this module, please click campus.tum.de or here.

Module Description

SG810001: Health and Society | Health and Society

Version of module description: Gültig ab winterterm 2016/17

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
A written exam assesses the students' ability to understand sociological theories and social dimensions of health and illness as well as social aspects of prevention and health promotion. In a given time (90 min) they have to demonstrate their ability to summarize their level of knowledge by answering open short-answer questions.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Basic knowledge of social and health sciences

Content:
- History of social medicine and the sociological approach towards health and illness
- Illness as social deviance
- Medicalization and the social construction of health and illness
- Professionalism and professionalization in health care
- Diversity and health
- Functional health and (dis-)ability
- Sociology and the body
- Assistive technologies in health care
- Social conditions, contextual factors and social determinants of health
- Salutogenesis and health promotion
- Globalization and the WHO perspective on global health
- Sociological critiques of health promotion

Intended Learning Outcomes:
After successfully completing the module, students will be able:

- to understand social conditions, contextual factors and social determinants of health
- to comprehend sociological approaches towards health and illness
- to understand and discuss processes of the social construction of health problems
- to critically asses health discourses and dynamics of medicalization
- to identify social inequalities in health related matters
- to have thorough knowledge of gender- and diversity-sensitive aspects in prevention and health promotion
- to understand resource-based approaches, following a salutogenic model

Teaching and Learning Methods:
The module consists of 2 classes with blended learning components. The contents of the lecture are transmitted live and through multimedia presentations. In the exercise students will work in small groups, reading and discussing literature that deepens the understanding of the lectures contents. Discussions will be initiated via student presentations.

Media:
PowerPoint, video clips, reader, Moodle

Reading List:
Germov J. (2009). Second opinion: an introduction to health sociology. 4th Edition. Oxford University Press.

Responsible for Module:
Richter, Matthias; Prof. Dr. rer. soc.

Courses (Type of course, Weekly hours per semester), Instructor:
Health & Society (Vorlesung, 2 SWS)
Göttler A

Health & Society (Übung, 2 SWS)
Göttler A, Obeka B
For further information in this module, please click campus.tum.de or here.

Module Description

WZ1414: Hot Topics and Techniques in Metabolism Research | Hot Topics and Techniques in Metabolism Research

Version of module description: Gültig ab winterterm 2020/21

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The type of assessment is a presentation complemented by a brief written precis.
Students will be evaluated based on their presentations (oral presentation of their topic, format of their choice, 50%) and a written abstract on their topic to be handed in at the end of the semester (50%). The presentation consists of the oral presentation plus discussion (in total 30 minutes). The students will have to show that they are able to prepare a computer-based (PowerPoint) presentation and to demonstrate competence in critical evaluation and focused aggregation of a topic. The students also will have to reveal their expertise in open-minded handling of feedback and discussion in an audience.
The written abstract should be one Word doc page long and is structured like “News & Views” or “Highlights” in scientific journals. It is accomplished by a one page graphical abstract that summarizes the take home message in a graphical way. Both formats are regularly used in scientific journals, and the students gain competence in evaluating scientific publications. Furthermore, they will have to demonstrate their knowledge and understanding in the selected scientific topic in form of a focused and precisely written abstract text.

Repeat Examination:
End of Semester

(Recommended) Prerequisites:
Basic knowledge of molecular biology, biochemistry and metabolism, genetics. No other modules are required.

Content:
This module will cover the latest developments in ‘omics’ techniques (genomics, proteomics, metabolomics, lipidomics, bioinformatics) applied to current areas of investigation in metabolic signaling. We will cover novel NGS techniques to interrogate the genome (RNA-Seq, ChIP-Seq,

ATAC-Seq, single cell sequencing...) with actual protocols and publications. We will discuss GWAS and other types of human genetics studies as well as mammalian model organisms. Other hot topics include metabolic signaling and nutrient sensing pathways (such as mTOR), epigenetics and histone modifications (DNA methylation, histone acetylation, methylation and recently discovered novel modifications), adipose tissue plasticity (beiging or browning of white adipocytes), cancer metabolism, immunometabolism, circadian rhythms, posttranslational modifications and proteomes, obesity genetics and 'hot molecules' (such as lactate, alpha ketoglutarate, GDF15,…).

Intended Learning Outcomes:
Upon completion of this course, students will have gained a broad overview of both experimental techniques and methods, as well as open areas and unsolved puzzles, which are currently being used and addressed in metabolism research. Students are able to
- understand basic principles and methodologies (genomics, proteomics, metabolomics, lipidomics, bioinformatics, RNA-Seq, ChIP-Seq, ATAC-Seq, single cell sequencing, etc.) applied when testing scientific hypotheses and designing experiments.
- recognize and critically evaluate the latest scientific literature.
- present their critical evaluation and focused aggregation of a topic in computer-based (PowerPoint) presentation.
- discuss their results with an audience in an open-minded handling.
- describe their results in a structured way like "News & Views" or "Highlights" in scientific journals.
- use a graphical abstract that summarizes the take home message in a graphical way.
- independently inform themselves and evalute new developments in the field of cellular signaling pathways, epigenetics, cancer and immune-metabolism.
- apply the tools learned in this course and prepare themselves best in respect of scientific topics and methods for job interviews, Master's or PhD theses as well as for different career paths.

Teaching and Learning Methods:
This is a student-centric format! Participants will receive relevant materials, which they prepare during independent study and research, and which they will then present and 'teach' to the other students in the course. This will be followed by an interactive discussion and explanations as well as specific examples, protocols and problems to be solved by the students.

Media:
PowerPoint, Pubmed, Peer-reviewed publications, Whiteboard.

Reading List:
Articles and publications will be provided to you during the course. No textbook is required.
To get an idea of the type of publications to be analyzed, please check out:
https://www.nature.com/natmetab/news-and-comment

Responsible for Module:
Uhlenhaut, Nina Henriette; Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
Hot topics and techniques in metabolism research (Seminar, 4 SWS)
Uhlenhaut N [L], Uhlenhaut N
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3224: Health Behaviour and Health Promotion | Health Behaviour and Health Promotion

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 105	**Contact Hours:** 45

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The learning outcome from this module is evaluated based on a seminar paper (approx. 10 pages per student), a
seminar presentation (approx. 10 minutes per student plus discussion) and a 30 minute oral group examination.
With the seminar paper and the respective presentation, the students demonstrate that they are able
to understand a given scientific problem related to health behaviour and health promotion;
to use respective scientific literature;
to make use of a variety of behavioural theories when evaluating given strategies in disease prevention and health
promotion w.r.t. a specific type of health compromising behaviour (e.g. smoking, diet, sedentary lifestyle);
to develop promising health promotion concepts;
to report their insight in a concise and well-comprehensible manner.
In the oral examination students prove their abilities
to remember important theories of health behaviour;
to understand consumers' health behaviours;
to evaluate advantages and disadvantages of various health systems.
Overall, students show their ability to discuss scientific matters of health behaviour and health promotion using
proper terminology in oral as well as in written form. The final grade is an averaged from the seminar contributions
(paper and presentation, 20% each) and the oral examination (60 %).

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Students may benefit from basic insights into Economics and Public Health

Content:
Health behaviour from the perspective of Health Psychology: Models of health, health behaviour and health
education;
Health behaviour from the perspective of Behavioural Economics: Prospect Theory;
Economics of Health and Health Care: stakeholders in health care systems, measures of cost containment, quality
of health services;
Health Promotion: exemplary evaluation of strategies in disease prevention and health promotion.

Intended Learning Outcomes:
Upon successful completion of the module, students are able
to remember the most important theories of health behaviour;
to understand consumers' health behaviours;
to evaluate pros and cons of various health care systems;
to evaluate given strategies and programes of health promotion;
and to create promising health promotion concepts.

Teaching and Learning Methods:
Lecture, group work, discussions, examples, demonstrations, student presentations, homework, students' selfdependent
study of relevant literature

Media:
The following media will be used as and when required:
Reader, (white)board, PowerPoint, moodle online course, videos

Reading List:
Antonovsky A (1996): The salutogenic model as a theory to guide health promotion. Health Promotion International : 11(1), 11-18
Bartholomew LK et al. (2006): Planning Health Promotion Programs. 2nd ed. Jossey-Bass
Folland S, Goodman AC, Stano M (2001): Economics of Health and Health Care. 3rd ed. Prentice-Hall
Gedrich K (2003): Determinants of nutritional behaviour – a multitudes of levers for successful intervention? Appetite 41, p. 231-8
Kahneman D & Tversky A (1979): Prospect theory: An analysis of decision under risk. Econometrica 47/2, 263-291
van Lange PAM, Kruglanski AW & Higgins ET (Eds.) (2012): Handbook of Theories of Social Psychology. Vol. 1. Sage
Naidoo J, Wills J (2009): Foundations Health Promotion : Foundations for Practice. 3rd ed. Baillière Tindall (Elsevier)

Taylor SE (2003): Health Psychology. 5th ed. McGraw-Hill
Tversky A & Kahneman D (1981): The framing of decisions and the psychology of choice. Science 211, 453-458
Tversky A & Kahneman D (1986): Rational choice and the framing of decisions. The Journal of Business 59, 251-278

Responsible for Module:
Kurt Gedrich KGedrich@tum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Health Behaviour (Vorlesung, 2 SWS)
Gedrich K [L], Gedrich K

Health Promotion (Seminar, 1 SWS)
Gedrich K [L], Gedrich K
For further information in this module, please click campus.tum.de or here.

Module Description

WZ0479: Introduction to Anthropology of Food | Introduction to Anthropology of Food [AnthroFood]

Version of module description: Gültig ab winterterm 2021/22

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** summer semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 105	**Contact Hours:** 45

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The examination will consist of a 20-minute oral discussion of one of the topics presented during the module, and its relative literature. Critical approach and personal understanding of the matter will be considered as the achievement of a deeper knowledge. The final evaluation will result from the examination (70%) and the in-class reports about specific literature that students are assigned during the seminars (30%).

Repeat Examination:
Next semester / End of Semester

(Recommended) Prerequisites:

Content:
Eating and drinking are universal needs for human beings, but the uncountable representations and practices that relate to those needs are culturally and socially defined. Even taste is not only the product of biochemical interactions between our gustative receptors and food's taste molecules: as anybody may experience, it is also the result of historical, socio-cultural, and even economic and political factors. This module aims to furnish the students with the rudiments of cultural anthropology, and signally the basic knowledge of anthropology of food. The lessons and the suggested bibliography will shed light on the cultural and even symbolical dimension of food as well as on its strict relation with both local and global social dynamics.

Lecture topics:
1. Introduction to cultural anthropology.
2. Food as a cultural object.
3. How taste is culture-informed.

4-5. Food as a symbol of socio-cultural identity.
6-7. Food and religion.
8. Non-religious food taboos and prescriptions.
9. Food, memory, and tradition.
10. Local food as a product of globalization.
11. What is ethnic in ethnic cuisine?
12. Taste, snobbery, and social distinction.
13. “Cultural Orthorexia” and dietary fads.
14. Globalizing kosher food in Italy: a case study.
15. Summary and conclusions.

Intended Learning Outcomes:
Upon successful completion of this module, students will be able to understand food as a social and cultural object, to apply basic anthropological tools in order to analyze the diversity of representations and practices related to food in different human contexts, and evaluate the symbolical and identitary contents of foodways.

Teaching and Learning Methods:
The lectures will be conducted by the lecturer through oral and visual presentations about the topics, but they will be open to students’ critical discussion. The seminars will involve actively the students, both individually and as working groups: they will be assigned to report and comment about specific readings of original literature.

Media:
PowerPoint Presentation; Video projection

Reading List:
Fox, Robin. 2014. “Food and Eating: An Anthropological Perspective”. Social Issues Research Centre. (online). http://www.sirc.org/publik/foxfood.pdf
Mintz, Sidney W., and Christine M. Du Bois. 2002. “The Anthropology of Food and Eating”. Annual Review of Anthropology 2002 31(1): 99-119.
Douglas, Mary. 1972 “Deciphering a Meal”. Daedalus 101 (1): 61-81.

Responsible for Module:
Klingenspor, Martin; Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
Introduction to Anthropology of Food (Übung, 1 SWS)
Della Costa F, Wochian S

Introduction to Anthropology of Food (Vorlesung, 2 SWS)
Della Costa F, Wochian S
For further information in this module, please click campus.tum.de or here.

Module Description

WI100311: Food & Agribusiness Marketing | Lebensmittelmarketing und Agribusiness-Marketing

Version of module description: Gültig ab winterterm 2020/21

Module Level: Master	**Language:** German	**Duration:** one semester	**Frequency:** summer semester
Credits:* 6	**Total Hours:** 180	**Self-study Hours:** 120	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Die Prüfung erfolgt in Form einer wissenschaftlichen Ausarbeitung (Seminararbeit: 10-15 Seiten, 50% der Note; Gesamtpräsentationszeit: 35 bis 40 Minuten bzw. je Studierendem: 15-20 Minuten, 50% der Note). Hierfür erhalten die Studierenden in Gruppen eine Fragestellung aus dem Lebensmittelmarketing oder Agribusiness-Marketing. In der wissenschaftlichen Ausarbeitung demonstrieren die Studierenden ihre Fähigkeit (1) eine Marktabgrenzung vorzunehmen, (2) ein Beispiel für eine wissenschaftliche Marktforschungsstudie unter Einsatz der Methoden der Marktforschung darzustellen und (3) Beispiele für die Anwendung von Marketinginstrumenten zu behandeln.
Die Teilelemente (1)-(3) stellen die Studierenden in Präsentationen semesterbegleitend vor und diskutieren die erzielten Teilergebnisse. Das Feedback aus den Diskussionen integrieren die Studierenden in die Seminararbeit. Durch die Präsentation wird die kommunikative Kompetenz des Präsentierens von wissenschaftlichen Themen überprüft. Durch die Gruppenarbeit zeigen die Studierenden, ihre Fähigkeit eine Aufgabenstellung durch konstruktive und konzeptionelle Zusammenarbeit im Team zu lösen. Die Leistungen der Einzelnen in der Prüfungsleistung müssen individuell erkennbar und bewertbar sein. Der Teilbeitrag jeder Person wird im Text vermerkt.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Marketing; Methoden der Marktforschung.

Content:
Das Modul behandelt Beispiele der Marketingpraxis im Agrarmanagement und der Agrarmarktforschung. Es betrachtet:

- die Marktstruktur der Agrar- und Ernährungswirtschaft;
- das Festlegen von Zielen und Strategien im Agrarmarketing;
- das Management von Marken, auch Handelsmarken;
- die Kommunikation im Agribusiness Marketing (Werbung, Gemeinschaftswerbung);
- die Preisbildung im Agribusiness Marketing;

- das Produkt- und Qualitätsmanagement im Agribusiness Marketing (Auswirkungen auf Kooperation und Integration);
- Innovation und Produktdifferenzierung;
- Distribution, insbes. im Lebensmitteleinzelhandel.

Intended Learning Outcomes:
Am Ende des Moduls sind Studierende in der Lage, strategische Überlegungen im Marketingmanagement für Lebensmittel und im Agribusiness zu entwickeln. Studierende werden a) wesentliche Eigenschaften von Lebensmitteln und Agrargütern mit Bezug zum Agrarsystem bestimmen und b) daraus ihre Konsequenzen für die Vermarktung argumentieren. Darüber hinaus werden die Studierenden aktuelle Forschungsergebnisse im Bereich des Lebensmittel- und Agribusiness-Marketing evaluieren.
Außerdem werden die Studierenden eine Marketingkonzeption für eine angewandte Fragestellung des Lebensmittel- und Agribusiness-Marketing vor dem Hintergrund einer systemischen Betrachtung entwickeln können. Die Erfolgsaussichten einer Marketingstrategie können sie anhand der aktuellen Marketingliteratur beurteilen.
Die Studierenden lernen eine Aufgabenstellung durch konstruktive und konzeptionelle Zusammenarbeit im Team zu lösen.

Teaching and Learning Methods:
Das Modul wird in Form eines Seminars abgehalten. In Gruppen und unter Anleitung durch den Dozenten recherchieren die Studierenden die geeignete wissenschaftliche Literatur und Daten und Fakten zu Praxisbeispielen einer Marketingkonzeption und vermitteln diese den anderen Seminarteilnehmern in Präsentationen. Feedback aus den anschließenden Diskussionen wird in die Seminararbeit integriert. Die Illustration einer Marketingkonzeption an einem Fallbeispiel kann durch die Studierenden am besten in einem Seminar vorgenommen werden.

Media:
Präsentationen, wissenschaftliche Aufsätze, Lehrbuchkapitel

Reading List:
Meffert, H., Burmann, C., Kirchgeorg, M. (2015). Marketing: Grundlagen marktorientierter Unternehmensführung Konzepte - Instrumente – Praxisbeispiele, 12. Auflage. Wiesbaden: Springer-Gabler.

Responsible for Module:
Roosen, Jutta; Prof. Dr. Ph.D.

Courses (Type of course, Weekly hours per semester), Instructor:
Lebensmittelmarketing und Agribusiness-Marketing (WI100311) (Seminar, 4 SWS)
Roosen J [L], Benninger N, Groß S
For further information in this module, please click campus.tum.de or here.

Module Description

ME2496: Molecular and Medical Virology | Molekulare und Medizinische Virologie

Version of module description: Gültig ab winterterm 2011/12

Module Level: Master	**Language:** German	**Duration:** two semesters	**Frequency:** winter/summer semester
Credits:* 6	**Total Hours:** 180	**Self-study Hours:** 120	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Die Modulprüfung besteht aus einer Klausur (90min, benotet) in der die Studierenden grundlegende und vertiefte Kenntnisse der Virologie abrufen und anwenden sollen.
Die Prüfungsleistung wird am Ende des 2. Vorlesungssemesters (SS) erbracht. Die Wiederholungsklausur findet in der vorlesungsfreien Zeit zu Beginn des darauf folgenden WS Semesters statt.
In der Prüfung soll nachgewiesen werden, dass Grundlagen der Virologie inkl. molekularer und medizinisch relevanter Aspekte verstanden und wichtige funktionelle Zusammenhänge der Virus-Wirt-Interaktion analysiert werden können.
Das Beantworten der Fragen erfordert teils eigene Formulierungen und teils Ankreuzen von vorgegebenen Mehrfachantworten. Es sind keine Hilfsmittel erlaubt.

Repeat Examination:
Next semester / End of Semester

(Recommended) Prerequisites:
Kenntnisse der Molekularbiologie und Grundkenntnisse in Zellbiologie und Immunologie

Content:
Allgemeine Themen der molekularen Virologie (z.B. Viruseintritt in Wirtszellen, Replikationsstrategien von RNA und DNA Viren, Expressionskontrolle, Virusassembly), Virusfamilien (z.B. Toga-, Flavi, Herpes-, Myxo, Hepatitis-, Retroviren); medizinische Aspekte der Virologie (z.B. angeborene und adaptive Immunreaktionen gegen Viren, Immunevasion, Impfungen, Emerging viruses, onkogene Transformation, virale Vektoren)

Intended Learning Outcomes:
Nach dem Besuch des Moduls versteht der Studierende die grundlegenden Prinzipien der Virologie, kennt die Merkmale bedeutender Virusfamilien und die wichtigsten Mechanismen der Virus-Wirt-Beziehung

Teaching and Learning Methods:
Vorlesungen mit Unterstützung durch PowerPoint Präsentationen, die Folien werden zum Download bereitgestellt

Media:

Reading List:
Flint et al., Principles of Virology I and II, ASM Washington
Modrow et al., Molekulare Virologie, Spektrum Verlag 2010

Responsible for Module:
Protzer, Ulrike; Prof. Dr.med.

Courses (Type of course, Weekly hours per semester), Instructor:
Molekulare und medizinische Virologie (Teil 1 und 2) (Vorlesung, 2 SWS)
Protzer U [L], Protzer U, Baer de Oliveira Mann C, Deng L, Ebert G, Möhl-Meinke B, Pichlmair A, Vincendeau M, Wettengel J
For further information in this module, please click campus.tum.de or here.

Module Description

WZ2185: Protein Engineering Methods | Methodische Grundlagen des Proteinengineerings

Version of module description: Gültig ab summerterm 2012

Module Level: Master	**Language:** German	**Duration:** one semester	**Frequency:** summer semester
Credits:* 2	**Total Hours:** 30	**Self-study Hours:** 15	**Contact Hours:** 15

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Prüfungsdauer (in min.): 60.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
keine

Content:
Methoden zur gentechnischen Herstellung, Reinigung und Charakterisierung rekombinanter Proteine, Strategien zur Expression rekombinanter Proteine in Escherichia coli, gerichtete Mutagenese von Proteingenen, Herstellung und Durchmusterung von Proteinbibliotheken, Verfahren zur Messung von Protein/Ligand-Interaktionen

Intended Learning Outcomes:
Nach der Teilnahme an dieser Vorlesung ist der Studierende in der Lage, Methoden zur gentechnischen Herstellung, Reinigung und Charakterisierung rekombinanter Proteine, zum gezielten Austausch von Aminosäuren sowie zur Herstellung und Durchmusterung von Proteinbibliotheken und Verfahren zur Messung der Interaktion von Proteinen mit Liganden zu verstehen.

Teaching and Learning Methods:
Vorlesung

Media:

Reading List:

Responsible for Module:
Arne Skerra (skerra@tum.de)

Courses (Type of course, Weekly hours per semester), Instructor:
Methodische Grundlagen des Protein-Engineerings (Vorlesung, 1 SWS)
Skerra A [L], Schlapschy M
For further information in this module, please click campus.tum.de or here.

Module Description

WZ2402: Microbial Toxins in Food | Mikrobielle Toxine in der Nahrung

Version of module description: Gültig ab summerterm 2012

Module Level: Master	**Language:** German	**Duration:** one semester	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Die Studierenden weisen in einer benoteten Klausur (60 min) nach, dass sie in der Lage sind in begrenzter Zeit und ohne Hilfsmittel ihr Fachwissen über mikrobielle Toxinbildner, deren Habitaten und Toxinen darzustellen. Zudem sollen sie grundlegende toxikologische Arbeitstechniken beschrieben sowie toxikologische Probleme mikrobieller Herkunft in ihrer Bedeutung für die Lebensmittelsicherheit einordnen können.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Grundkenntnisse in Anatomie, Physiologie und Biochemie.

Content:
Vermittlung toxikologischer und analytischer Grundlagen. Darstellung relevanter Bakterien-, Pilz- und Algentoxine: Ökologie der Toxinbildner; biochemische und pathophysiologsiche Wirkungen der Toxine; Vorkommen in der Nahrungskette ("carry over"); Prophylaxemaßnahmen, gesetzliche Reglementierungen.

Intended Learning Outcomes:
Nach der Teilnahme an den Modulveranstaltungen besitzen die Studierenden das grundlegende theoretische Verständnis und Fachwissen über mikrobielle Toxinbildner, deren Habitaten und deren Toxine. Weiterhin haben sie grundlegende toxikologische Arbeitstechniken (z.B. Zellkulturversuche, LC-MS/MS) erlernt und geübt. Sie sollen gelernt haben, toxikologische Probleme mikrobieller Herkunft analysieren und bewerten zu können. Das Modul soll weiterhin Fähigkeiten zum Lösen von Problemen entwickeln helfen, sowie das Interesse an mikrobiellen Toxinen und deren Bedeutung für die Lebensmittelsicherheit fördern.

Teaching and Learning Methods:
Vorlesung und Übungen im Labor

Media:
PowerPoint

Reading List:
Freitext

Responsible for Module:
Johann Bauer (johann.bauer@mytum.de)

Courses (Type of course, Weekly hours per semester), Instructor:
Mikrobielle Toxine in der Nahrung (Medizinische Mikrobiologie und Hygiene, Teil Mikrobielle Toxine) (Vorlesung, 2 SWS)
Meyer K

Analytik mikrobieller Toxine (Übung, 2 SWS)
Meyer K
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3230: Mitochondrial Biology | Mitochondrial Biology

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** summer semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The students will demonstrate their acquired knowledge on mitochondrial biology during a graded, oral examination
of 20 minutes. The ability of the student will be examined (1) to describe the underlying concepts of mitochondrial
functional units as covered by the course, (2) to apply this knowledge in a novel context, e.g. to explain a primary
dataset or the consequences of a disease mutation and (3) to integrate knowledge into recent scientific advance as
covered by the seminar.

Repeat Examination:

(Recommended) Prerequisites:
Basics in Nutrition and Food, Energy Balance Regulation

Content:
The course covers the entire spectrum of mitochondrial involvement in cellular homeostasis and metabolism. This
includes oxidative phosphorylation, membrane potential, thermogenesis, anaplerotic reactions, apoptosis, calcium
homeostasis, reactive oxygen species, mtDNA and mitochondrial
transcription/translation, mtDNA mutations in disease and the phylogeny of human origin, evolution and the
endosymbiotic theory, fusion and fission, protein import, solute transport, mito-ER association and iron/heme
metabolism.

Intended Learning Outcomes:
The students will have broadened their understanding of mitochondria from mere ATP producers to their complex
role as integrative hubs in multiple metabolic and signaling pathways. They will be familiar with the state of the art
and thus be able to participate in ongoing research projects studying mitochondrial function with little further training
on scientific background or typically employed technology. Due to the integrative nature of mitochondrial function
within a plethora of other pathways, students will have acquired the ability to place seemingly self-contained
knowledge fields into a greater cellular context. Students will be able to understand and integrate recent and future
literature into this complete framework of mitochondrial function.

Teaching and Learning Methods:
Basic knowledge will be provided in the form of lectures (2 SWS). The corresponding seminar (2 SWS) will allow
students to both practice their presentation skills of original literature and convey highlights of current research in
the above fields.

Media:
presentation slides, whiteboard

Reading List:
‘Bioenergetics 4’ by David Nicholls, ISBN: 9780123884251
‘Mitochondria’ by Immo Scheffler, ISBN: 0471194220

Responsible for Module:
Tobias Fromme fromme@tum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Mitochondrial Biology (Seminar, 2 SWS)
Fromme T

Mitochondrial Biology (Vorlesung, 2 SWS)
Klingenspor M [L], Fromme T
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3232: Molecular Oncology | Molecular Oncology

Version of module description: Gültig ab summerterm 2020

Module Level: Master	**Language:** English	**Duration:** two semesters	**Frequency:** winter/summer semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
This modul is composed of two courses distributed over two semesters: Molekulare Onkologie 1MED (MolOnc 1) and Molekulare Onkologie 1 HA (MolOncHA). The lecture of MolOnc 1 is recommended to be continuously visited which qualifies the student for the written final exam (free questions, grades), which serves to test the knowledge and competence acquired with the help of the lectures. There are no aids allowed in the final exams. The questions can be based on any subject of the lectures or a combination thereof and demand the ability to reproduce, associate, and transfer thinking. The passing of the exam is prerequisite for allowance for MolOncHA. MolOncHA is a homework written in English. The aim of this homework is that the students intensify their knowledge on selected topics of the lecture in MolOnc1. For the homework the students will work independently with specific instructions given by the lecturer at the beginning of the semester in which the students are qualified for MolOnc1HA. Specific instructions include the topic, the aim, the content, the format, and on how and when to file-in the homework. The homework should be taken in the subsequent semester after MolOnc1.
The module examination consists of a written exam (90 min) and a homework assignment during the semester (ungraded course work).

Repeat Examination:

(Recommended) Prerequisites:
basics of biochemistry, molecular biology, genetics. Other modules are not a pre-requisite.

Content:
Microenvironments, Hallmarks of Cancer, Qualities of transformed cells in the experiment); Causes of the
tumorigenesis (stem cells and tumor formation, wnt/hedgehog Self-renewal, mutations, repair, cellular answer to

mutagens); Oncogenes (experiments of Rous, Rubin, Temin, Weinberg, definitions, function classes of oncogenes
and examples);
Tumor suppressor genes (definitions, Knudson two hit hypothesis, PTEN, Checkpoints of the cell cycle, pRB, p53,
MDM2, Apoptosis); epigenetics (definitions, histone modifications, DNA methylation, pRb, CpG Islands, Examples,
experiments of Mary Hendrix); Environment of the cell (components of a tumor, tumor stroma as therapeutical
target, Extra cellular matrix: Components and meaning, interactions cell/ECM, Zell-Zell contact); Mechanisms of the
metastasis cascade (steps of the cascade, angiogenesis, angiogenic switch, Invasion, cicatrization and cancer,
tumor associated Macrophagen, epithelial mesenchymal transition, seed and soil hypothesis, role of proteases,
metastatic niche; Markergene; Metastasis models in the mouse); Proteases/proteolytic network (physiological and
pathophysiological functions of proteases and protease inhibitors, regulation of proteases, splitting mechanisms, the
proteolytic balance, Proteasenfamilien, Proteases as prognostic Marker, development of synthetic protease

inhibitors, clinical examinations, optimization of synthetic protease inhibitors, the Cancerdegradome); Specific
methodology of the molecular oncology (in vivo model, biochemical/molecular proof methods of proteases and
protease inhibitors, Zymography, knock-out Systeme, siRNA, shRNAi, viral vector systems, in vitro migration and
invasion models); Deepening of the mentioned areas (discussion of current publications from relevant professional
journals, acquirement of a recessed understanding of the learned mechanisms).

Intended Learning Outcomes:
research and know the principle questions and implications addressed in upcoming publications in the field. They
are also able to judge the evolution of knowledge as they get insight into the history of major discoveries in the field
which is meant to boost their self-confidence as future graduate students. Specifically, the students are able not

only to reproduce facts but are trained to associate pieces of knowledge and transfer this to unknown problems. The
students acquire knowledge of a set of experimental procedures allowing them to design relevant experiments.
This, together with the problem-oriented in-depth analyses of topic-related problems will enable them to be
wellprepared
for job-related questions even in other research fields in the life sciences.

Teaching and Learning Methods:
Talk with the development of schemes at the blackboard, relatively sparse use of power point slides.
Study of the script and the notes taken, suggested follow-ups in the literature. In depth work and literature research
on specific topics in the homework. Reiteration and extension of topics of the lecture by studying independently.

Media:
Topics will be developed at the blackboard with the help of power point presentations. The script is made available
beforehand.

Reading List:
No text books are necessary to pass the exam. Additional information can be obtained from:Cell and Molecular
Biology. G. Karp. Wiley Verlag, 4. Auflage, ISBN: 0-471-65665-8
The Biology of Cancer. R. A. Weinberg. Garland Science, 1. Auflage, ISBN: 0-8153-4076-1

Responsible for Module:
Achim Krüger achim.krueger@tum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Molekulare Onkologie 1MED (Vorlesung, 2 SWS)
Krüger A [L], Krüger A

Molekulare Onkologie I Hausarbeit (Seminar, 2 SWS)
Krüger A [L], Krüger A
For further information in this module, please click campus.tum.de or here.

Module Description

WZ1329: Nutrition in the Elderly | Nutrition in the Elderly

Version of module description: Gültig ab summerterm 2019

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** summer semester
Credits:* 3	**Total Hours:** 70	**Self-study Hours:** 54	**Contact Hours:** 21

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The learning assessment will be controlled by a written exam of 60 minutes duration. Use of a calculator is allowed. The answers have to be written in own phrases. To assess active knowledge, there will be no multiple-choice questions. In the written exam, students demonstrate their ability to remember aspects of nutrition in advanced life stages and of diseases, which are nutrition related or in which nutrition plays an important therapeutic role. Students should show that they understand the functional interrelation of the components of nutrition and that they are able to transfer their knowledge to exemplary pathologies. The result of the written exam will be the final grade of the module.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Basic knowledge of human physiology, macronutrients and micronutrients as well as of analyzing and evaluating the current literature.

Content:
The lecture series Nutrition in the Elderly covers nutritional aspects specific for advanced life stages. Focal points are malnutrition, aging, sarcopenia and obesity in the elderly.

Intended Learning Outcomes:
The students understand the specific nutritional problems and requirements in the elderly including specific pathophysiological knowledge of common disease entities of advanced age stages. They are also able to analyze and evaluate the relevant literature on these topics.
After completion of the module, the students know and understand the different nutritional deficiencies and environmental influences which lead to e.g. sarcopenia and frailty. The students understand the consequences of nutrition deficiencies in this life stage.

Teaching and Learning Methods:
Lecture with transfer of knowledge and critical discussion of the presented topics with the students during the lesson. The lecture is given with a teacher-centered approach (PowerPoint presentation).

Media:
PowerPoint presentation and discussion of the content with the students during the lectures.

Reading List:
Research articles and reviews presented and discussed in the lectures.

Responsible for Module:
Hans Hauner hans.hauner@tum.de

Courses (Type of course, Weekly hours per semester), Instructor:

For further information in this module, please click campus.tum.de or here.

Module Description

WZ3203: Nutrition in Life Stages | Nutrition in Life Stages [NiLS]

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** summer semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 105	**Contact Hours:** 45

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The learning assessment will be controlled by a written exam of 120 minutes duration. Use of a calculator is
allowed. The answers have to be written in own phrases. To assess active knowledge, there will be no multiplechoice
questions. In the written exam, students demonstrate their ability to remember aspects of nutrition in different
life stages and of diseases, which are nutrition related or in which nutrition plays an important therapeutic role.
Students should show that they understand the functional interrelation of the components of nutrition and that they
are able to transfer their knowledge to exemplary pathologies. The result of the written exam will be the final grade
of the module.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Basic knowledge of human physiology, macronutrients and micronutrients as well as of analyzing and evaluating
the current literature.

Content:
The lecture series Nutrition in Life Stages covers nutritional aspects specific for different life stages. Focal points are
prenatal nutrition during the embryonal and fetal stage as well as nutrition of babies and infants, of adolescents, of

adults and of the elderly. It includes as topics prenatal programming, breastfeeding, formula feeding, introduction of
complementary food, food allergies and intolerances, water balance in different life stages in health and disease,
malnutrition, aging, and sarcopenia and obesity in the elderly.

Intended Learning Outcomes:
The students understand the specific nutritional problems and requirements in different phases of life including
specific pathophysiological knowledge of common disease entities of the different age stages. They are also able to
analyze and evaluate the relevant literature on these topics.
After completion of the module, the students know and understand the different nutritional deficiencies and
environmental influences which lead to prenatal damage of the fetus. The students understand the consequences of
these prenatal influences on health later in life. The students will also be able to understand the major
consequences of breastfeeding and formula feeding for the babies, the mothers and the health care system and to
realize the limitations of knowledge on this topic. The students will know the major preferences of eating behavior in
childhood and how this behavior can be influenced in practice. They will also know the causes and mechanisms of
water imbalance and food intolerances and how these conditions can be diagnosed and treated.

Teaching and Learning Methods:
Lecture with transfer of knowledge and critical discussion of the presented topics with the students during the
lesson. The lecture is given with a teacher-centered approach (PowerPoint presentation).

Media:
PowerPoint presentation and discussion of the content with the students during the lectures.

Reading List:
Research articles and reviews presented and discussed in the lectures.

Responsible for Module:
Witt, Heiko; Prof. Dr.med.

Courses (Type of course, Weekly hours per semester), Instructor:
Lecture
Nutrition in Life Stages
3 SWS

Heiko Witt
heiko.witt@tum.de
For further information in this module, please click campus.tum.de or here.

Module Description

WZ2580: Protein Engineering | Protein-Engineering [Protein-Engineering]

Version of module description: Gültig ab summerterm 2014

Module Level: Master	**Language:** German	**Duration:** one semester	**Frequency:** summer semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 105	**Contact Hours:** 45

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Prüfung: schriftlich; Prüfungsdauer: 90 min
Eine Klausur bildet den Abschluss des Moduls und dient der Überprüfung der erlernten Kompetenzen. Die Lernenden zeigen in einer Klausur, dass sie die erarbeiteten Informationen beschreiben, interpretieren und auf ähnliche Sachverhalte übertragen sowie die unterschiedlichen Informationen zu einem neuartigen Ganzen verknüpfen können. So weisen die Studierenden beispielsweise nach, dass sie die grundlegenden Ansätze des Protein-Engineerings für die Entwicklung von biomedizinischen Wirkstoffen verstanden haben, gentechnische Methoden zur Entwicklung von Proteintherapeutika beschreiben und erläutern können, Zusammenhänge zwischen Proteinstrukturen und daraus resultierenden anwendungstechnischen Möglichkeiten beurteilen können und Strategien zur Optimierung von rekombinanten Proteinen für biotechnologische oder biomedizinische Anwendungen entwickeln können. Der Lehrende gibt den Termin der Prüfungsleistung (Klausur) zu Beginn des Moduls bekannt.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Voraussetzungen für die erfolgreiche Teilnahme sind theoretische und praktische Kenntnisse von Grundlagen der Proteinbiochemie.

Content:
In diesem Modul werden die wissenschaftlichen Methoden und Arbeitstechniken des Protein-Engineerings auf theoretischer Grundlage diskutiert. Schwerpunkte sind die gentechnische Produktion von Proteinen in Bakterien (cytoplasmatisch und periplasmatisch), Verfahren zur ortsgerichteten Mutagenese, Herstellung von Genbibliotheken, Selektions- und Screening-Methoden sowie Verfahren zur Bestimmung der Affinität zwischen Proteinen (z.B. Antikörpern,

Rezeptoren) und ihren Liganden oder Wechselwirkungspartnern sowie ggf. der enzymatischen Aktivität.
Des weiteren wird im Modul das Potential gentechnisch hergestellter Proteine als neue Generation von biologischen Arzneimitteln erläutert. Die pharmakologischen Eigenschaften (Affinität zu medizinisch relevanten Zielstrukturen, Effektorfunktionen, Plasma-Halbwertszeit) können durch Protein-Engineering wie auch mit proteinchemischen Methoden gezielt manipuliert werden. Anhand aktueller Fallbeispiele (Insulin, Wachstumsfaktor, humanisierte Antikörper usw.) wird die Entwicklung und Optimierung innovativer Biopharmazeutika mittels Protein-Engineering dargestellt.

Intended Learning Outcomes:
Nach der erfolgreichen Teilnahme an dem Modul sind die Studierenden in der Lage:
• den theoretischen Hintergrund des Protein-Engineerings zur Entwicklung von Proteinen als biomedizinische Laborreagenzien sowie als therapeutische Wirkstoffe wiederzugeben
• die Entwicklung moderner Proteintherapeutika auf molekularer Basis mittels gentechnischer Methoden nachzuvollziehen
• die Zusammenhänge zwischen Primärstruktur, Faltung und biochemischer Funktion von Proteinen aus anwendungsbezogener Perspektive zu verstehen
• die Bedeutung biophysikalischer Wechselwirkungen des biochemisch/pharmakologisch aktiven Proteins mit dem entsprechenden Liganden/Substrat zu beurteilen
• Strategien zur Optimierung von rekombinanten Proteinen für praktische Anwendungen in Biotechnologie oder Biomedizin zu entwickeln
• das ökonomische Potential von durch Protein-Engineering optimierten Biopharmazeutika zu beurteilen

Teaching and Learning Methods:
Veranstaltungsform/Lehrtechnik: Vorlesung/Präsentation; Lernaktivität: Literaturstudium; Lehrmethode: Vortrag
Die regelmäßige aktive Teilnahme an der Lehrveranstaltung wird empfohlen.

Media:
Die Vorlesungen erfolgt mit graphischen Präsentationen (Projektor und PowerPoint). Die Folien werden den Studenten in elektronischer Form oder als Ausdruck rechtzeitig zugänglich gemacht.

Reading List:
Wink, "Molekulare Biotechnologie: Konzepte, Methoden und Anwendungen", Wiley-VCH 2011.
Lottspeich et al., "Bioanalytik", Spektrum 2012.
Williamson & Williamson, "How Proteins Work", Garland 2011.
Walsh, "Biopharmaceuticals: Biochemistry and Biotechnology", John Wiley & Sons 2003.

Responsible for Module:
Arne, Prof. Dr. Skerra (skerra@tum.de)

Courses (Type of course, Weekly hours per semester), Instructor:
Engineering therapeutischer Proteine (Vorlesung, 2 SWS)
Skerra A

Methodische Grundlagen des Protein-Engineerings (Vorlesung, 1 SWS)
Skerra A [L], Schlapschy M
For further information in this module, please click campus.tum.de or here.

Module Description

WZ2662: Modern Topics in Evolutionary Biology | Modern Topics in Evolutionary Biology

Version of module description: Gültig ab summerterm 2013

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** summer semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
20min presentations with subsequent discussion of research papers on the topics of the course will be evaluated during the seminar part.

Repeat Examination:
End of Semester

(Recommended) Prerequisites:
Basic knowledge in Evolution and Genetics

Content:
1) Origin of life and early evolution; 2) Epigenetics and Evolution: return of Lamarckism? ; 3) Evolution of cooperation and society: game theory, kin selection and inclusive fitness ; 4) Ecology and evolution: levels of selection, metagenomics and holobionts ; 5) Experimental evolution in real time in the lab; 6) Origin of evolutionary innovations.

Intended Learning Outcomes:
A profound understanding of the evolutionary mechanisms and experimental tests, Development of critical analysis of articles and topics in evolutionary biology

Teaching and Learning Methods:
lecture, seminars, literature study, mutual questions and answers

Media:
Powerpoint presentations

Reading List:
Mark Ridley, Evolution, Oxford University Press 2011; Pigliucci M. and G.B. Mueller, Evolution: The extended Synthesis, MIT Press, 2010; Maynard-Smith J. and Szathmary E., The Major transitions in Evolution, Oxford University Press 1995.

Responsible for Module:
Aurelien Tellier (tellier@wzw.tum.de)

Courses (Type of course, Weekly hours per semester), Instructor:
Modern topics in Evolutionary Biology (Seminar, 2 SWS)
Tellier A [L], Tellier A

Modern topics in Evolutionary Biology (Vorlesung, 2 SWS)
Tellier A [L], Tellier A
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3240: Research Internship (4 Weeks) | Research Internship (4 Weeks)

Version of module description: Gültig ab summerterm 2021

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter/summer semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 45	**Contact Hours:** 105

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The student's performance is evaluated, as documented in the lab notebook and the internship report (max. 12 pages), by the following criteria:
- understanding of the research question
- overview of the published scientific literature related to the research question
- ability to learn and apply new methods
- skillfulness in research tasks
- precision and accuracy in data acquisition and data management
- data analyses and evaluation
- ability to study and work autonomously
- clarity of scientific writing

Repeat Examination:

(Recommended) Prerequisites:
Module Research Methods
Module Basics in Computational Biology
Module Integrated Lab Course

shedule:

1. The students search themselves one TUM internal supervisor from the given list of classes no matter if the planned research Internship is going to be TUM internal or TUM external. They do so by contacting a chair of TUM School of Life Sciences that already has a class connected to each one of the offer-nodes within the module-node of WZ3240 in TUMonline. If a preferred

supervisor's classes and exam is already listed a topic or supervisor needs no further approval by the Examination Board.
If there should be another potential TUM internal supervisor whose chair is not yet part of the list of classes and/or exams, the students can ask for an extension of the list by the preferred supervisor writing a conclusive e-mail to recognition.co@ls.tum.de.

2. The students decide whether they want to do an internal OR an external internship and register for the supervisor's class connected to the respective offer-node (internal/external).

3. It will be the TUM internal supervisor who will (re-)read the report and finally submits the grade and the title.

Content:
The scientific questions addressed by laboratories on the TUM campus or at external research facilities hosting the master students for the research internship deal with nutrition-related research, either on the fundamental or applied level, in the fields of biochemistry, molecular biology, nutrition physiology, metabolism, microbiology, food chemistry, nutrition medicine, genetics, clinical studies, epidemiology and public health. The internship is an opportunity for our students to apply their theoretical and practical knowledge acquired during the first two semesters to a specific research question in the framework of a project in the host laboratory.

Intended Learning Outcomes:
After successful finalization of the module, our students have acquired initial theoretical and practical skills to tackle a scientific question predefined by a supervisor and conduct research tasks under guidance by this supervisor. They have gained first hands-on experience in the design of experiments in life science laboratories, or the development of study protocols in clinical study units. They are experienced in sensible and reproducible application of selected methods, understand the technical background and limitations of the applied technologies. They gained insights into quality control procedures in scientific research. They have learned to document the day-by-day progress of their work in a comprehensible manner that allows independent recapitulation of the applied methods, the acquired data and the results obtained. In a structured written report, accompanied by a day-by-day protocol, they can (1) explain the scientific context and define the goal of their research project, (2) describe the application of methods in comprehensive technical notes, (3) document and analyze the acquired data, (4) judge upon the reliability and reproducibility of the results, and (5) evaluate and interpret these results in relation to published work. They are trained to explain the goals, experimental design and essential outcome of their research internship to their peers and supervisor in short and concise oral presentations.

Teaching and Learning Methods:
The internship is composed of three elements with theoretical and practical aspects: Phase 1- Developing and planning of a scientific project, Phase 2- Implementation of a research plan

devised in Phase 1, and Phase 3– writing a scientific report about the research project. In the practical course, students are trained to scrutinize a research question related to nutrition science and biomedicine as predefined by the supervisor. The research internship embeds in a defined research context at the respective chair/laboratory/department hosting the student. High intensity supervision of students by experienced scientific personnel supports the training success. Students document their research work in a dedicated lab notebook, with a focus on detailed description of applied methodologies, data acquisition and data analyses. They report to their supervisor on the progress of their work in regular meetings and summarize the goals of their research project and the main findings in short oral presentations, using PowerPoint, or equivalent presentation tools. Within this setting, the project progress and plans to further develop the project are discussed.

Media:

Reading List:
Review articles and original research articles related to the topic of the research internship. The supervisor assists the
student to find the relevant papers and recommends specialized textbooks.

Responsible for Module:
Klingenspor, Martin; Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
External: Research Internship (4 weeks) Nutrition and Immunology (Prof. Haller) - Master (Forschungspraktikum, 1 SWS)
Aguanno D, Coleman O, Haller D, Metwaly A, Omer H, Schmöller I, Schwamberger S

Research Internship (4 weeks) Food and Bioprocess Engineering (Prof. Kulozik) - Master (Forschungspraktikum, 7 SWS)
Ambros S, Kalinke I, Kürzl C, Reiter M

External: Research Internship (4 weeks) Food and Bioprocess Engineering (Prof. Kulozik) - Master (Forschungspraktikum, 1 SWS)
Ambros S, Kalinke I, Kürzl C, Reiter M

External: Research Internship (4 weeks) Nutritional Medicine (Prof. Hauner) - Master (Forschungspraktikum, 1 SWS)
Bader B, Skurk T

Research Internship (4 weeks) Nutritional Medicine (Prof. Hauner) - Master (Forschungspraktikum, 7 SWS)
Bader B, Skurk T

Research Internship (4 weeks) Brewing and Beverage Technology (Prof. Becker) - Master (Forschungspraktikum, 7 SWS)
Becker T [L], Becker T

External: Research Internship (4 weeks) Brewing and Beverage Technology (Prof. Becker) - Master (Forschungspraktikum, 1 SWS)
Becker T [L], Becker T

Research Internship (4 weeks) Molecular Nutritional Medicine (Prof. Klingenspor) - Master (Forschungspraktikum, 7 SWS)
Fromme T

External: Research Internship (4 weeks) Molecular Nutritional Medicine (Prof. Klingenspor) - Master (Forschungspraktikum, 1 SWS)
Fromme T

Research Internship (4 weeks) Nutrition and Immunology (Prof. Haller) - Master (Forschungspraktikum, 7 SWS)
Haller D [L], Aguanno D, Coleman O, Haller D, Kießling S, Metwaly A, Omer H, Schmöller I

External: Research Internship (4 weeks) Nutritional Medicine (Praktikum, 1 SWS)
Hauner J [L], Bader B

Research Internship (4 weeks) Nutritional Medicine (Praktikum, 7 SWS)
Hauner J [L], Bader B

Research Internship (4 weeks) Bewegung, Ernährung und Gesundheit (Forschungspraktikum, 7 SWS)
Köhler K

Research Internship (4 weeks) Livestock Biotechnology (Prof. Schnieke) - Master (Forschungspraktikum, 7 SWS)
Schnieke A

External: Research Internship (4 weeks) Livestock Biotechnology (Prof. Schnieke) - Master (Forschungspraktikum, 1 SWS)
Schnieke A

Research Internship (4 weeks) Nutritional Systems Biology (Prof. Somoza) - Master (Forschungspraktikum, 7 SWS)
Somoza V

Research Internship (4 weeks) Metabolic Programming (Prof. Uhlenhaut) - Master (Forschungspraktikum, 7 SWS)

Uhlenhaut N [L], Greulich F, Spanier B, Strickland B, Uhlenhaut N, Xing Z

External: Research Internship (4 weeks) Metabolic Programming (Prof. Uhlenhaut) - Master (Forschungspraktikum, 1 SWS)
Uhlenhaut N [L], Greulich F, Spanier B, Uhlenhaut N
For further information in this module, please click campus.tum.de or here.

Module Description

WZ1676: Sustainable Land Use and Nutrition | Sustainable Land Use and Nutrition

Version of module description: Gültig ab summerterm 2022

Module Level: Bachelor	**Language:** English	**Duration:** one semester	**Frequency:** summer semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
During the participation in the lecture (usually Friday + Saturday), students give talks on given topics (10 min per student plus 5 min discussion und questions per student). Here, the students demonstrate that they have gained deeper knowledge of a given topic by using literature and are able to present their knowledge and discuss it. In the written examination (90 min) at the end of the semester students demonstrate the theoretical knowledge of the various perspectives of sustainable land use and nutrition by answering questions under time pressure and without helping material.
The final grade is a combined grade from the written examination (50 %) and from the student's talk (50 %).

Repeat Examination:
End of Semester

(Recommended) Prerequisites:

Content:
The module provides an overview on the various perspectives of sustainable land use and nutrition. An introduction establishes the structure of the module, which follows a supply chain: 1) The production of commodities addresses: Availability of soil resources; ecology and history of landscapes; terrestrial ecology; horticultural products for sustainable nutrition; integrative land-use concepts; production technology. 2) The distribution of commodities (transport, storage) is analyzed under the aspects of resource economics. 3) Sustainability of processing. 4) The distribution through trade and services is focused by sustainable marketing concepts. 5) Finally, consumer affairs are addressed by health aspects in the context of global nutrition; food safety; new designed food.

Intended Learning Outcomes:
The students know about the great variety of sustainability aspects in land use and nutrition. They understand the preconditions to understand the complexity and interconnectedness of multiple sectors. Students are able to analyze sustainability concepts and to transfer them to new problems. They understand that only a comprehensive perspective will lead to sustainable concepts for land use and nutrition.

Teaching and Learning Methods:
Lecture, discussion, students' talks

Media:
PowerPoint, research literature on moodle, Handouts

Reading List:
Each lecturer provides a list of articles regarding his/her topic on moodle and also during the lecture itself.

Responsible for Module:
Knoke, Thomas; Prof. Dr. rer. silv.

Courses (Type of course, Weekly hours per semester), Instructor:
Sustainable Land Use and Nutrition (Vorlesung, 4 SWS)
Windisch W [L], Abate Kassa G, Albrecht H, Bernhardt H, Bucka F, Eisner P, Hauner J, Knoke T, Langowski H, Leonhardt S, Roosen J, Schad P, Stark T, Windisch W
For further information in this module, please click campus.tum.de or here.

Module Description

WZ2682: Sensory and Behavioral Neurogenetics | Sensory and Behavioral Neurogenetics

Version of module description: Gültig ab summerterm 2020

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** summer semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The module examination consists of a written exam (90 min), where students are expected to remember and reproduce topics that were covered in the lecture (theories of behavioral analysis, methods, examples etc.) without additional aids. The exam will consist of multiple choice, free formulations, tables to be completed and interpretations of schemes etc. In addition, students will write an essay based on literature research on a topic that was discussed in the lecture. Topics will be assigned by the lecturer after discussion with the student. The module is passed, when the essay is successfully completed and the grade of the written exam is at least 4,0.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Basic knowledge of neurobiology and genetics are obligatory.

Content:
LECTURE: once a week during the semester for two hours including a break, the lecture will cover the following topics:

• general introduction, deepening of knowledge in form, function, and networks of synaptic connections and nervous systems.
• the role of model animal systems in neuroscience
• illustration and deeper understanding of neuroscience research on the example of sample publications covering model system (including genetic models) such as worm, fly, fish, mouse, monkey, primate.
• Analysis and explanation of model specific methods such as automated behavioral analysis, in vivo imaging, electrophysiology, multiphoton microscopy, live microscopy, modeling

• Examples describing the role of internal state and behavioral context including the role of neuromodulation
• translation and general meaning of results obtained in model organisms
• evolution of neuronal networks and their translational meaning

EXERCISE: The exercise consists of a home assignment, independent literature research and writing of an essay. The topic will be assigned after consultation with the lecturer.

Intended Learning Outcomes:
Upon successful completion of the module, students:
• know important definitions and methods in neurogenetics and behavioral analysis, and why and how they are used in model organisms.
• understand the terms optogenetics, chemogenetics, calcium imaging, connectomics, system neuroscience, neuronal networks, phsychophysics, neuromodulation and can explain them.
• are able to interpret, analyse and develop results obtained in behavioral studies, neurophysiology and neuroanatomy.

Teaching and Learning Methods:
LECTURE: In the lecture material will be presented in a powerpoint presentation, which features many examples, pictures, schemes, videos. In addition, at the beginning of each lecture the content of the previous lecture will be summarized and open questions will be discussed. At the end of each lecture, a list of 'take home messages' will be given. EXERCISE: The exercise consists of a written essay that students will write over the course of several weeks following independent literature research at home. The topic of the essay will follow the topics covered in the lecture and will be assigned by the lecturer after consulting with the student. The aim is too deepen the student's knowledge in a topic of the lecture that is of particular interest to them. To this end, they will use online literature search tools such as Pubmed and Google, but also in person interviews or other sources that they deem informative. The lecturer will be available to discuss content and structure.

Media:
Pubmed, ejournals, video materials, online databases

Reading List:
Standard textbook: Eric Kandel (editor), Principles of Neural Sciences; various journal articles (list will be made available in class)

Responsible for Module:
Grunwald, Ilona; Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:

For further information in this module, please click campus.tum.de or here.

Module Description

WZ2727: Sustainability of Food Chains | Sustainability of Food Chains

Version of module description: Gültig ab winterterm 2015/16

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Combination of Poster and oral presentation provides to assess the students ability to conduct a life cycle analysis of a special food product. The poster needs a very concentrated presentation, focus on the important information and factors and shows the students capability to understand the principles of the LCA and the special food production process.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Attendance in Module 4209 and 4210 is recommended.

Content:
Food chains of processed food, from agricultural production via processing to packed product unit in a food store, principles of life cycle analysis, assessment criteria, energy input output ratio, energy efficiency, CO2 emission, carbon footprint, virtual water
LCA calculation and calculation program (Umberto).

Intended Learning Outcomes:
At the end of the module the students are able to understand food chains. They can describe and apply life cycle analysis to processed food products. They are able to assess energy and emission impact of different crop and animal production system and processing procedures. The will get basic skills of the software Umberto.

Teaching and Learning Methods:
Teachers Presentations Life cycle analysis, food chain, energy, CO2 emission and water impacts, students contributions, special aspects of processing paper reading for contributions to group discussions and outline of the final presentation.

Media:
Presentation notes, computer program.

Reading List:
Tba

Responsible for Module:
Dipl. Ing. Max Kainz - Lehrstuhl für Ökologischen Landbau und Pflanzenbausysteme Liesel Beckmann Str. 2, 85354 Freising, 08161/71 - 3034, kainz@wzw.tum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Sustainabilityof Food Chains
Max Kainz
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3055: Transgenic and Stem Cell Biotechnology | Transgenic and Stem Cell Biotechnology

Version of module description: Gültig ab winterterm 2012/13

Module Level: Master	**Language:** German	**Duration:** one semester	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 150	**Contact Hours:** 0

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:

Repeat Examination:

(Recommended) Prerequisites:

Content:

Intended Learning Outcomes:

Teaching and Learning Methods:

Media:

Reading List:

Responsible for Module:

Courses (Type of course, Weekly hours per semester), Instructor:
Transgenic and Stem Cell Biotechnology (Vorlesung, 2 SWS)
Schnieke A, Flisikowska T, Fischer K

Transgenic and Stem Cell Biotechnology (Seminar, 2 SWS)
Schnieke A, Flisikowska T, Rieblinger B
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3239: The Theoretical and Practical Basics of Systemic Energy Balance Regulation | The Theoretical and Practical Basics of Systemic Energy Balance Regulation

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 90	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Oral exam: 20 min.

Repeat Examination:
End of Semester

(Recommended) Prerequisites:
participation in the lecture "Energy Balance Regulation" from the 1st term is recommended

Content:
The course will deepen the theoretical and practical knowledge on how energy metabolism is regulated and
measured on the organismal and cellular level. The course starts with a refreshment of the knowledge obtained in
the lecture “Energy Balance Regulation” from the 2nd term. We then in depth discuss the most important theoretical
and practical basics of energy balance regulation. This includes in depth discussion on relevant central and
peripheral pathways and signal mechanisms implicated in systemic energy balance regulation as well as the
principles of measuring relevant endpoints in rodent studies, such as e.g. indirect and direct calorimetry, pairfeeding
studies and in vivo measurement of glucose metabolism and insulin sensitivity.

Intended Learning Outcomes:
At the end of the course, the students can explain the most common signal mechanisms underlying the regulation of
energy metabolism and the respective hormones regulating food intake and energy expenditure. Furthermore, the
students can explain the most common theoretical and practical basics of how systems metabolism is measured
including what the pros and cons of the different techniques are.

Teaching and Learning Methods:
teaching methods: lecture (2 SWS), seminar (2 SWS):
The lecture (2SWS) is best described as interactive frontal treaching, meaning that state-of-the art scientific context
is presented by the lecturer and is then discussed in the audience. Each lecture starts with a summary of the last
leture, giving students the possibility to ask questions and to discuss topics between lectures and topics. It is key
that the students prepare the lectures independently to best inspire interactive communication.
The seminar (2SWS) is organized in that the students prepare and present a research manuscript on a topic
choosen by the teacher. The content of the manuscript is then reviewed by the student presenting, followed by in
depth discussion in the group. It is key to understand and reflect not only the key scientific message of the
manuscripts, but also to critically assess the pitfalls and limitations of the studies presented. The overall goal of the
seminar is tio sharpen the view of the investigator to read and to understand top class scientific manuscripts and to
present in front of a class.
learning methods: literature search, preparation and holding of presentations, open discussions in small groups

Media:
PowerPoint, Flipchart

Reading List:

Responsible for Module:
Timo Müller timo.mueller@helmholtz-muenchen.de

Courses (Type of course, Weekly hours per semester), Instructor:
The theoretical and practical basics of systemic energy balance regulation (Seminar, 2 SWS)
Müller T

The theoretical and practical basics of systemic energy balance regulation (Vorlesung, 2 SWS)
Müller T
For further information in this module, please click campus.tum.de or here.

Module Description

WZ5150: Sugar, Sugar Products and Alkaloid Containing Food | Zucker, Zuckererzeugnisse und alkaloidhaltige Lebensmittel

Version of module description: Gültig ab winterterm 2015/16

Module Level: Bachelor	**Language:** German	**Duration:** one semester	**Frequency:**
Credits:* 5	**Total Hours:** 150	**Self-study Hours:** 120	**Contact Hours:** 30

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Die Modulprüfung ist schriftlich (60 min). Es sind keine Hilfsmittel zugelassen. Die Studierenden müssen mittels geeigneter Skizzen und Fließschemata die Herstellung von Zucker, Zuckererzeugnissen und alkaloidhaltigen Lebensmittelen darstellen. Die Fragen müssen mit eigenen Worten beantwortet werden. Grundlegende Geräteskizzen und Funktionen der wichtigsten Kernstücke müssen skizziert und in eignen Worten beschrieben werden.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Grundlegende Kenntnisse in anorganischer und organischer Chemie sowie allgemeiner Lebensmitteltechnologie .

Content:
Die Themenschwerpunkte des Moduls "Zucker, Zuckererzeugnisse und alkaloidhaltige Lebensmittel" sind:
- Gewinnung, Herstellung und Verarbeitung von Kaffee, Tee, Kakao, Tee- und Kakaobohnenfermentation
- Kaffeeröst- und Entcoffeinierungsverfahren
- Instantkaffee
- Schokoladentechnologie
- Saccharosegewinnung aus Zuckerrübe und Zuckerrohr
- Gewinnung, Herstellung und technologische Verwendungsmöglichkeiten von Glucose (Dextrose), Fructose, Lactose, Stärkeverzuckerungserzeugnissen, HFCS, Zuckeralkoholen, Zuckeraustauschstoffen und Süßstoffen
- Zuckerwaren und Speiseeis.

Intended Learning Outcomes:
Nach der Teilnahme an der Veranstaltung sind die Studierenden in der Lage, die grundlegende Chemie und Technologie bei der Gewinnung und Verarbeitung von Tee, Kaffee, Kakao sowie von Zuckern und Zuckererzeugnissen zu verstehen. Sie können den grundlegende Aufbau von Geräten zur Verarbeitung der Produkte selbstständig darstellen.

Teaching and Learning Methods:
PowerPoint- und videounterstützte Vorlesung

Media:
PowerPoint Präsentation. Videos zu ausgewählten Prozessen.

Reading List:
1) Osterroth, D. (Hrsg.): Taschenbuch für Lebensmittelchemiker und -technologen II. (Springer-Verlag)
2) Heiss, R. (Hrsg.): Lebensmitteltechnologie: Biotechnologische, chemische, mechanische und thermische Verfahren der Lebensmittelverarbeitung. (Springer)
3) Belitz, H.D., Grosch, W., Schieberle, P.: Lehrbuch der Lebensmittelchemie (Springer)
4) Vorlesungsbegleitendes Skript

Responsible for Module:
Dr. rer. nat. Walter Weiss walter.weiss@mytum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Zucker und Zuckererzeugnisse und alkaloidhaltige Lebensmittel (Vorlesung, 2 SWS)
Weiss W
For further information in this module, please click campus.tum.de or here.

Module Description

ME2453: Molecular Pathology and Organ-Specific Carcinogenesis | Molekulare Pathologie und organspezifische Karzinogenese

Version of module description: Gültig ab summerterm 2021

Module Level: Master	**Language:** German/English	**Duration:** one semester	**Frequency:** winter/summer semester
Credits:* 6	**Total Hours:** 180	**Self-study Hours:** 120	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Die regelmäßige Teilnahme an den Vorlesungen "Molekulare Pathologie" und "Organspezifische Molekulare Karzinogenese" ist erforderlich. Zwei Klausuren (jeweils 90 min, Single choice, benotet) dienen der Überprüfung der in den Vorlesungen erworbenen theoretischen Kompetenzen. Aufgrund des Pandemiegeschehens hat der/die Studierende auch die Möglichkeit, an einer beaufsichtigten elektronischen schriftlichen Fernprüfung (Aufsicht mit Proctorio, 90 min.) teilzunehmen (Onlineprüfung: me555o +me654o).
Diese schriftliche Prüfung wird zeitgleich parallel in Präsenz angeboten (me555+ me564)

No aids may be used in the examinations. The examination questions cover the entire lecture material. Students have the task of marking the correct answer(s) to 20 questions per exam from four given answers per question. The exams test the students' expertise and check whether they are able to combine and interpret the acquired knowledge. The two lectures can be attended in the same or different semesters. The overall grade of the module is made up of both exam grades.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
The basic knowledge of molecular biology and genetics acquired during the bachelor's program should be sufficient for understanding the lectures. Attending other modules is not required.

Content:
The lecture "Molecular Pathology" teaches methodological basics of tissue analysis on the highest scientific level and deals with interdisciplinary aspects of pathological processes. Special emphasis

is placed on oncogenes and tumor suppressor genes, cell adhesion and metastasis, signal transduction, cell cycle and apoptosis, angiogenesis, environmental carcinogenesis and cancer stem cells. This will provide an understanding of the molecular mechanisms of oncogenesis. In the lecture "Organ-Specific Molecular Carcinogenesis", basic tumor classifications are explained and organ-specific carcinogenesis is explained in detail and in an understandable way for carcinomas of the stomach, colon, liver, pancreas, mamma, lung and urogenital tract. In addition, leukemias and lymphomas, brain tumors, and endocrine tumors are covered. In addition, leukemias and lymphomas, brain tumors and endocrine tumors are treated.

Intended Learning Outcomes:
After attending the two lectures, the students will have basic knowledge of molecular pathology, molecular pathological working techniques and organ-specific molecular carcinogenesis. They should have learned to understand molecular pathological questions and working techniques and to develop solutions independently, to understand molecular mechanisms of oncogenesis and to recognize interrelationships and particularities of carcinogenesis of different organs. The module should provide an insight into human pathology and arouse interest in the diagnosis and therapy of cancer.

Teaching and Learning Methods:
Course type/teaching technique: Lecture, teaching method: lecture; learning activities: study of lecture material, lecture notes and literature

Media:
Presentations via Powerpoint,
Script (download option for lecture material)

Reading List:
There is no textbook available that covers all contents of this module. It is recommended as a basis or as a addition:
C. Wagener, O.Müller (Hsg.) Molecular Oncology, Georg Thieme Verlag, Stuttgart, 2010.

Responsible for Module:
Luber, Birgit; Apl. Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
Organspezifische Molekulare Karzinogenese (Vorlesung, 2 SWS)
Luber B [L], Luber B, Azimzadeh O, Becker K, Keller G, Kuhn P, Muckenhuber A, Nawroth R, Neff F, Pellegata N, Sarker R

Molekulare Pathologie (Vorlesung, 2 SWS)
Luber B [L], Luber B, Becker K, Azimzadeh O, Keller G, Kuhn P, Mörtl S, Pellegata N, Rosemann M
For further information in this module, please click campus.tum.de or here.

Module Description

me551: Specialized Topics in Immunology | Spezielle Immunologie [ME551_Imm2]

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**Language:** German/English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 3	**Total Hours:** 90	**Self-study Hours:** 64	**Contact Hours:** 26

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Prüfungsdauer (in min.): 60 schriftlich (im Anschluss an die Vorlesung)
In der Prüfung werden Kenntnisse zu den aktuellen wissenschaftlichen Fragestellungen im Bereich der Immunologie abgefragt. Die Fähigkeit, diese Fragestellungen im immunologischen Gesamtkontext einzuordnen und kritisch zu bewerten, wird überprüft. Die Studierenden sollen belegen, dass sie die zur Bearbeitung dieser Fragestellungen relevanten methodischen Ansätze, sowie deren Grenzen verstanden haben und entsprechend beurteilen können. Die Studierenden sollen mit dem Nachweis dieser Kenntnisse einen soliden Wissensschatz als Grundlage für eine eigene Forschungstätigkeit im Rahmen einer Masterarbeit im Bereich der Immunologie belegen können.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Erfolgreicher Abschluss des Moduls 'Immunologie 1'. Wurde dieses Modul zuvor nicht besucht, können unter Umständen vergleichbare Studienleistungen als Zugangsvoraussetzung anerkannt werden.

Content:
Das Modul 'Immunologie 2' richtet sich an Studierende, die - aufbauend auf dem Modul 'Immunologie 1' - ihre Kenntnisse der Immunologie vertiefen möchten. Die Vorlesung 'Spezielle Immunologie' behandelt Fragestellungen aus der aktuellen immunologischen Forschung.
Das Grundwissen über die Mechanismen der Immunabwehr soll durch die Betrachtung komplexerer immunologischer Sachverhalte (z.B. die genauen immunologischen Vorgänge bei Autoimmunerkrankungen und Tumorerkrankungen) erweitert werden. Außerdem werden

offene Fragen in der immunologischen Forschung aufgezeigt und aktuelle Forschungsergebnisse behandelt.

Intended Learning Outcomes:
Nach der Absolvierung dieses Moduls sind die Studierenden in der Lage, die wichtigsten experimentellen Methoden zur Untersuchung immunologischer Fragestellungen zu verstehen. Der Besuch der Vorlesung ermöglicht es den Studierenden, auch kompliziertere experimentelle Ansätze anhand von konkreten wissenschaftlichen Fragestellungen zu verstehen und einen tiefen Einblick in aktuelle immunologische Forschungsgebiete zu erhalten.
Der Besuch der Vorlesung bildet die Basis für die Fähigkeit, das im Verlauf des Moduls 'Immunologie 1' erlangte Grundwissen der Immunologie auch auf unbekannte Sachverhalte anzuwenden, immunologische Fragestellungen zu bewerten und unter Umständen eigene Lösungsansätze zu entwickeln. Der Besuch dieses Moduls legt die Grundlagen für weitere immunologische Forschung des Studierenden in entweder einer Master- oder auch Doktorarbeit.

Teaching and Learning Methods:
Das Modul besteht aus einer Vorlesung:

“Spezielle Immunologie für Biologen, Biochemiker, Molekulare Biotechnologen und Mediziner” LV Nummer 240657537)

Media:
Präsentationen mittels Powerpoint, Skript (Downloadmöglichkeit für Vorlesungsmaterial)

Reading List:
wissenschaftliche Originalarbeiten (durch die Dozenten empfohlen)

Janeway's Immunobiology (Englisch) by Kenneth Murphy, Will Travers und Walport, Verlag: Garland Publishing Inc. ISBN-10: 0815344627.

Abul K. Abbas, Andrew H. Lichtman und Shiv Pillai: Cellular and Molecular Immunology (Englisch), Verlag: Saunders, ISBN-10: 9781416031239.

Responsible for Module:
Dirk Busch (dirk.busch@tum.de)

Courses (Type of course, Weekly hours per semester), Instructor:
Spezielle Immunologie für Biologen, Biochemiker, Molekulare Biotechnologen und Mediziner (Vorlesung, 2 SWS)
Buchholz V, Busch D, Friedrich V, Gerhard M, Hochrein H, Keppler S, Kohleisen B, Mejias Luque R, Meyer H, Neuenhahn M, Prazeres da Costa C, Prodjinotho U, Rosenbaum M, Schiemann M, Schumann K
For further information in this module, please click campus.tum.de or here.

Accredited Elective Modules | Wahlmodule auf Antrag

Module Description

WZ2048: Biology and Diagnostics of Pathogenic Bacteria - an Introduction | Einführung in die Biologie und Diagnostik pathogener Bakterien

Version of module description: Gültig ab winterterm 2021/22

Module Level: Master	**Language:** German	**Duration:** one semester	**Frequency:** winter semester
Credits:* 3	**Total Hours:** 60	**Self-study Hours:** 30	**Contact Hours:** 30

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Eine Klausur (60 min, benotet) dient der Überprüfung der erlernten theoretischen Kompetenzen. Die Studierenden zeigen in der Klausur, ob sie in der Lage sind, das erlernte Wissen über humanpathogene Bakterien sowie ihre Diagnostik zu strukturieren und die wesentlichen Aspekte darzustellen. Sie sollen die erarbeiteten Informationen beschreiben, interpretieren, sinnvoll kombinieren und auf ähnliche Sachverhalte übertragen können.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Vorlesung und Praktikum Allgemeine Mikrobiologie

Content:
Short overview:
Part I: Biology of pathogenic bacteria
Humans and microbes. Basic lectures from Robert Koch. Introduction to pathogenicity and virulence. Host defense systems. Defense systems of pathogens. Adhesion to the host cell. Intracellular pathogens. Bacterial toxins
Part II: Diagnostics of pathogenic bacteria
Taxonomy. Identification. Diagnostic procedure. Epidemiology.

Intended Learning Outcomes:
This lecture offers basic knowledge in the following fields: Taxonomy and identification of bacterial pathogens, mechanisms ofinteraction of pathogens with human hosts, biochemicl and molecular basis of diagnostic tools, epidemiological applications. In summary, the student shall aquire the ability to appreciate the impact of bacterial pathogens in the fields of medicine and food biotechnology.

Teaching and Learning Methods:
Lehrtechniken: Vorlesung
Lehrmethode: Vortrag, Fallstudien, interaktiver Diskurs mit Studenten während der Vorlesung.
Lernaktivitäten: Auswendiglernen; Lösen von Übungsaufgaben, Studium von Literatur

Media:
Tafelarbeit, PowerPoint Präsentationen, Filme.
Ausgabe von Vorlesungsfolien und Übungsfragensammlung.

Reading List:
Salyers AA, Whitt DD (2011) Bacterial pathogenesis: A molecular approach. ASM Press, Washington, 3. Auflage.
Hof H, Dörries R (2009) Medizinische Mikrobiologie. 4. Auflage.

Responsible for Module:
Hall, Lindsay; Prof. Dr.

Courses (Type of course, Weekly hours per semester), Instructor:
Einführung in die Biologie humanpathogener Bakterien (Vorlesung, 2 SWS)
Hall L
For further information in this module, please click campus.tum.de or here.

Requirement Proof of Proficiency in German | Nachweis Deutschkenntnisse

Module Description

WZ8000: Accredited Requirement Proof of Proficiency in German | Anerkennung Nachweis Deutschkenntnisse

Version of module description: Gültig ab summerterm 2018

Module Level:	Language:	Duration:	Frequency:
Credits:*	**Total Hours:**	**Self-study Hours:**	**Contact Hours:**

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:

Repeat Examination:

(Recommended) Prerequisites:

Content:

Intended Learning Outcomes:

Teaching and Learning Methods:

Media:

Reading List:

Responsible for Module:

Courses (Type of course, Weekly hours per semester), Instructor:

For further information in this module, please click campus.tum.de or here.

Module Description

SZ03011: Intensive Course German as a Foreign Language A1.1 | Blockkurs Deutsch als Fremdsprache A1.1

Version of module description: Gültig ab summerterm 2010

Module Level: Bachelor/Master	**Language:** Language taught	**Duration:** one semester	**Frequency:** winter/summer semester
Credits:* 4	**Total Hours:** 120	**Self-study Hours:** 60	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
1 final written exam 90 min. (100%) - no learning aids permitted
The midterm exam is intended to monitor students' learning progress and reduce the amount of material covered in the final exam.
Written exams will assess students level of acquisition of the learning outcomes specified in the module description. Specifically, exam questions focus on the usage of vocabulary and grammar, as well as reading comprehension and text production. Listening comprehension is tested by posing questions based on audio samples to which students respond in writing. Verbal skills are evaluated using appropriate prompts from sample print dialogs.

Repeat Examination:

(Recommended) Prerequisites:
none

Content:
In this module, students acquire basic knowledge of the German language, including intercultural and regional aspects, that will enable them to express themselves in everyday situations, such as shopping, going to a restaurant, public transport etc.
Students learn and practice basic vocabulary on topics such as family, occupation, leisure time, food and living, plural noun forms, personal and demonstrative pronouns and simple forms of negation. They become familiar with numbers, prices and time, learn how to ask and answer simple questions about a person or family, as well as talk about matters of everyday life in simply structured sentences in the simple present.
Students learn different strategies for effective, self-motivated, independent learning. Students acquire teamwork skills through collaborative work in multinational mixed groups.

Intended Learning Outcomes:
The module is based on level A1 of GER.
Upon completion of this module, students are able to express themselves using everyday expressions and simple sentences. They are able to introduce themselves and other people, they can ask and answer simple questions about personal details, describe daily routines in a simple manner and provide information about themselves in writing in simple sentences.
Furthermore, students are able to communicate their wishes, if dialog partners are willing to help and to speak slowly and clearly.

Teaching and Learning Methods:
The module consists of a seminar covering material appropriate to desired learning outcomes and encompassing relevant listening, reading, writing and speaking exercises. These exercises may take the form of individual, partner or group work, implementing a communicative and activity-oriented approach. Students have the opportunity to deepen basic knowledge conveyed in the seminar through independent study and work, using specified (online) materials covering fundamental grammar and communication patterns of the foreign language.
Voluntary homework (preparation and follow-up work) reinforces classroom and structured learning.

Media:
Textbook; multimedia teaching and learning materials (chalk/white board, overheads, worksheets, images, films, etc.) and online resources

Reading List:
Textbook (to be announced in class)

Responsible for Module:

Courses (Type of course, Weekly hours per semester), Instructor:

For further information in this module, please click campus.tum.de or here.

Module Description

SZ03021: Intensive Course German as a Foreign Language A1.2 | Blockkurs Deutsch als Fremdsprache A1.2

Version of module description: Gültig ab winterterm 2015/16

Module Level: Bachelor/Master	**Language:** Language taught	**Duration:** one semester	**Frequency:** winter/summer semester
Credits:* 4	**Total Hours:** 120	**Self-study Hours:** 60	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
1 final written exam 90 min. (100%) - no learning aids permitted
The midterm exam is intended to monitor students' learning progress and reduce the amount of material covered in the final exam.
Written exams will assess students level of acquisition of the learning outcomes specified in the module description. Specifically, exam questions focus on the usage of vocabulary and grammar, as well as reading comprehension and text production. Listening comprehension is tested by posing questions based on audio samples to which students respond in writing. Verbal skills are evaluated using appropriate prompts from sample print dialogs.

Repeat Examination:

(Recommended) Prerequisites:
Firm knowledge of level A1.1; placement test with the achievement A1.2

Content:
In this module, students acquire basic knowledge of the German language, including intercultural and regional aspects, that will enable them to express themselves in everyday situations, such as shopping, going to a restaurant, public transport etc.
Students learn and practice basic vocabulary on topics such as family, occupation, leisure time, food and living. They learn to talk about matters of everyday life in simply structured sentences in the tenses simple present and present perfect simple and practice the usage of modal verbs, the imperative and the two-case preposition.
Students learn different strategies for effective, self-motivated, independent learning. They acquire teamwork skills through collaborative work in multinational mixed groups.

Intended Learning Outcomes:
The module is based on level A1 of GER.
Upon completion of this module, students are able to express themselves using everyday expressions and simple sentences.
Students are able to answer simple questions about themselves and their family and pose questions, in kind, to a dialog partner. They are able to arrange meetings and provide information about themselves in writing. They are able to describe daily routines in the past and present tense and can successfully communicate their wishes in everyday situations, such as going shopping or eating in a restaurant, with dialog partners who are willing to help and speak slowly and clearly.

Teaching and Learning Methods:
The module consists of a seminar covering material appropriate to desired learning outcomes and encompassing relevant listening, reading, writing and speaking exercises. These exercises may take the form of individual, partner or group work, implementing a communicative and activity-oriented approach. Students have the opportunity to deepen basic knowledge conveyed in the seminar through independent study and work, using specified (online) materials covering fundamental grammar and communication patterns of the foreign language.
Voluntary homework (preparation and follow-up work) reinforces classroom and structured learning.

Media:
Textbook; multimedia-based teaching and learning materials (black board, overheads, exercise sheets, image, film, etc.) also online

Reading List:
Textbook (to be announced in class)

Responsible for Module:

Courses (Type of course, Weekly hours per semester), Instructor:

For further information in this module, please click campus.tum.de or here.

Module Description

SZ03031: Intensive Course German as a Foreign Language A2.1 | Blockkurs Deutsch als Fremdsprache A2.1

Version of module description: Gültig ab winterterm 2015/16

Module Level: Bachelor/Master	**Language:** German	**Duration:** one semester	**Frequency:** winter/summer semester
Credits:* 4	**Total Hours:** 120	**Self-study Hours:** 60	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
1 final exam 90 min. (100%) - no learning aids permitted
The midterm exam is intended to monitor students' learning progress and reduce the amount of material covered in the final exam. Written exams will assess students level of acquisition of the learning outcomes specified in the module description. Specifically, exam questions focus on the usage of vocabulary and grammar, as well as reading comprehension and text production. Listening comprehension is tested by posing questions based on audio samples to which students respond in writing.
Verbal skills are evaluated using appropriate prompts from sample print dialogs.

Repeat Examination:

(Recommended) Prerequisites:
Firm knowledge of level A1.2; placement test with the achievement A2.1

Content:
In this module, students acquire basic knowledge of the German language, including intercultural and regional aspects, that will enable them to express themselves in everyday situations, such as traveling, at the doctor’s office, searching for an apartment, in a department store, among colleagues, friends or neighbors.

Students learn and practice basic vocabulary and expressions on topics such as education, profession, health and traveling. Students learn and practice using simply structured main and subordinate clauses (that, because, and, than, etc.), employing the preterit (modal verbs) and perfect, as well as the comparative, the superlative and the declination of the adjective. They reinforce and expand the usage of the prepositions in the accusative and dative case.

Students learn strategies for successful verbal and written communication despite minimal language skills. Opportunities will be made available for effective, self-motivated, independent learning. Students acquire teamwork skills through collaborative work in multinational mixed groups.

Intended Learning Outcomes:
The module is based on level A2 of GER.
Upon completion of this module, students are able to understand and use simple sentences and expressions in conversations on a broad spectrum of familiar topics. These conversations are based on basic information concerning everyday life and subjects relevant to studying or working, including sociocultural aspects of German-speaking countries.
For example, students are able to describe themselves and other people, their living situation, state of health, leisure time activities and job situation.
Students are able to understand longer texts and letters about familiar topics that include foreseeable information and are written in simple language about everyday life or job related topics. Students are able to compose short, informative texts or notifications about basic situations in everyday life or situations related to studying.

Teaching and Learning Methods:
The module consists of a seminar covering material appropriate to desired learning outcomes and encompassing relevant listening, reading, writing and speaking exercises. These exercises may take the form of individual, partner or group work, implementing a communicative and activity-oriented approach. Students have the opportunity to deepen basic knowledge conveyed in the seminar through independent study and work, using specified (online) materials covering fundamental grammar and communication patterns of the foreign language.
Voluntary homework (preparation and follow-up work) reinforces classroom and structured learning.

Media:
Textbook; multimedia-based teaching and learning materials (black board, overheads, exercise sheets, image, film, etc.) also online

Reading List:
to be announced in the Class

Responsible for Module:

Courses (Type of course, Weekly hours per semester), Instructor:
Blockkurs Deutsch als Fremdsprache A2.1 (Seminar, 4 SWS)
Gemaljevic J, Kretschmann A, Niebisch D, Semeraro G
For further information in this module, please click campus.tum.de or here.

Module Description

SZ03051: Intensive Course German as a Foreign Language B1.1 | Blockkurs Deutsch als Fremdsprache B1.1

Version of module description: Gültig ab winterterm 2015/16

Module Level: Bachelor/Master	**Language:** German	**Duration:** one semester	**Frequency:** winter/summer semester
Credits:* 4	**Total Hours:** 120	**Self-study Hours:** 60	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
1 schriftlicher End Term Test 90 min. (100%) - keine Hilfsmittel erlaubt
In der schriftlichen Prüfung werden die in der Modulbeschreibung angegebenen Lernergebnisse geprüft. Sie beinhaltet Fragen zur Anwendung von Wortschatz und Grammatik, zu Text- bzw. Leseverstehen, sowie Aufgaben zur freien Textproduktion. Das Hörverstehen wird anhand von Hörbeispielen mit Hörverstehens-Fragen überprüft, die schriftlich beantwortet werden müssen. Mündliche Reaktionsfähigkeiten werden anhand der Anwendung entsprechender Redemittel in schriftlichen Dialogbeispielen überprüft.

Repeat Examination:

(Recommended) Prerequisites:
Sound knowledge of level A2.2; placement test level B1.1

Content:
In this module, knowledge of German as a foreign language will be further developed, enabling students to express themselves in German independently and confidently in familiar situations, e.g. in the classroom, at work, in free time and with the family, on topics of general interest, e.g. films, music, sports, etc, when standard German is spoken. Students expand and test a basic repertoire of logical main and subordinate clauses (final clauses, consecutive clauses, relative clauses), learn and practice the use of reflexive verbs, the function and use of second subjunctive and the passive. They review and develop elementary aspects of grammar, such as the use of the tenses and prepositions. They examine specific cultural features with regard to festivals and traditions, the educational system, the business world, lifestyles and leisure activities, and obtain insight into contemporary culture in Germany.

Intended Learning Outcomes:
The module is aimed at level B1 of the CEFR. Students acquire knowledge of German as a foreign language at the standard language level with a focus on intercultural, cultural and academic aspects. Students obtain team competence through collaborative work in mixed, multinational groups. Following completion of this module, students can make themselves understood in most situations which occur in the context of studies, career and leisure time in German speaking regions. They can report on academic and business careers; express hopes and wishes; make, accept or reject invitations; give advice and directions; express and discuss opinions. They can understand and summarize the general content of simple, authentic texts from the everyday world and take part in spontaneous discussions on familiar topics. Students can compose longer personal letters and texts on personal experiences.

Teaching and Learning Methods:
The module consists of a seminar in which course objectives will be achieved in an activity-oriented, communicative atmosphere through listening, reading, writing and speaking exercises in individual, partner and group work. The fundamental language skills conveyed in the classroom are reinforced through the use of guided self-learning in the form of prepared (and online) materials.

Media:
Textbook; multimedia teaching and learning materials (chalk/white board, overheads, worksheets, images, films, etc.) and online resources.

Reading List:
Textbook (to be announced in class)

Responsible for Module:

Courses (Type of course, Weekly hours per semester), Instructor:
Blockkurs Deutsch als Fremdsprache B1.1 (Seminar, 4 SWS)
Niebisch D, Oelmayer J, Schimmack B, Stoephasius J
For further information in this module, please click campus.tum.de or here.

Module Description

SZ0303: German as a Foreign Language A2.1 | Deutsch als Fremdsprache A2.1

Version of module description: Gültig ab winterterm 2019/20

Module Level: Bachelor/Master	**Language:** German	**Duration:** one semester	**Frequency:** winter/summer semester
Credits:* 6	**Total Hours:** 180	**Self-study Hours:** 120	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
1 final exam 90 min. (100%) - no learning aids permitted
The midterm exam is intended to monitor students' learning progress and reduce the amount of material covered in the final exam. Written exams will assess students level of acquisition of the learning outcomes specified in the module description. Specifically, exam questions focus on the usage of vocabulary and grammar, as well as reading comprehension and text production. Listening comprehension is tested by posing questions based on audio samples to which students respond in writing.
Verbal skills are evaluated using appropriate prompts from sample print dialogs.

Repeat Examination:

(Recommended) Prerequisites:
Firm knowledge of level A1.2; placement test with the achievement A2.1

Content:
In this module, students acquire basic knowledge of the German language, including intercultural and regional aspects, that will enable them to express themselves in everyday situations, such as traveling, at the doctor’s office, searching for an apartment, in a department store, among colleagues, friends or neighbors.

Students learn and practice basic vocabulary and expressions on topics such as education, profession, health and traveling. Students learn and practice using simply structured main and subordinate clauses (that, because, and, than, etc.), employing the preterit (modal verbs) and perfect, as well as the comparative, the superlative and the declination of the adjective. They reinforce and expand the usage of the prepositions in the accusative and dative case.

Students learn strategies for successful verbal and written communication despite minimal language skills. Opportunities will be made available for effective, self-motivated, independent learning. Students acquire teamwork skills through collaborative work in multinational mixed groups.

Intended Learning Outcomes:
The module is based on level A2 of GER.
Upon completion of this module, students are able to understand and use simple sentences and expressions in conversations on a broad spectrum of familiar topics. These conversations are based on basic information concerning everyday life and subjects relevant to studying or working, including sociocultural aspects of German-speaking countries.
For example, students are able to describe themselves and other people, their living situation, state of health, leisure time activities and job situation.
Students are able to understand longer texts and letters about familiar topics that include foreseeable information and are written in simple language about everyday life or job related topics. Students are able to compose short, informative texts or notifications about basic situations in everyday life or situations related to studying.

Teaching and Learning Methods:
The module consists of a seminar covering material appropriate to desired learning outcomes and encompassing relevant listening, reading, writing and speaking exercises. These exercises may take the form of individual, partner or group work, implementing a communicative and activity-oriented approach. Students have the opportunity to deepen basic knowledge conveyed in the seminar through independent study and work, using specified (online) materials covering fundamental grammar and communication patterns of the foreign language.
Voluntary homework (preparation and follow-up work) reinforces classroom and structured learning.

Media:
Textbook; multimedia-based teaching and learning materials (black board, overheads, exercise sheets, image, film, etc.) also online

Reading List:

Responsible for Module:

Courses (Type of course, Weekly hours per semester), Instructor:
Deutsch als Fremdsprache A2.1 (Seminar, 4 SWS)
Aßmann J, Bauer G, Comparato G, Geishauser C, Gemaljevic J, Keza I, Kovacs O, Kutschker T, Nierhoff-King B, Schlüter J, Semeraro G
For further information in this module, please click campus.tum.de or here.

Module Description

SZ0304: German as a Foreign Language A2.2 | Deutsch als Fremdsprache A2.2

Version of module description: Gültig ab winterterm 2019/20

Module Level: Bachelor/Master	**Language:** German	**Duration:** one semester	**Frequency:** winter/summer semester
Credits:* 6	**Total Hours:** 180	**Self-study Hours:** 120	**Contact Hours:** 60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
1 final exam 90 min. (100%) - no learning aids permitted
Written exams will assess students level of acquisition of the learning outcomes specified in the module description. Specifically, exam questions focus on the usage of vocabulary and grammar, as well as reading comprehension and text production. Listening comprehension is tested by posing questions based on audio samples to which students respond in writing.
Verbal skills are evaluated using appropriate prompts from sample print dialogs.

Repeat Examination:

(Recommended) Prerequisites:
Firm knowledge of level A2.1; placement test with the achievement A2.2

Content:
In this module, students acquire basic knowledge of the German language, including intercultural and regional aspects, that will enable them to express themselves in everyday situations, such as traveling, at the doctor’s office, searching for an apartment, in a department store, among colleagues, friends or neighbors.
Students reinforce and augment basic vocabulary and expressions on topics such as education, profession, living and traveling. Students learn and practice classifying and using an extended spectrum of main and subordinate clauses (final clause, indirect questions, temporal subordinate clause, causal sentence). They also learn to employ the preterit (modals verbs) and perfect and will repeat and expand the usage of the prepositions and the declination of the adjective.
Students learn strategies for successful verbal and written communication despite minimal language skills. Opportunities will be made available for effective, self-motivated, independent

learning. Students acquire teamwork skills through collaborative work in multinational mixed groups.

Intended Learning Outcomes:
The module is based on level A2 of GER.
Upon completion of this module, students are able to understand and use simple sentences and expressions in conversations on a broad spectrum of familiar topics. These conversations are based on basic information concerning everyday life and subjects relevant to studying or working, including sociocultural aspects of German-speaking countries.
For example, students are able to describe themselves and other people, their living situation, state of health, leisure time activities and job situation. Students are able to communicate in various situations, for example, when searching for an apartment, traveling or on holiday, and are able to report about their experiences in simple standard language.
Students are able to understand longer texts and letters about familiar topics that include foreseeable information and are written in simple language about everyday life or job related topics. Students are able to compose short, informative texts or notifications about basic situations in everyday life or situations related to studying.

Teaching and Learning Methods:
The module consists of a seminar covering material appropriate to desired learning outcomes and encompassing relevant listening, reading, writing and speaking exercises. These exercises may take the form of individual, partner or group work, implementing a communicative and activity-oriented approach. Students have the opportunity to deepen basic knowledge conveyed in the seminar through independent study and work, using specified (online) materials covering fundamental grammar and communication patterns of the foreign language.
Voluntary homework (preparation and follow-up work) reinforces classroom and structured learning.

Media:
Textbook; multimedia-based teaching and learning materials (black board, overheads, exercise sheets, image, film, etc.) also online

Reading List:

Responsible for Module:

Courses (Type of course, Weekly hours per semester), Instructor:
Deutsch als Fremdsprache A2.2 (Seminar, 4 SWS)
Aßmann J, Bauer G, Comparato G, Feistle C, Hagner V, Hanke C, Kostial M, Reulein C, Schimmack B, Selent D, Stiebeler H, Thiessen E
For further information in this module, please click campus.tum.de or here.

Module Description

SZ0322: German as a Foreign Language A2.1 plus A2.2 | Deutsch als Fremdsprache A2.1 plus A2.2

Version of module description: Gültig ab winterterm 2019/20

Module Level:	**Language:** German	**Duration:** one semester	**Frequency:** winter/summer semester
Credits:* 8	**Total Hours:** 240	**Self-study Hours:** 150	**Contact Hours:** 90

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
1 final exam 90 min. (100%) - no learning aids permitted
Written exams will assess students level of acquisition of the learning outcomes specified in the module description. Specifically, exam questions focus on the usage of vocabulary and grammar, as well as reading comprehension and text production. Listening comprehension is tested by posing questions based on audio samples to which students respond in writing.
Verbal skills are evaluated using appropriate prompts from sample print dialogs.

Repeat Examination:

(Recommended) Prerequisites:
Firm knowledge of level A1.2; placement test with the achievement A2.1

Content:
In this module, students acquire basic knowledge of the German language, including intercultural and regional aspects, that will enable them to express themselves in everyday situations, such as traveling, at the doctor’s office, searching for an apartment, in a department store, among colleagues, friends or neighbors.
Students learn and practice basic vocabulary and expressions on topics such as education, profession, health and traveling. They learn and practice classifying and using an extended spectrum of main and subordinate clauses (final clause, indirect questions, temporal subordinate clause, causal sentence). They learn to employ the preterit (modal verbs) and perfect, how to use the comparative and the superlative, as well as the declination of the adjective (in the nominative, accusative and dative case). They also reinforce and expand the usage of prepositions in the accusative and dative case.

Students learn strategies for successful verbal and written communication despite minimal language skills. Opportunities will be made available for effective, self-motivated, independent learning. Students acquire teamwork skills through collaborative work in multinational mixed groups.

Intended Learning Outcomes:
The module is based on level A2 of GER.
Upon completion of this module, students are able to understand and use simple sentences and expressions in conversations on a broad spectrum of familiar topics. These conversations are based on basic information concerning everyday life and subjects relevant to studying or working, including sociocultural aspects of German-speaking countries.
For example, students are able to describe themselves and other people, their living situation, state of health, leisure time activities and job situation. Students are able to communicate in various situations, for example, when searching for an apartment, traveling or on holiday, and are able to report about their experiences in simple standard language.
Students are able to understand longer texts and letters about familiar topics that include foreseeable information and are written in simple language about everyday life or job related topics. Students have the ability to compose short, informative texts or notifications about basic situations in everyday life or situations related to studying.

Teaching and Learning Methods:
The module consists of a seminar covering material appropriate to desired learning outcomes and encompassing relevant listening, reading, writing and speaking exercises. These exercises may take the form of individual, partner or group work, implementing a communicative and activity-oriented approach. Students have the opportunity to deepen basic knowledge conveyed in the seminar through independent study and work, using specified (online) materials covering fundamental grammar and communication patterns of the foreign language.
Voluntary homework (preparation and follow-up work) reinforces classroom and structured learning.

Media:
Textbook; multimedia-based teaching and learning materials (black board, overheads, exercise sheets, image, film, etc.) also online

Reading List:

Responsible for Module:

Courses (Type of course, Weekly hours per semester), Instructor:

For further information in this module, please click campus.tum.de or here.

Alphabetical Index

E

F

G

H

I

M

N

P

R

S

T