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 139

Required Courses | Pflichtmodule

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

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

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

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

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

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

External: Research Internship (6 weeks) Nutritional Medicine (Prof. Hauner) - Master (Forschungspraktikum, 1 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

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

Research Internship (6 weeks) Nutritional Medicine (Praktikum, 15 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

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

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.

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:* 5	**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:
Klingenspor, Martin; Prof. Dr. rer. nat.

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

WZ3236: Research Tools I and II | Research Tools I and II

Version of module description: Gültig ab summerterm 2015

Module Level:	Language:	Duration:	Frequency:
Credits:* 8	**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:
Basics in Computational Biology (Vorlesung mit integrierten Übungen, 3 SWS)
Fromme T, Klingenspor M, Oeckl J, Stolz J

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.

Elective Courses | Wahlmodule

Module Description

WZ2460: Current Topics in Neurobiology | Aktuelle Themen der Neurobiologie

Version of module description: Gültig ab winterterm 2018/19

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:
Graded presentation (20-30 min.)
Students will have to prepare themselves for the general topic of the respective lesson by means of introductory texts each week; this general part will be discussed together at the beginning of the seminar. Subsequently, one student will present a more detailed text or a current publication from a high-class peer-reviewed journal; this additional information will then be discussed. The entire seminar will be held in English. The overall grade of the module is based on the students' participation and previous knowledge in the general preliminary information and discussions (30 %) as well as on their own presentation performance (categories text comprehension, completeness, structure, presentation style, handout, together 40 %) and participation in the special discussion (20 %).

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Basic knowledge of neurobiology, at least on the level of the lecture "Human and Animal Physiology", should be available. Ideally, the attendance of this seminar should be combined with the simultaneous attendance of the lecture "Neurobiology".

Content:
Basic and advanced aspects of neurobiology including methods, formal and theoretical foundations, model systems for basic research and for applied research, pharmaceutical research, molecular and molecular biological aspects of complex functions and dysfunctions These contents are introduced basally by means of basic articles (mostly textbook excerpts, more rarely simpler

reviews) and then brought up to the current state of knowledge by means of more recent, top-class published articles. The assessment of further developments in the respective research areas is explicitly made.

Intended Learning Outcomes:
Students acquire scientifically sound, basic knowledge of neurobiology and an overview of current developments in the most important research areas. After completing this seminar, students will be able to extract current research results from publications, put them into context and integrate them into their knowledge system. The topics discussed are not to be understood as a completed historical process. In particular, students will develop ideas about how research lines and processes behave with regard to their further development and will be able to understand the mechanisms of the science establishment.

Teaching and Learning Methods:
Event type/teaching technique: Seminar
teaching method: seminar, question-developing method, presentation, group work
Learning activities: studying the basic information given out, researching material, summarising documents, preparing and giving presentations, gathering information in special lectures, incorporating new information supported by question and answer sessions.

Media:
Literature will be distributed or made available for download on Moodle. Own presentations are to be created using PowerPoint or similar presentation techniques. Additional information will be communicated on Moodle (URLs, further texts)

Reading List:
The basic textbook "Neuroscience. Exploring the brain." by Bear, Connors, Paradiso from the Lippincott, Williams and Wilkins publishing house is recommended as the basic textbook, in the English version. The German edition ("Neuroscience." from Spektrum Verlag) is more expensive and not in the language used in the seminar. Other textbooks of neurobiology are also suitable for the basic contents.

Responsible for Module:
Harald Luksch Harald.Luksch@wzw.tum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Aktuelle Themen der Neurobiologie: Biologie und Neuroethologie der Fledermäuse (Seminar, 2 SWS)
Firzlaff U

Aktuelle Themen der Neurobiologie: Neurobionik (Seminar, 2 SWS)
Kohl T [L], Luksch H (Kohl T)

Aktuelle Themen der Neurobiologie: Neuroethologie von Räubern und Beute (auf englisch) (Seminar, 2 SWS)
Ondracek J

Aktuelle Themen der Neurobiologie: Zelluläre und molekulare Neurophysiologie (auf Englisch) (Seminar, 2 SWS)
Weigel S, Michel K, Bühner S
For further information in this module, please click campus.tum.de or here.

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 (Seminar, 1 SWS)
Ecker J

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

Module Description

WZ1671: Crop Physiology: Growth and Development of Plants | Crop Physiology: Growth and Development of Plants [WZ1671]

Crop Physiology: Growth and Development of Plants

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:
Aufgrund des Pandemiegeschehens hat der/die Studierende auch die Möglichkeit, an einer mündlichen Onlineprüfung (Aufsicht mit Zoom, 30 min.) teilzunehmen (Onlineprüfung: WZ1671o). Eine Präsenz-Prüfung wird zeitgleich parallel angeboten (WZ1671).

Students demonstrate their ability to understand the physiological processes affecting horticultural crop production and to evaluate limiting factors during the different growth stages of vegetable and ornamental cultures by answering comprehension questions and solving sample problems in a written examination (120 min). Furthermore, students will be tested for their ability to outline cultivation-specific and genetic approaches to improve qualitative and quantitative yield traits in horticultural crops. The use of learning aids during the examination is not allowed. Examination questions should be answered by writing self-formulated text.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Basic knowledge in genetics, plant physiology and plant production.

Content:
Flower formation, seed and fruit development. Physiology of vegetable crops as growth and development processes determining quality and yield of harvested products. Scientific basis of floricultural practice: Vegetative propagation; genetic/chemical/cultivation-dependent control of branching; genetic/chemical/cultivation-dependent control of shoot growth; leaf/flower variegation;

flower development in floricultural crops; physiology of flower color; postharvest physiology of cut flowers.

Intended Learning Outcomes:
Upon successful completion of this module, students are able:
- to understand the influence of environmental factors on major ontogenetic processes of vegetable crops such as flowering and the formation of the harvested products;
- to understand the underlying physiological principles of ornamental crop production methods including vegetative propagation, optimization of plant architecture and flower quality and improving longevity of ornamental crop products;
- to analyze growth conditions of important crop species to optimize yield;
- to evaluate molecular parameters affecting qualitative and quantitative yield traits in horticultural crops.

Teaching and Learning Methods:
The learning contents are presented as PowerPoint-supported lectures to impart the relevant theoretical background in plant physiology and to provide application-relevant examples in horticulture. In addition, class discussions of case studies from literature are conducted to deepen the knowledge in relevant topics.

Media:
Black board illustrations, presentation slides, lecture, scriptum (Moodle), selected articles in scientific journals.

Reading List:
Scriptum.
Taiz, L. and Zeiger, E. 2006: Plant Physiology.
Wien, H.C. 1997: The Physiology of Vegetable Crops.
Actual articles from scientific journals will be provided.

Responsible for Module:
Sieberer, Tobias; Dr. nat. techn.

Courses (Type of course, Weekly hours per semester), Instructor:
Crop Physiology: Growth and Development of Plants (Vorlesung, 4 SWS)
Sieberer T [L], Bienert G, Sieberer T
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

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

WZ2375: Evolution of Pathogens | Evolution von Krankheitserregern

Version of module description: Gültig ab summerterm 2012

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:
Die Studierenden zeigen in einer benoteten Klausur (60 min), dass sie das in der Vorlesung und in den Übungen erworbene Wissen zu grundlegenden mikrobiellen Evolutionsprozessen (molekulare Quellen der Variabilität bakterieller Genome, Darwin'sche Selektionsprozesse, neutrale Evolution nach Kimura) auf Problemstellungen der Evolution von Krankheitserregern anwenden können.
Sie zeigen in der Klausur, daß sie in der Lage sind, in begrenzter Zeit und ohne Hilfsmittel den Erwerb und die nachfolgende Evolution von Pathogenitätsfaktoren (wie beispielsweise Toxine, Pathgenitätsinseln) sowie die molekularen Evolutionsprozesse, welche der de novo Entstehung, Adaptation sowie der Verbreitung von Antibiotikaresistenzen zugrunde liegen, kritisch modellieren und diskutieren zu können.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Kenntnisse in Allgemeiner Mikrobiologie, Molekularer Bakteriengenetik und Biologie pathogener Bakterien.

Content:
Teil 1, Einführung in die Evolutionsbiologie: Methoden der Evolutionsforschung, Entstehung von Variabilität in Individuen, Fixierung von Allelen in Populationen.
Teil 2, Bakterielle Genome und Populationsstrukturen: Bakterielle Genome als Ergebnis fixierter Mutationen, Typisierung bakterieller Populationen, Infraspezifische phylogenetische Populationsanalyse.
Teil 3, Evolution von Antibiotikaresistenzen: Wirkungen von Antibiotika, Ökologie des mikrobiellen Resistoms, Mechanismen der Antibiotikaresistenz, Evolution von Antibiotikaresistenzen.
Teil 4, Ökologie als angewandte Evolutionsbiologie: Ökologische Rahmenbedingungen, Invertebraten und Vertebraten als Wirte, Wirtswechsel, Populationsökologie, Virulenzgentransfer

und Pathogenitätsinseln, Ökologie intrazellulärer Pathogene, Reduktive Evolution bei Pathogenen und Symbionten.

Intended Learning Outcomes:
Nach dem erfolgreichen Abschluss dieses Moduls kennen die Studierenden die grundlegenden Methoden der Evolutionsforschung sowie experimentell belegte Evolutionsprozesse bei Prokaryonten und sind in der Lage ihr Wissen auf molekularbiologische und epidemiologische Daten (z.B. Antibiotikaresistenzevolution, Populationen von Pathogenen) anzuwenden. Darüber hinaus sind die Studierenden in der Lage experimentell nicht reproduzierbare Konzepte aus der vergleichenden Biologie (z.B. Sequenzvarianzen, Existenz von Pathogenitätsinseln, reduzierte Genome) vor dem Hintergrund der in der Vorlesung erlernten, experimentell verifizierten Evolutionsprozesse zu interpretieren und Evolutionshypothesen zu formulieren. Diese Fähigkeit wird durch kritische Lektüre von Fallstudien aus der Literatur und deren Diskussion in der Gruppe eingeübt.

Teaching and Learning Methods:
Lehrtechniken: Vorlesung mit begleitender Übung.
Lehrmethode: Vortrag, Fallstudien, interaktiver Diskurs mit Studenten während der Vorlesung.
Lernaktivitäten: Auswendig lernen; Lösen von Übungsaufgaben; Studium von anspruchsvoller Originalliteratur als Hausaufgabe; Präsentation in Kurzform in den Übungen; gemeinsame kritische Analyse der in den Originalarbeiten angewendeten Problemlösungsstrategien in der Gruppe.

Media:
Tafelanschrieb, Powerpoint Präsentationen, Vorlesungsfolien, Reader, Übungsfragenkatalog

Reading List:
Leider existiert kein Lehrbuch, die Qellen des unterrichteten Stoffs sind daher auf den Vorlesungsfolien zum Selbststudium angegeben. Als Unterstützung wird folgendes allgemeines Lehrbuch zur Evolutionsbiologie empfohlen: Barton et al (2007) Evolution. Cold Spring Haror, New York.

Responsible for Module:
Siegfried Scherer (Siegfried.Scherer@wzw.tum.de)

Courses (Type of course, Weekly hours per semester), Instructor:
Übungen zur Ökologie und Evolution pathogener Bakterien (Übung, 1 SWS)
Neuhaus K

Ökologie und Evolution von pathogenen Bakterien (Vorlesung, 2 SWS)
Neuhaus 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

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 Design (Vorlesung, 1,5 SWS)
Pearson S

Food Industry (Vorlesung, 1,5 SWS)
Pearson S
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

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

WZ3115: InDisNet: The Interdisciplinary Network | InDisNet: Das interdisziplinäre Netzwerk

Version of module description: Gültig ab summerterm 2014

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 5	**Total Hours:** 124	**Self-study Hours:** 80	**Contact Hours:** 42

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

Description of Examination Method:
Prüfungsdauer (in min.): 45.
Presentation and final report

Repeat Examination:

(Recommended) Prerequisites:
Being motivated, open-minded and having an interest in practical problem solving via scientific methods.

Content:
The Inter-disciplinary course arises from an initiative of three lecturers in context of the ProLehre Multiplicator Program for excellent teaching at TUM. The course aims at teaching the principles of scientific working in an interdisciplinary environment by applying scientific methods to practical problems, and disseminating the results. In particular, students will work as inter-faculty teams on one project in tune with up-to-date research activities and with their academic background. Together, they will be responsible for all project management issues and tasks necessary to provide answers to the main scientific question addressed in their respective projects. By means of different methodological approaches and intensive mentoring by the three seminar leaders, students will be confronted with new learning strategies and will have the opportunity to get insights into aspects of sciences from other disciplines. Thereby, they will be asked to go beyond their own area of expertise and be able to work with students from other study faculties. The students will tackle issues related to project and time managment, literature survey and experimental and prototypical work in the field of microbiology, nutrition, molecular biology and informatics as well as marketing.

The course is in general organised into three workshops where the groups will be introduced to (1) the setting and the project to be completed along the course, (2) the principles of scientific working aligned to the context of the project, and finally (3) present the project results to the other groups. Between the workshops, three advisors of the participating faculties will support the students in their project.

Those projects have their setting within the inter-disciplinary context of the seminar aforementioned and they constitute the prototypical implementation of applications in the field of personalized and healthy nutrition. These projects are aligned with current ongoing work in the frame of research activities coordinated at TUM by Prof. Hannelore Daniel (www.food4me.org/de) and are thus embedded within a thematic area with promising future perspectives.

Intended Learning Outcomes:
Student will learn to exchange ideas in clear and concise manner with peers from other subject areas, which is essential for interdisciplinary work. Students will be in charge of the success of their team and the final results, and, very importantly, will learn how to evaluate peers. Next to these aspects, soft skills such as oral and poster presentation, questioning in congress atmosphere and pitching will also be addressed within InDisNet. For the students of the degree program Molecular Biotechnology, Nutritional Sciences, Renewable Resources, and Informatics, the seminar is a unique chance to carry out exciting inter-disciplinary projects in step with actual practice in current research to learn:
- the principles of interdiscplinary working and cooperation
- soft skills necessary for team communication, self management and team work, and presentation of project results

Teaching and Learning Methods:
Seminars, short lectures and laboratory work as appropriate.

Media:
Presentations and handout material as a preparation to the project as well as the material necessary to work on the projects.

Reading List:
Basic literature on the methods applied in context of the projects.

Responsible for Module:
Thomas Clavel (thomas.clavel@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

WZ2690: Latest Neuroscience - Presenting Papers to Researchers and the General Public | Latest Neuroscience - Presenting Papers to Researchers and the General Public

Version of module description: Gültig ab summerterm 2017

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 3	**Total Hours:** 90	**Self-study Hours:** 58	**Contact Hours:** 32

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

Description of Examination Method:
This seminar series will start with an introductory lecture by the course lecturers, followed by an assignment of 2 reviews and 1 research paper to each student. Research paper and reviews will be read and analyzed during self-study hours and discussed with the lecturer during individual meetings. During three and a half days of block seminar, students will in the first two days present the main points of their paper including aims, results and discussion in the context of a comprehensive background that is to be researched and based in part on the distributed reviews. During the second part, students will learn how to present a research finding to the general public and how to write a press release for the layman. Papers and reviews will comprise landmark and latest papers in the field of neuroscience research with a special focus on internal and metabolic state and neuromodulation. Students will discuss the mechanisms of state-dependent neuromodulation and its implications in animal behavior, disease etc. Students will also discuss the latest scientific tools that are used to study neuromodualtion in different animal models based on the assigned papers. In the first part, each student will give a 45 minutes presentation of the selected paper in front of the group. In addition, the students will prepare questions to be discussed with the other participants following the presentations. In the second part, the first half day will be used to look at press releases in the group and to dissect their structure, wording etc. After 1 and a half days of home work, students will present their paper in a presentation format aimed at the general public with general introductions, schemata, conclusions etc. In addition, the students are requested to write a press release on their paper at home, which is again aimed at the general public and should be concise and interesting with some illustrations. The evaluation is based on the presentations, the press release, and the discussion of the selected papers (70%) and the participation in the course (30%).

Repeat Examination:

(Recommended) Prerequisites:
Basic knowledge of neurobiology is mandatory.

Content:
Group seminar with a 3 hours introductory meeting/discussion and a block of 3 and a half days of presentations by students.

Intended Learning Outcomes:
Students who successfully complete this module will understrand the concept of how internal and metabolic states influence neurons and neuronal processing by neuromodlation and its implications in animal behavior including human behavior in health and disease. In particular, they will know important landmark works, know different modes and forms of neuromodulation including neuropeptides and monoamines, be able to name and describe important techniques used to study neuromodulation. Furthermore, they understand the importance of neuromodulation and neuromodulatory mechanisms in the treatment of common diseases including diabetes, obesity, depression, and get first insights into concepts of drug design and function. Students will learn different ways of presenting scientific works - to a scientific audience as well as to a layman audience. Students will understand the difference between a scientific presentation and manuscript and an article and presentation aimed at the general public to promote Science and important findings. They will have been introduced on how to write a press release and how to explain a scientific problem and finding to a layman.

Teaching and Learning Methods:
A general introduction on the topic and list of proposed papers will be given during the preparatory meeting (3 hrs). Then students will have the option to choose a paper and will have a week to prepare a presentation based on the paper and two accompanying reviews. In addition, students have the opportunity to meet the lecturer in a one-on-one meeting prior to their presentations of the paper to discuss questions. Students will individually present the paper in the group meeting. In the first part, each student will get 45 minutes to present the paper and 20 minutes for discussion. A feedback will be given after each presentation by the group and lecturer and if requested also individually at a later time. In the second part, press releases will be read and analyzed in the group together with the lecturer. Then each student will present a short laymen slide presentation to the group. Finally, each student has to formulate a press release at home.

Media:
Pubmed, powerpoint, black board

Reading List:
Literature for reading will be provided or suggested during the introductory meeting. The internet will be used to find examples of good (and less inspiring) press releases and newspaper articles. Furthermore, TED talks and other science interviews will be studied. In addition, the textbook 'Principles of Neural Science' by Eric Kandel and colleagues is recommended.

Responsible for Module:
Ilona Grunwald Kadow ilona.grunwald@tum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Latest Neuroscience - Presenting Papers to Researchers and the General Public (Seminar, 2 SWS)
Grunwald I [L], De Backer J, Grunwald I
For further information in this module, please click campus.tum.de or here.

Module Description

WZ2372: Pathogenic Microorganisms | Mikroorganismen als Krankheitserreger

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:** 105	**Contact Hours:** 45

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

Description of Examination Method:
Prüfungsdauer (in min.): 90.
Die Studierenden zeigen anhand der benoteten Klausur (90 min) ob sie in der Lage sind, Formenvielfalt und taxonomische Stellung von pathogenen Bakterien zu erläutern. Die Studierenden müssen zeigen, daß sie die Interaktion von Pathogenen mit ihren verschiedenen Wirten (Menschen und Pflanzen) im Einzelnen darstellen können. Anhand von Fallbeispielen werden diagnostische Verfahren für bakterielle Krankheitserreger geprüft. Insbesondere wird Schlüsselwissen für die Risikobeurteilung bezüglich des Vorkommens von Pathogenen im Lebensmittel- und medizinischen Bereich sowie in der Phyopathologie abgefragt und es wird erwartet, daß die Studierenden auch komplexere epidemiologische Ansätze erläutern können.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Modul Mikrobiologie sowie Molekulare Genetik.

Content:
Biologie humanpathogener Mikroorganismen: Übersicht über Menschen und Mikroben; Verhältnis zwischen Kommensalen und Pathogenen; Koch'sche Postulate; Übersicht über bakterielle Pathogenität und Virulenz; Abwehrsysteme des Wirtes (v.a. verschiedene Ebenen des innaten Immunsystems); Abwehrsysteme des Pathogens (Immunevasion, Adhesion an die Wirtszelle, Invasion und intrazelluläres Wachstum, bakterielle Toxine); Übersicht über pathogene Hefen und Pilze.
Erreger von Pflanzenkrankheiten: Übersicht über Pflanzen und Krankheiterreger, Übersicht über Pathogenität und Virulenz bei Pflanzenpathogenen; Abwehrsysteme des Wirtes (v.a. verschiedene Ausprägungen der Resistenz, Gen-für-Gen Hypothese, systemische Resistenz); Abwehrsysteme

von Pflanzenpathogenen; Rezeptorsysteme und innate Immunität der Pflanze; Vergleich Pflanze-Säugetier; Gentechnik und Pflanzenschutz;
Diagnostik und Epidemiologie: Taxonomie von pathogenen Bakterien; Artbegriffe; Identifizierung (physiologische, biochemische, biophysikalische und genetische Verfahren); Diagnostische Verfahren (Anreicherungen, Schnellverfahren, automatisierte Verfahren); Infektionsepidemiologie (Bedeutung von Infektionen in Deutschland, Erhebung von epidemiologischer Daten, Methoden zur Verfolgung von Kontaminationsrouten).

Intended Learning Outcomes:
Nach der Teilnahme an diesem Modul verfügen die Studierenden über sichere Grundkenntnisse hinsichtlich Formenkenntnis und Taxonomie von pathogenen Bakterien, Interaktion von bakteriellen Krankheitserregern mit humanen und pflanzlichen Wirten, diagnostischer Verfahren in mikrobiologischen Labors und epidemiologischer Anwendungen.

Die Studierenden können die Bedeutung von Krankheitserregern im lebensmittelbiotechnologischen, medizinischen und phytopathologischen Bereich einschätzen und kritisch beurteilen.
Mit dem biologisch-theoretischen Wissen aus diesem Modul sind sie in der Lage eine Forschungspraktikums im Pathogenlabor zu absolvieren.

Teaching and Learning Methods:
Die Vermittlung der Modulinhalte erfolgt durch Dozentenvortrag in der Vorlesung sowie anhand von Fallstudien, die in interaktivem Diskurs während der Vorlesung behandelt werden. Das Wissen der Studenten wird durch (i) eigenständige Nachbereitung der Vorlesungsinhalte anhand der ausgegebeben ppt Präsentationen, (ii) die Vorlesungsmitschrifte, (iii) das Studium der abgegebenen Literatur und schließlich (iv) die Lösung der ausgegebenen Übungsaufgaben nachhaltig gefestigt.

Media:
Tafelarbeit, PowerPoint Präsentationen, Filme, Vorlesungsfolien, 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.
Buchanan et al (2002) Responses to Plant pathogens. Kapitel 11 in: Biochemistry & Molecular Biology of Plants, Buchanan B, Gruissem W, Jones R, Verlag ASPP

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

Courses (Type of course, Weekly hours per semester), Instructor:
Einführung in Biologie pflanzenpathogener Mikroorganismen (Vorlesung, 1 SWS)

Durner J

Einführung in die Biologie humanpathogener Bakterien (Vorlesung, 2 SWS)
Hall L
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:
Analytik mikrobieller Toxine (Übung, 2 SWS)
Meyer K

Mikrobielle Toxine in der Nahrung (Medizinische Mikrobiologie und Hygiene, Teil Mikrobielle Toxine) (Vorlesung, 2 SWS)
Meyer K
For further information in this module, please click campus.tum.de or here.

Module Description

WZ3220: Molecular Sensory Science | Molecular Sensory Science

Version of module description: Gültig ab summerterm 2016

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:
In the written examination (120 min) students demonstrate by answering questions under time pressure and without helping material the theoretical knowledge of the chemisty, biology and analytics of taste and aroma compounds. To answer the questions, own wordings and calculations are necessary and sketches, biosyntheses and reaction pathyways.

Repeat Examination:
End of Semester

(Recommended) Prerequisites:
none

Content:
The basics of aroma- and taste recognition, evaluation, analysis on a molecular level were communicated. In detail, the following topics were discussed: - basics of human and tase recognition (anatomy, receptors, basic taste modalities, signal transduction, synergism and antagonism, taste modulaters, taste and aroma disruptions). - methods for the analysis of volatile compounds (headspace, distillation,SPME, SBSE, SAFE, solvent fractionation, capillary-gaschromatographie-olfactometry, AEDA, identification, thresholds, quantitation, SIDA, aroma activity value, aroma recombination, „character-impact“- und „off-flavour-compounds). - methods for the analysis of taste-active compounds (isolation, activity-guided fractionation, structure elucidation, quantitation, SIDA, thresholds, DoT, structure-activity studies, taste reconstitution experiments, omission experiments). - overwiev on the most important natural taste and aroma compounds in food (biosyntheses, precursors, stability, enzymatically generated compounds, degradation or reactions during storage or processing, aroma stabilisation). - overview on the most important aroma compounds formed upon thermal treatment of food (Maillard-reaction, Strecker degradation, phenylpropan compound degradation)

Intended Learning Outcomes:
Upon completion of the module, students are able to understand and analyse the most important aroma and taste compounds of food, their fate during food storage and/or food processing. Methods for identification and quantitation were used to characterize the impact of each flavour compound on the basis of its aroma activity value or DoT-factor. Students are able to reflect the biological interaction of flavour compounds with their specific receptors.

Teaching and Learning Methods:
The content of the lecture is presented by means of powerpoint presentations and whiteboard writing. Students are motivated for self-study on additional literture to the topic.

Media:
whiteboard, reader scripts as pdf and download

Reading List:
Belitz, Grosch, Schieberle: Food Chemistry, 4. edition Springer Verlag, ISBN-10: 354069935X, ISBN-13: 978-3540699354

Responsible for Module:
Hofmann, Thomas F.; Prof. Dr.

Courses (Type of course, Weekly hours per semester), Instructor:
Molecular Sensory Science (Vorlesung, 4 SWS)
Dawid C [L], Krautwurst D, Stark T, Steinhaus M
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 I Hausarbeit (Seminar, 2 SWS)
Krüger A [L], Krüger A

Molekulare Onkologie 1MED (Vorlesung, 2 SWS)
Krüger A [L], Krüger A
For further information in this module, please click campus.tum.de or here.

Module Description

SG810006: Nutrition - Health Science Research | Nutrition - Health Science Research

Nutrition: Health promotion and Prevention

Version of module description: Gültig ab winterterm 2021/22

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 8	**Total Hours:** 240	**Self-study Hours:** 180	**Contact Hours:** 60

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

Description of Examination Method:
Successful completion of the course will be based on the quality of written exam (100%, 90 minutes).
In the exam students are expected to demonstrate, by answering questions, their theoretical knowledge of nutritional prevention, methods of nutritional assessment and of body composition measurement. The questions will also include case studies. Furthermore, they have to prove their knowledge about the practically applied tools (nutritional assessment and of body composition) in different settings and problems. So, they provide evidence to establish case-related settings.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Baseline knowledge on nutrition related parameters

Content:
- Prevention policy (e.g. prevention framework in Germany)
- Prevention programs in nutritional medicine (e.g. diabetes, obesity, cancer, neuro-degeneration, osteoporosis, atherosclerosis, coronary heart disease)
- Prevention programs in different life stages and settings (pregnancy, lactation, early childhood, school, employee health management, elderly, nursing homes etc.)
- Special prevention programs against malnutrition/undernutrition in third world countries (i.e. iodine, iron, vitamin A, etc.)
- Nutritional assessment methods and its use in research
- Application of nutritional assessment methods for prevention strategies in real-life settings

- Body composition methods and their application/evaluation in different target populations and settings

Intended Learning Outcomes:
After successfully completing the module, students will be able:
- to understand, communicate and apply target-group-specific prevention strategies
- to understand and describe prevention strategies in different healthcare settings
- to analyze the efficacy of prevention programs in different indication areas and evaluate the benefit for the target population
- to suggest relevant nutritional prevention programs for different age groups in different settings
- to use typical methods, tools, instruments and software programs for nutritional assessment (i.e. 24-h recall, diet history, food frequency questionnaire)
- to assess and use reliable methods for measuring body composition in different target populations (i.e. BMI, BIA, skinfold thickness, MRI, ultrasonography, etc.).

Teaching and Learning Methods:
The module consists of 2 parts: 1 lecture and 1 exercise. Within the lecture part students will learn the basics of nutritional prevention programs in different indication areas / for different target groups. The according literature for the prevention programs will be in English and the students have to understand and critically reflect the contents by self-study, so that during the lessons the basic content of the programs is existent. During the first part of the exercise course students will learn nutritional assessment methods and their practical use. The second part of the exercise will comprise body composition methods and how to use them. Both, the nutritional assessment methods and the body composition methods will be tested personally and among each other, so that each unit contains preliminary work, e.g. survey 24-h recall nutritional assessment. Furthermore, the student will test the tools in real-life settings by recruiting different target populations.

Media:
PowerPoint

Reading List:
Current international publications via Pubmed

Responsible for Module:
Köhler, Karsten; Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
Methods of nutritional assessment and of body composition measurement (Übung, 2 SWS)
Hechenbichler Figueroa S, Wasserfurth-Grzybowska P

Nutritional prevention strategies and research (Vorlesung, 2 SWS)
Hofmann H

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

WZ3237: Nutritional Epidemiology | Nutritional Epidemiology

Version of module description: Gültig ab summerterm 2015

Module Level:	Language:	Duration:	Frequency:
Credits:* 5	**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

ME2413: Pharmacology and Toxicology for Students of Life Sciences | Pharmakologie und Toxikologie für Studierende der Biowissenschaften (Vertiefung)

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**Language:** German	**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 concludes with a written exam (75 min) in the form of free questions. Two to three questions are formulated for each topic, covering the essential learning content of the module from the beginnings of drug development through the various drug classes to toxic and addictive effects. A special focus is on current drug developments in pharmacology. Through regular active participation in the course and self-study on the basis of the instructional slides provided, the students are enabled to reproduce the knowledge acquired and present the essential aspects in a structured way in a limited time and without aids. Through their own formulations, the students show in the exam whether they have reached a deeper understanding of the topics. The exam is passed if at least grade 4.0 has been achieved. A possibility for repetition is given at the end of the semester.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Module WZ2522: General Pharmacology for students of life sciences (bachelor)

Content:
As part of the module the knowledge in pharmacology will be extended from the bachelor's degree. The knowledge of many novel drug classes for treatment of common and serious diseases is acquired. In a historical overview, examples of drugs from nature are learned. The development and optimization of drugs is discussed from drug design to the approval of drugs. Clinical studies and the transmissibility to humans are discussed. Additional contents includes the treatment of tumors and cancer pain, allergies and autoimmunity, infectious diseases such as HIV, heart rhythm disorders and psychoses, as well as biologicals, gene therapy, toxicology and dependence on

psychotropic substances. The seminar serves to strengthen and expand the lecture content, and provides the opportunity for practical exercises.

Intended Learning Outcomes:
After completing the module, students are able to reproduce the development of a drug from target identification through lead identification and optimization up to the approval and clinical studies. The students can name different resources for drugs and classify alternative treatment methods. They are able to remember important new drug groups, their targets and mechanisms of action. For each drug class, students can reproduce the lead compounds. They are further able to remember the most common and serious side effects and drug interactions and explain their occurrence. With this knowledge they can differentiate treatment options for common and serious diseases. Finally, students are able to detect toxic and addictive effects and select appropriate antidotes and remedies.

Teaching and Learning Methods:
The module consists of a lecture and a seminar.In the lecture the necessary knowledge is mediated through lectures and presentations by department staff. Students are encouraged to study the literature and discuss the issues with each other. In the seminars, the contents of the lecture is deepened and expanded. Different learning and teaching methods are used. E. c. Students prepare and show presentations in small groups or they answer specific questions or collaborate on selected (case) examples. Occasionally, examination questions are exercised. To prepare for each seminar a relevant material research is necessary.

Media:
PowerPoint, board work, flipchart, exercise sheets, OnlineTED, movies, downloads

Reading List:
There is no textbook available that covers all the contents of this module. Current literature is provided by the respective lecturers. As a basis or to supplement is recommended: Pharmakologie und Toxikologie: Arzneimittelwirkungen verstehen - Medikamente gezielt einsetzen von Heinz Lüllmann, Klaus Mohr und Lutz Hein (Gebundene Ausgabe - 18. Auflage von Januar 2016)

Responsible for Module:
Stefan Engelhardt (Stefan.Engelhardt@tum.de) Andrea Welling@tum.de (andrea.welling@tum.de)

Courses (Type of course, Weekly hours per semester), Instructor:
Vertiefungsvorlesung Pharmakologie (Vorlesung, 2 SWS)
Welling A [L], Andergassen D, Avramopoulos P, Dueck A, Engelhardt S, Klug C, Laggerbauer B, Lang A, Ramanujam D, Rammes G, Thiermann H, Welling A

Seminar für Studierende der Biowissenschaften (Master) (Seminar, 2 SWS)
Welling A [L], Andergassen D, Avramopoulos P, Klug C, Laggerbauer B, Lang A, Mägdefessel L, Ramanujam D, Rammes G, Welling A, Wille T

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

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

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

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

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

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

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

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

SG810002: Study Design; Ethics - Research Methods | Study Design; Ethics - Research Methods

Version of module description: Gültig ab winterterm 2017/18

Module Level: Master	**Language:** English	**Duration:** one semester	**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:
In a written examination (90 min; 60%) students demonstrate their theoretical, methodological and analytic competence by answering questions using given answers. This will show that they understand different study designs, study conduct and study analysis as well as methods to control bias and confounding. Additionally, the attainment of learning outcomes for the module will be assessed by a written research grant proposal (about 15-20 pages; 40%). By developing a research grant proposal, students will show their ability to work independently and in detail on a selected complex epidemiological study design, applying good epidemiological practice, principles of ethics and international quality standards.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Basic knowledge of study design and research methods, basics of epidemiology, basics of biostatistics

Content:
- Study design, planning, conduct and analysis
- Research questions and hypotheses
- Ethical approval
- Research grants
- Time / Cost / Resource Assessment
- Literature review and Meta-Analysis
- Standards / Principles of Ethics
- International human rights / guidelines
- Good Epidemiological Practice Good Clinical Practice

- Methods to avoid bias and control confounding

Intended Learning Outcomes:
After successfully completing the module, students will be able:
- To understand advanced epidemiology
- To understand details of different epidemiological study designs
- To understand study planning and conduct
- To understand the importance of ethical issues
- To understand the responsibilities of research ethics committees
- To apply Good Epidemiological Practice
- To apply principles of ethics and international quality standards
- To understand informed consent
- To write a research grant proposal
- To develop a study design (including literature review / analysis / ethics)
- To understand study conduct
- To apply study analysis
- To understand bias and confounding

Teaching and Learning Methods:
The module consists of one lecture with blended learning components and one practical seminar. The content of the lectures will be discussed in detail in the seminars using research papers and student presentations. Students will work in small groups on a research grant and will be encouraged to study the relevant literature.

Media:
PowerPoint slides, Scientific publications from elektr. Semester apparatus, exercise sheets

Reading List:
Gordis, L. (2014). Epidemiology. Oxford: Elsevier LDT (fifth edition).
Rothman, K.J.; Greenland, S.; Lash, T.L. (2013). Modern Epidemiology. Philadelphia: Lip-pincott Williams & Wilkins (third edition).
Further literature will be announced in the lecture

Responsible for Module:
Klug, Stefanie; Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
Applied Study Design; Ethics (Seminar, 2 SWS)
Eberl M, Gimazova K, Liang L, Sudharsanan N

Advanced Study Design; Ethics (Vorlesung, 2 SWS)
Gimazova K, Klug S
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

WZ3078: Sports and Nutrition | Sport und Ernährung

Version of module description: Gültig ab winterterm 2013/14

Module Level:	Language:	Duration:	Frequency:
Credits:* 5	**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

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

WZ0125: Viticulture | Weinbau

Version of module description: Gültig ab winterterm 2015/16

Module Level: Bachelor	**Language:** German	**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:
Die Modulleistung wird in Form einer mündlichen Prüfung (30 Min.) erbracht. In dieser soll nachgewiesen werden, dass die Anbauverfahren, die qualitativen Zusammenhänge bei der Produktion sowie die Vermarktungsmöglichkeiten einschließlich des Bezeichnungsrechts verstanden werden. Darüber hinaus sind Weine in einer praktischen Prüfung sensorisch zu bewerten.

Repeat Examination:
Next semester / End of Semester

(Recommended) Prerequisites:

Content:
Geschichte der Rebkultur, Weltweinbau und Bezeichnungsrecht, Anatomie und Physiologie der Rebe, Rebsortenkunde, weinbauliche Standortlehre, Arbeitsabläufe im Weinberg, Rebernährung und Rebschutz, Grundlagen der Rebenzüchtung, ökologischer Weinbau, Weinmarketing und Weinsensorik

Intended Learning Outcomes:
Nach der Teilnahme an den Modulveranstaltungen sind die Studierenden in der Lage die Anbauverfahren des Weinbaus zu verstehen, die Einflussfaktoren auf die Qualität der Weine zu bewerten, die Grundlagen des Weinmarketings zu verstehen und die bezeichnungs-rechtlichen Grundlagen des Weines zu erklären.

Teaching and Learning Methods:
Vorlesung zur Darstellung der Gesamtzusammenhänge der Rebenkultur, sensorische Übungen zur praktischen Beurteilung von Weinen, Fachexkursion zur Vertiefung handlungsrelevanter Zusammenhänge in Weinberg und Keller

Media:
Vortrag, Skripten, PPP, Tafelarbeit, Folien

Reading List:

Responsible for Module:
Hadersdorfer, Johannes; Dr. agr.

Courses (Type of course, Weekly hours per semester), Instructor:
Vorlesungen, Übungen, Exkursion
Weinbau
4 SWS

Klaus Wahl
Bayerische Landesanstalt für Weinbau und Gartenbau
klaus.wahl45@gmx.de
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

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.

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.

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.

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