

Modulhandbuch

M.Sc. Nutrition and Biomedicine
TUM School of Life Sciences
Technische Universität München

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Allgemeine Informationen und Lesehinweise zum Modulhandbuch

Zu diesem Modulhandbuch:

Ein zentraler Baustein des Bologna-Prozesses ist die Modularisierung der Studiengänge, das heißt die Umstellung des vormaligen Lehrveranstaltungssystems auf ein Modulsystem, in dem die Lehrveranstaltungen zu thematisch zusammenhängenden Veranstaltungsblöcken - also Modulen - gebündelt sind. Dieses Modulhandbuch enthält die Beschreibungen aller Module, die im Studiengang angeboten werden. Das Modulhandbuch dient der Transparenz und versorgt Studierende, Studieninteressierte und andere interne und externe Adressaten mit Informationen über die Inhalte der einzelnen Module, ihre Qualifikationsziele sowie qualitative und quantitative Anforderungen.

Wichtige Lesehinweise:

Aktualität

Jedes Semester wird der aktuelle Stand des Modulhandbuchs veröffentlicht. Das Generierungsdatum (siehe Fußzeile) gibt Auskunft, an welchem Tag das vorliegende Modulhandbuch aus TUMonline generiert wurde.

Rechtsverbindlichkeit

Modulbeschreibungen dienen der Erhöhung der Transparenz und der besseren Orientierung über das Studienangebot, sind aber nicht rechtsverbindlich. Einzelne Abweichungen zur Umsetzung der Module im realen Lehrbetrieb sind möglich. Eine rechtsverbindliche Auskunft über alle studien- und prüfungsrelevanten Fragen sind den Fachprüfungs- und Studienordnungen (FPSOen) der Studiengänge sowie der allgemeinen Prüfungs- und Studienordnung der TUM (APSO) zu entnehmen.

Wahlmodule

Wenn im Rahmen des Studiengangs Wahlmodule aus einem offenen Katalog gewählt werden können, sind diese Wahlmodule in der Regel nicht oder nicht vollständig im Modulhandbuch gelistet.

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Pflichtmodule | Required Courses

Modulbeschreibung

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

Modulbeschreibungsversion: Gültig ab Sommersemester 2024

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Sommersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 105	Präsenzstunden: 45

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

Written exam (Klausur, 120 min). In the exam the students have to demonstrate that they have achieved a deep understanding of various anabolic and catabolic processes and will be able to classify and reflect their cell- and organ-specific regulation. The students should be able to outline and analyse complex metabolic pathways, to assess their main function 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 and interpret typical pathophysiological situations in case studies.

Wiederholungsmöglichkeit:

Folgesemester

(Empfohlene) Voraussetzungen:

It is essential that the students have previously visited the module Basics Nutrition and Food. Many of the materials presented in Advanced Metabolism build upon and logically connect to the contents of the module Basics Nutrition and Food.

Inhalt:

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

Lernergebnisse:

In the lecture Advanced Metabolism, the students will understand the 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 Food but brings the participants to a higher level of complexity and understanding.

Lehr- und Lernmethoden:

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

Medienform:

PowerPoint presentations.

Literatur:

Jeremy M. Berg, Lubert Stryer, John L. Tymoczko and Gregory J. Gatto: Biochemistry (8th edition, 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.

Modulverantwortliche(r):

Uhlenhaut, Nina Henriette; Prof. Dr. rer. nat.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

WZ3201: Basics Nutrition and Food | Basics Nutrition and Food

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Wintersemester
Credits:* 3	Gesamtstunden: 90	Eigenstudiums- stunden: 30	Präsenzstunden: 60

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

A Klausur (written examination, 120 min) is offered in presence (WZ3201). If required by the pandemic situation, this can be supplemented by a simultaneous electronic written distance examination. (Online exam: WZ3201o).

The progress of the students will be tested in a Klausur (written exam, 120 min) 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 (course work). 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).

Wiederholungsmöglichkeit:

Semesterende

(Empfohlene) Voraussetzungen:

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.

Inhalt:

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

Lernergebnisse:

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 from 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.

Lehr- und Lernmethoden:

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. The main body of the module is a lecture in PowerPoint format given by several lecturers. 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 lecture will be complemented by a tutorial that takes place in smaller groups in the time between the lecture and the exam. Here, senior students of Nutrition and Biomedicine will be available for questions that may have appeared during the self study time. The tutorial provides additional space for interaction with other students and helps to identify areas that need more attention.

Medienform:

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

Literatur:

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.

Modulverantwortliche(r):

Stolz, Jürgen; PD Dr. rer. nat. habil.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Basics Nutrition And Food (Vorlesung, 4 SWS)

Stolz J [L], Bader B, Fromme T, Haller D, Klingenspor M, Michel K, Oeckl J, Schnabl K, Spanier B, Stolz J

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

WZ3226: Basics in Computational Biology | Basics in Computational Biology

Modulbeschreibungsversion: Gültig ab Sommersemester 2024

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Sommersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 105	Präsenzstunden: 45

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

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

Wiederholungsmöglichkeit:

Folgesemester

(Empfohlene) Voraussetzungen:

none

Inhalt:

Public databases (Ensemble, UniProt, PDB) open source (Clustal Omega, Phylip, MEGA, Benchling) and commercial software (Genomatix) for the analysis of sequences related to nutritional biomedicine and biological sciences. Topics: Genomes, sequence archives, alignments, polymerase chain reaction, cloning, molecular phylogeny, primary structures of proteins, functional domains und 3D-structures, promoter analysis, polymorphisms.

Lernergebnisse:

Students have acquired basic skills in biological computing. At the end of the module they can apply basic knowledge in bioinformatics to solve new problems related to nutrition science and biomedical research. They are able to use their knowledge to solve practical problems occurring

in everyday life of a molecular biologist in the laboratory. Students will be able to run the required software on their own computer, and can apply the software in their research internship and master thesis.

Lehr- und Lernmethoden:

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

Medienform:

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

Literatur:

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

Modulverantwortliche(r):

Klingenspor, Martin; Prof. Dr. rer. nat.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

WZ3210: Disease Pathologies and Nutrition | Disease Pathologies and Nutrition

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Wintersemester
Credits:* 8	Gesamtstunden: 240	Eigenstudiums- stunden: 150	Präsenzstunden: 90

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

The examination of the module is two-part and conducted for the lecture as a written exam (Klausur, graded examination) on the lecture subjects and for the seminar as coursework in the form of a presentation (assessed as „pass“ or „fail“).

The students' overall achievements in the module are assessed by a graded written exam (Klausur, 120 min). The exam tests the students' understanding of the lecture subjects on the basics in pathophysiology, their underlying molecular and metabolic mechanisms and whether they can apply their theoretical knowledge. The exam questions can be a mixture of 'open questions', comprehensive questions and 'closed questions' (multiple choice) dependent on the respective lecturer. The grade of the written exam equals the final grade for the module, since the examination of seminar part work is non-graded („pass“ or „fail“). Moreover, to gain 8 credit points for the module the student has to pass both the exam on the lectures and the seminar, i.e. for the module there is no splitting of the credits.

For the seminar groups of 2 to 5 students preparing (self-study) their respective group coursework presenting it as oral presentation (PowerPoint presentation approx. 40 min) in the seminar followed by the discussion (approx. 20 min) with the seminar audience. Each coursework comprises the analysis of specific published disease/nutrition-related human studies and/or animal models by the group members. The coursework is non-graded („pass“ or „fail“). In the seminar the students should learn to apply the knowledge from the lectures in combination with self-studies to prepare and present their course work, but also to be an interactive part in the audience asking questions and/or commenting the presentations.

Wiederholungsmöglichkeit:

Folgesemester

(Empfohlene) Voraussetzungen:

Basics in nutrition, metabolism, physiology and nutritional medicine.

Inhalt:

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.

Lernergebnisse:

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.

Lehr- und Lernmethoden:

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

Medienform:

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.

Literatur:

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

Modulverantwortliche(r):

Bader, Bernhard, Dr. rer. nat. Klinische Ernährungsmedizin bernhard.bader@tum.de <http://www.em-tum.de/>

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Disease Pathologies and Nutrition (Vorlesung, 4 SWS)

Bader B [L], Annahazi A, Bader B, Fromme T, Haller D, Oeckl J, Pfluger P, Skurk T, Traidl-Hoffmann C, Witt H

Seminar Disease Pathologies and Nutrition (Seminar, 2 SWS)

Bader B [L], Bader B

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

LS40012: Energy Balance and Regulation | Energy Balance and Regulation

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache:	Semesterdauer: Einsemestrig	Häufigkeit: Wintersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 90	Präsenzstunden: 60

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

The examination of the module is conducted in the form of a written exam (Klausur, 120 min). The written exam 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 module. 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 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.

In addition, there is the option of taking a voluntary mid-term assignment as course work in accordance with APSO §6, 5. For this, a presentation (10 min) has to be given 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.

The module grade can be improved by 0.3 by passing the course work if this better characterizes the student's performance level on the basis of the overall impression and the deviation has no influence on passing the examination. No repeat date is offered for the mid-term performance.

When retaking a failed module examination at the next possible examination date, successfully passed mid-term assignments will be taken into account.

Wiederholungsmöglichkeit:

Folgesemester

(Empfohlene) Voraussetzungen:

Basic knowledge in mammalian physiology, cell biology, biochemistry, genetics and molecular biology.

Inhalt:

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

Lernergebnisse:

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 (patho-)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 to 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. They can weigh the positives and negatives of experimental design, address limitations in study designs, data presentation as well as data interpretation.

Lehr- und Lernmethoden:

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.

Medienform:

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

Literatur:

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

Modulverantwortliche(r):

Martin Klingenspor (mk@tum.de)

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

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Modulbeschreibung

LS40013: Food and Health | Food and Health

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Sommersemester
Credits:* 8	Gesamtstunden: 240	Eigenstudiums- stunden: 150	Präsenzstunden: 90

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

A written exam (Klausur, 120 min, open questions and up to 20% multiple choice questions) 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. Students should show that they understand the functional interrelation of the food components and certain diseases that they are able to transfer their knowledge to exemplary pathologies. For the exam, no supporting material is allowed.

In addition, there is the option of taking a voluntary mid-term assignments as course work in accordance with APSO §6, 5. For this, a presentation (50 min, PowerPoint) has to be given. The module grade can be improved by 0.3 by passing the course work if this better characterises the student's performance level on the basis of the overall impression and the deviation has no influence on passing the examination.

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.

No repeat date is offered for the mid-term performance. When retaking a failed module examination at the next possible examination date, successfully passed mid-term assignments will be taken into account.

Wiederholungsmöglichkeit:

Semesterende

(Empfohlene) Voraussetzungen:

Basic knowledge of the biofunctionality of food and food components as well as nutritional science.

Inhalt:

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.

Lernergebnisse:

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.

Lehr- und Lernmethoden:

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

Medienform:

PowerPoint presentations; original research papers and reviews

Literatur:

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).

Modulverantwortliche(r):

Dirk Haller Dirk.haller@tum.de 2.Dozent Ingrid Schmöller Ingrid.schmoeller@tum.de

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

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

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Zweimestrig	Häufigkeit: Wintersemester/ Sommersemester
Credits:* 10	Gesamtstunden: 300	Eigenstudiums- stunden: 180	Präsenzstunden: 120

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

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

Wiederholungsmöglichkeit:

Folgesemester

(Empfohlene) Voraussetzungen:

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

Inhalt:

Students acquire practical knowledge in a broad spectrum of experimental methods applied in research laboratories for nutrition and food science and in biomedical research:

- A. Western blot analysis (LS Ernährungsmedizin, Hauner)
- B. Mycotoxins in the food chain (LS Tierhygiene, komm. Langosch)
- C. Neurogastroenterology (LS Humanbiologie, Schemann)
- D. Flow cytometry for cell cycle studies (LS Ernährung und Immunologie, Haller)

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

Lernergebnisse:

After successful completion students know a broad spectrum of methods in molecular biology, analytical biochemistry, cell biology and physiology applied in nutrition and food sciences and biomedical research (e.g. PCR genotyping, functional genomics, protein analytics, chromatography and mass spectrometry of metabolites, mitochondrial bioenergetics, tumor models). They are familiar with the theoretical background, technical details and potential pitfalls of these methods, and have first hands-on experience in their application. Students are able to generate laboratory protocols of their experimental work, documenting data acquisition, processing and analysis. They can evaluate results obtained in a self-contained manner. Students understand the principles of experimental design and apply suitable methods in the framework of a research project.

Lehr- und Lernmethoden:

For each individual lab course, students must download and study the specific lab instructions from Moodle in advance. Students must read and understand these lab instructions before they attend the practical course. In particular, they need to attend the safety instructions. Practical training in laboratory skills and techniques takes place in small groups during the course.

The two-semester delivery of the module is driven by the learning outcomes and can be didactically justified. The combination of teaching theoretical and practical knowledge of methods as well as the efficient and safe execution of experimental work requires the continuous laboratory work of the students extending over two semesters. The accompanying protocol work, the continuous training in scientific documentation, writing, evaluation and interpretation in this interdisciplinary and complexly interwoven field of knowledge requires a step-by-step competence transfer over two semesters to be able to ensure the internalization of scientific working methods and approaches at an advanced level.

Medienform:

Experimental instructions will be made available on Moodle.

Literatur:

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

Modulverantwortliche(r):

Klingenspor, Martin; Prof. Dr. rer. nat.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Integrated lab-course I (Übung, 4 SWS)

Bader B, Bruder J, Ewers M, Hoffmann T, Klingenspor M, Reil G, Schaten S, Schmöller I, Spanier B, Wurmser C

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

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

Modulbeschreibungsversion: Gültig ab Sommersemester 2024

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Sommersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 90	Präsenzstunden: 60

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

The examination requirements of the module "Nutrition and Mirobe-host Interactions" consist of a written examination on any content of the module (Klausur 90 min, open questions and up to 70% multiple choice questions). 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.

In addition, there is the option of taking a voluntary mid-term assignment as course work in accordance with APSO §6, 5. For this, a report (PowerPoint presentation of data analysis, 4-6 pages) must be submitted. The module grade can be improved by 0.3 by passing the course work if this better characterises the student's performance level on the basis of the overall impression and the deviation has no influence on passing the examination. No repeat date is offered for the mid-term performance. When retaking a failed module examination at the next possible examination date, successfully passed mid-term assignments will be considered. The mid-term assignment will assess the ability of the students to apply microbial profiling data analysis to describe and interpret bacterial community profiles on the provided datasets.

Wiederholungsmöglichkeit:

Semesterende

(Empfohlene) Voraussetzungen:

Basic knowledge in physiology, microbiology, bio functionality and immunology.

Inhalt:

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.

Lernergebnisse:

After successful participation in the module, 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. Students will gain a deeper understanding of microbe-host interactions, as well as the link between the microbiome and disease. Using this knowledge, students will be able to critically assess recent studies and findings. The students will be able to carry out and interpret a range of analyses on 16S rRNA gene sequencing data for microbial profiling.

Lehr- und Lernmethoden:

Lectures will be held to teach the students the content of the module in a classroom environment. On top of this, students are expected to deepen their understanding of the content by studying independently. The seminar will consist of hands-on analysis workshops as well as independent analysis by the students, to allow for the practical implementation of theoretical knowledge that has been taught during the module.

Medienform:

Literatur:

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

Modulverantwortliche(r):

Haller, Dirk; Prof. Dr. rer. nat.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

WZ3204: Recent Topics | Recent Topics [RT]

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Zweisemestrig	Häufigkeit: Wintersemester/ Sommersemester
Credits:* 6	Gesamtstunden: 180	Eigenstudiums- stunden: 120	Präsenzstunden: 60

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

The examination of the module is conducted in the form of a research paper. 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.

Wiederholungsmöglichkeit:

Folgesemester

(Empfohlene) Voraussetzungen:

No prerequisites. Participation in the examination requires that students have passed the module Basics in Nutrition and Food

Inhalt:

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.

The two-semester delivery of the module is driven by the learning outcomes and can be didactically justified. The interdisciplinarity as well as the qualification profile of the study program require not only a deepening and broadening of the specialized knowledge of nutritional sciences, but also a deepening and broadening of the knowledge in medically relevant topics. The transfer of competence of this interrelated and interdisciplinary knowledge requires the two-semester duration of the module Recent Topics.

Lernergebnisse:

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.

Lehr- und Lernmethoden:

Lectures with subsequent discussions

Medienform:

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

Literatur:

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

Modulverantwortliche(r):

Klingenspor, Martin; Prof. Dr. rer. nat.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Recent Topics I (Vorlesung, 2 SWS)

Behrens M, Ecker J, Friano M, Greulich F, Hall L, Klingenspor M, Rath E, Traidl-Hoffmann C, Wagner A, Zehn D

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

WZ3225: Research Methods | Research Methods

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Wintersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 105	Präsenzstunden: 45

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

The exam will be a written examination (120 min) either with pen and paper or in electronic format. The exam will usually be taken in presence (WZ3225). If required by the pandemic situation, this can be supplemented by a simultaneous electronic written distance examination. (Online exam : WZ3225o).

The exam at the end of the winter term is a written test (Klausur, 120 min). This exam will check if the students can use the correct technical terms and are familiar with the advantages and disadvantages of the various lab techniques, experimental strategies and model organisms that are commonly used. The students need to identify mistakes in experimental strategies, evaluate data and make suggestions on how to design an experiment to gain the desired answers. The students will have to demonstrate that they know the current standards of how to make a clinical investigation and how to categorize and critically evaluate results of observational and interventional studies based on the study design. To this end, the students will be confronted with experimental results for critical assessment of the research strategy, data interpretation and a possible improvements of the research strategy.

Wiederholungsmöglichkeit:

Folgesemester

(Empfohlene) Voraussetzungen:

For the lecture Research Tools some basic knowledge in the core biological areas cell biology, classical genetics, molecular biology and biochemistry and in some classical analytical methods (such as SDS-PAGE, Western Blot, Northern Blot), is necessary. This is partially covered in the module Basics Nutrition and Food.

For the lecture Clinical Studies the pathophysiology of important metabolic disorders (e.g. diabetes mellitus type 2, dyslipidemia) is necessary. Also, basic statistical knowledge is

necessary for calculating effect size and power of the study, etc. Basic principles of “Good Clinical Practice” (GCP) should be known.

Inhalt:

Research Methods is comprised of two parts, both held in winter term.

The lecture Research Tools (2 SWS) will cover

- the (molecular) biology of model organisms used in nutrition research
- the advantages and disadvantages of the individual model organisms for research
- gene expression analysis by DNA arrays and sequencing approaches
- basics in human genetics and association of genetic variation with phenotypic traits such as disease susceptibility
- detection and functional analysis of genetic variation (coding and non-coding variants)
- techniques for proteome analyses and their limitations when applied to biomedical problems
- techniques for metabolome analyses, limitations encountered in the analysis of body fluids
- approaches for the analysis and visualization of complex data.

The lecture Clinical Studies (1 SWS)

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

Lernergebnisse:

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

Lehr- und Lernmethoden:

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

Medienform:

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

Literatur:

Basis for the development of clinical studies are legal texts as the „Good Clinical Practice” – guideline.

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

Modulverantwortliche(r):

Stolz, Jürgen; PD Dr. rer. nat. habil.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Clinical Studies (Vorlesung, 1 SWS)

Skurk T [L], Brandl B, Skurk T

VL Research Methods 1 (Vorlesung, 2 SWS)

Stolz J [L], Bader B, Grallert H, Ludwig C, Spanier B, Stolz J, Witting M (Grallert H)

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Wahlmodule | Elective Modules

Forschungspraktika | Research Internships

Modulbeschreibung

LS20011: Research Internship Internal (10 CP) | Research Internship Internal (10 CP)

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Wintersemester/ Sommersemester
Credits:* 10	Gesamtstunden: 120	Eigenstudiums- stunden: 300	Präsenzstunden: 180

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

The module is completed by the completion of the 8-week research internship (full-time, 37,5 h/wk)
The examination of the module is conducted in the form of a report.

The student's performance is evaluated, as documented in the lab notebook and the internship report (max. 25 pages, including tables, figures and references), 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

Wiederholungsmöglichkeit:

(Empfohlene) Voraussetzungen:

Module Research Methods

Module Basics in Computational Biology Module Integrated Lab Course

shedule:

The students search for themselves one TUM internal supervisor from the given list of classes. 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 LS20011 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.

Inhalt:

The scientific questions addressed by laboratories on the TUM campus 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.

The research internship consists of 240 hours of attendance or of working time (e.g. in the laboratory) and 60 hours for the internship follow-up (report). The internship period should thus comprise 8 weeks (37.5 h/week). In order to ensure continuous processing of the topic, the attendance time should be provided as continually as possible with a weekly working time of at least 20 hours and should not exceed the internship time of 15 weeks in part-time.

Lernergebnisse:

After successful finalization of the module, 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.

Lehr- und Lernmethoden:

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.

Medienform:

Literatur:

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.

Modulverantwortliche(r):

Klingenspor, Martin; Prof. Dr. rer. nat.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

LS20012: Research Internship Internal (5 CP) | Research Internship Internal (5 CP)

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Wintersemester/ Sommersemester
Credits:* 5	Gesamtstunden: 60	Eigenstudiums- stunden: 150	Präsenzstunden: 90

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

The module is completed by the completion of the 4-week research internship (full-time, 37,5 h/ week).

The examination of the module is conducted in the form of a report.

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

Wiederholungsmöglichkeit:

(Empfohlene) Voraussetzungen:

Module Research Methods

Module Basics in Computational Biology Module Integrated Lab Course

shedule:

The students search themselves one TUM internal supervisor from the given list of classes. 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 LS20012 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.

Inhalt:

The scientific questions addressed by laboratories on the TUM campus 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.

The research internship consists of 120 hours of attendance or of working time (e.g. in the laboratory) and 30 hours for the internship follow-up (report). In full-time, the internship period is therefore 4 weeks (37,5 h/week). In order to ensure continuous processing of the topic, the attendance time should be provided as continually as possible with a weekly working time of at least 20 hours and should not exceed the internship time of 8 weeks in part-time.

Lernergebnisse:

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.

Lehr- und Lernmethoden:

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.

Medienform:

Literatur:

Modulverantwortliche(r):

Klingenspor, Martin; Prof. Dr. rer. nat.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

LS20013: Research Internship External (10 CP) | Research Internship External (10 CP)

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Wintersemester/ Sommersemester
Credits:* 10	Gesamtstunden: 300	Eigenstudiums- stunden: 300	Präsenzstunden: 0

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

The module is completed by the completion of the 8-weeks research internship (full-time; 37,5 h/ week).

The examination of the module is conducted in the form of a report.

The student's performance is evaluated, as documented in the lab notebook and the internship report (max. 25 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

Wiederholungsmöglichkeit:

(Empfohlene) Voraussetzungen:

Module Research Methods

Module Basics in Computational Biology Module Integrated Lab Course

shedule:

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 LS20013 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.

Inhalt:

The scientific questions addressed by laboratories 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.

The research internship consists of 240 hours of attendance or of working time (e.g. in the laboratory) and 60 hours for the internship follow-up (report). The internship period should thus comprise 8 weeks (37.5 h/wk). In order to ensure continuous processing of the topic, the attendance time should be provided as continually as possible with a weekly working time of at least 20 hours and should not exceed the internship time of 15 weeks in part-time.

Lernergebnisse:

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.

Lehr- und Lernmethoden:

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

research internship, students are trained to scrutinize a research question related to nutrition science and biomedicine as predefined by the external supervisor. The research internship embeds in a defined research context at the respective external host institution. Experienced scientific personnel at the external host institution supports the training success of students. Students document their research work in a dedicated lab notebook, with a focus on detailed description of applied methodologies, data acquisition and data analyses. Upon request they report to their TUM supervisor on the progress of their work 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 options to further develop the project are discussed.

Medienform:

Literatur:

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.

Modulverantwortliche(r):

Klingenspor, Martin; Prof. Dr. rer. nat.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

LS20014: Research Internship External (5 CP) | Research Internship External (5 CP)

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Wintersemester/ Sommersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 150	Präsenzstunden: 0

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

The module is completed by the completion of the 4-week research internship (full-time, 37,5 h/wk).

The examination of the module is conducted in the form of a report.

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

Wiederholungsmöglichkeit:

(Empfohlene) Voraussetzungen:

Module Research Methods

Module Basics in Computational Biology Module Integrated Lab Course

shedule:

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 LS20014 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.

Inhalt:

The scientific questions addressed by laboratories 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.

The research internship consists of 120 hours of attendance or of working time (e.g. in the laboratory) and 30 hours for the internship follow-up (report). In full-time, the internship period is therefore 4 weeks (37,5 h/week)s. In order to ensure continuous processing of the topic, the attendance time should be provided as continually as possible with a weekly working time of at least 20 hours and should not exceed the internship time of 8 weeks in part-time.

Lernergebnisse:

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.

Lehr- und Lernmethoden:

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 external supervisor. The research internship embeds in a defined research context at the respective at the host institution. Experienced scientific personnel at the external host institution supports the training success of students. Students document their research work in a dedicated lab notebook, with a focus on detailed description of applied methodologies, data acquisition and data analyses. Upon request they report to their TUM supervisor on the progress of their work 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 options to further develop the project are discussed.

Medienform:

Literatur:

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.

Modulverantwortliche(r):

Klingenspor, Martin; Prof. Dr. rer. nat.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

WZ3061: Applied Food Law | Applied Food Law

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Zweimestrig	Häufigkeit: Wintersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 90	Präsenzstunden: 60

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

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. The individual performance of the examinees is assessed by answering questions independently, examining practical examples and showing in a discussion that they have thought through the subject matter in an argumentative way.

Wiederholungsmöglichkeit:

Folgesemester

(Empfohlene) Voraussetzungen:

Food law lecture in B.Sc. study recommended, but no prerequisite

Inhalt:

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.

Lernergebnisse:

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.

Lehr- und Lernmethoden:

The module consists of a lecture, including expert input. Product samples are presented, learnings from authorization procedures. Surveillance measures and the jurisdiction of the courts discussed.

Medienform:

Presentations with PowerPoint

Literatur:

Meisterernst, Lebensmittelrecht, C.H. Beck 2019; Textsammlung Lebensmittelrecht, R&W Verlag

Modulverantwortliche(r):

Meisterernst, Andreas; Hon.-Prof.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Applied Food Law (Vorlesung, 2 SWS)

Meisterernst A

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

LS40014: Basics of Metabolomics | Basics of Metabolomics

Modulbeschreibungsversion: Gültig ab Sommersemester 2024

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Sommersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 105	Präsenzstunden: 45

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

The examination of the module is conducted in the form of a project work.

The examination consists of an oral presentation of up to 5-7 minutes per person (60% of final mark) and submission of a maximum 6 page long research paper (40% of final mark) on the project work focusing on a specific experimental/theoretical problem related metabolomics experiments. The research paper is a mean to measure the overall understanding of the stated problem in metabolomics workflows and their ability to solve them, analyze the current state-of-art and develop novel solutions in order to improve current shortcomings in metabolomics. The oral presentation allows students to present their results to a wider auditory and subsequent discussion is a mean to measure their understanding of the scientific subject. The discussion includes justification in the selection of the analytical methods (mass spectrometry, nuclear magnetic resonance, type of chromatographic separation, etc) as well as overall understanding of the metabolomics workflow

Wiederholungsmöglichkeit:

Semesterende

(Empfohlene) Voraussetzungen:

- basic knowledge of biochemistry
- basic statistical knowledge, e.g. t-test, etc.
- basic laboratory skills

Inhalt:

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
- interpretation of results
- 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

Lernergebnisse:

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 scientific 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, are able to comment on them and present results in a scientific setting.

Lehr- und Lernmethoden:

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

Medienform:

Script; slides

Literatur:

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

Modulverantwortliche(r):

Witting, Michael; Dr. Dr. rer. nat.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

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

Modulbeschreibungsversion: Gültig ab Sommersemester 2024

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Sommersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 90	Präsenzstunden: 60

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

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 sets applying 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. In the group examination, students are individually asked questions and given statistical tasks to be completed, while the respective other student is given the chance to supplement or comment given answers leading to a scientific discussion. Students may use a sheet of paper with personal notes as auxiliary means (1 sheet of paper, max. page size DIN A4, double sided).

Wiederholungsmöglichkeit:

Folgesemester

(Empfohlene) Voraussetzungen:

Basics in statistics

Inhalt:

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, Non-parametric alternatives, bootstrapping; Correlations: Pearson, Spearman, Kendall, partial correlation; Linear Regression

Lernergebnisse:

Upon successful completion of the module, students are able 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 applying 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.

Lehr- und Lernmethoden:

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

Medienform:

The following media will be used as and when required:

Reader, (white)board, exercise sheets, PowerPoint, Moodle online course, Zoom online sessions

Literatur:

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

Modulverantwortliche(r):

Gedrich, Kurt, Apl. Prof. Dr. oec. troph. habil. kgedrich@tum.de

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

LS40015: Experimental Immunology and Pathology | Experimental Immunology and Pathology

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Wintersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 75	Präsenzstunden: 75

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

The examination of the module is conducted in the form of a laboratory assignment with a written report.

Students have to hand in the report (appx. 20 pages) covering all topics presented in the lab course including mouse dissection, histopathology, genotyping, immune phenotyping, gene expression analysis and microbiological analysis. Each student will have to write a separate report for each topic mention above, in the format of a thesis (scientific background on the mouse model and its relevance, material and methods, analysis of the data and results, discussion of the obtained results and perspectives including literature references). 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.

Wiederholungsmöglichkeit:

Folgesemester

(Empfohlene) Voraussetzungen:

Basic knowledge in immunology

Inhalt:

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.

Lernergebnisse:

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.

Lehr- und Lernmethoden:

Prior to the practical work, students will attend lectures (each approx. 60min) presenting all topics and respective methods (mouse dissection, histopathology, genotyping, immune phenotyping, gene expression analysis and microbiological analysis). Each student will receive a detailed script presenting the scientific background and methodologies with regard to the mouse model and applied lab techniques and protocols, as a permanent informational and reference tool. Where appropriate, videos and online content will be provided for students to access via Moodle for additional support. Before the end of the module, each topic will be discussed in a question and answer session, allowing students to clarify any uncertainties and deepen their knowledge. Each topic will be supervised by a different lecturer, who will also be the direct person of contact for the respective topic during the entire course and writing phase, maximizing the availability for questions from students. Within the practical lab course the students work in teams of two, however each student will write their own report.

Medienform:

Literatur:

Modulverantwortliche(r):

Dirk Haller Dirk.haller@tum.de

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

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

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Wintersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 90	Präsenzstunden: 60

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

The final grade will be based on a written exam which will include both, open and multiple-choice questions ($\leq 10\%$). The written examination will be 120 minutes with pen and paper and will be conducted without the use of learning aids. The examination will be roughly 6 weeks after the final lecture.

Passing of the exam will require a broad overview of the Food Industry and food design presented in the lectures. 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, distilling out and remembering the salient facts on how science and consumer behaviour underpins the economic performance of the Food Industry. Students will be able to demonstrate by answering questions:

- a practical knowledge of the Food Value Chain (Farm to Fork), economic performance as well as the challenges driven by environmental pressures, trends in society and consumer behaviour;
- the ability to describe the complexities involved in designing food products that meet consumer demands for safe, legally compliant, convenient, healthy and affordable food that must above all, taste good;
- they have understood the analysis of the various case studies on how different Food Companies have (and continue to work) with Governments, Non-Government Organisations (NGOs) and academia to address the challenges facing the Food Industry.

Wiederholungsmöglichkeit:

Folgesemester

(Empfohlene) Voraussetzungen:

The fundamentals of food chemistry/engineering and nutrition science plus a basic understanding of statistics

Inhalt:

The course gives an overview on the role of the Food Industry both 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 quick service restaurants) are reviewed.

The methods used in product development and commercialization are described. Case studies are used to illustrate consumer driven product design in the context of business expectations and trends in society.

The impact of legislation regarding product labelling and health claims is reviewed and illustrated by examples.

Lernergebnisse:

This module is designed for students with various scientific and cultural backgrounds and gives the students a holistic understanding of the Food Industry - Food Value Chain, economic performance as well as the challenges driven by environmental pressures, trends in society and consumer behaviour.

The students will analyse various case studies on how different Food Companies have (and continue) to work with Governments, Non-Government Organisations (NGOs) and academia to address these challenges. The students will be able to draw conclusions as to whether these challenges were resolved.

In addition, students will be able to describe the complexities involved in designing food products that meet consumer demands for safe, legally compliant, convenient, healthy and affordable food that must above all, taste good.

Finally, the students will be able to compare the roles played by Food Companies and academia in the Food Industry. They will be able to apply this knowledge when considering possible internships and future career prospects.

Lehr- und Lernmethoden:

Lectures using PowerPoint with commentary giving examples of practical experience in the Food Industry. Case studies are integrated into the lectures to illustrate and analyse how various methods are used in consumer driven product design.

During the lectures the students will be encouraged and given time to discuss and critique the various topics to enhance their comprehension of the subject.

Tutorial sessions will be available to the students as required

Medienform:

PowerPoint presentations will be used for the lectures. Links to the relevant scientific, commercial and literature are included on the PowerPoint slides. The material for the lectures will be posted on the Moodle platform 2 days before the lecture date.

Literatur:

Links to the relevant literature are included on the PowerPoint slides and will be highlighted during the lectures.

Modulverantwortliche(r):

Pearson, Stephen

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Food Design and Food Industry (Vorlesung, 4 SWS)

Klingenspor M [L], Pearson S

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

LS40016: Health Behaviour and Health Promotion | Health Behaviour and Health Promotion

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Wintersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 105	Präsenzstunden: 45

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

The learning outcome from this module is evaluated based on a 30 minute oral group examination (with two examinees) and a research paper (approx. 10 pages per student) completed by a presentation (approx. 10 minutes per student plus discussion).

In the oral examination, students prove their abilities to understand important theories of health behaviour; to apply those theories for understanding consumers' health behaviours; to evaluate advantages and disadvantages of various health systems.

In the group examination, students are individually asked questions, while the respective other student is given the chance to supplement or comment given answers leading to a scientific discussion.

The research paper and the respective presentation are both conducted as coursework. They provide students the opportunity to 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.

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.

Wiederholungsmöglichkeit:

Folgesemester

(Empfohlene) Voraussetzungen:

Students may benefit from basic insights into Economics and Public Health

Inhalt:

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;

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 and time discounting;

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.

Lernergebnisse:

Upon successful completion of the module, students are able to understand important theories of health behaviour;

to apply those theories for understanding consumers' health behaviours;

to evaluate pros and cons of various health care systems;

to understand a given scientific problem related to health behaviour and health promotion;

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.

Lehr- und Lernmethoden:

Lecture, group work, discussions, examples, demonstrations, student presentations, homework, students' self-dependent study of relevant literature

Medienform:

The following media will be used as and when required:

Reader, (white)board, PowerPoint, Moodle online course, Zoom online sessions

Literatur:

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

Modulverantwortliche(r):

Gedrich, Kurt; Apl. Prof. Dr. oec. troph. habil.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

WZ3230: Mitochondrial Biology | Mitochondrial Biology

Modulbeschreibungsversion: Gültig ab Sommersemester 2024

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Sommersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 90	Präsenzstunden: 60

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

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.

Wiederholungsmöglichkeit:

Folgesemester / Semesterende

(Empfohlene) Voraussetzungen:

Basics in Nutrition and Food, Energy Balance Regulation

Inhalt:

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 mutations in the phylogeny of human origin, evolution and the endosymbiotic theory, fusion and fission, protein import, solute transport, and mito-ER association.

Lernergebnisse:

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.

Lehr- und Lernmethoden:

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.

Medienform:

presentation slides, whiteboard

Literatur:

'Bioenergetics 4' by David Nicholls, ISBN: 9780123884251

'Mitochondria' by Immo Scheffler, ISBN: 0471194220

Modulverantwortliche(r):

Fromme, Tobias; PD Dr. rer. nat. habil.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

WZ3232: Molecular Oncology | Molecular Oncology

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Zweisemestrig	Häufigkeit: Wintersemester/ Sommersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 90	Präsenzstunden: 60

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

This modul is composed of two courses distributed over two semesters: Molekulare Onkologie 1MED (MoOnc 1) and Molekulare Onkologie 1 HA (MoOncHA).

The module examinations consists of a written exam (Klausur, 90 min, 60 min in pandemic emergencies, graded, weighted with 100%) and the examination of the homework (Report, typically 20-25 pages) for the subsequent semester. The homework is ungraded, but has to be passed to pass the module.

The lecture of MoOnc 1 is recommended to be continuously visited for those students aiming at excelling in the written final exam (free questions, graded), 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. By answering the questions correctly, the students demonstrate their skills and competence to reproduce facts from the lecture (approx. 70%, associate different facts presented during the lecture (approx. 20%), and employ their ability of transfer thinking (approx. 10%) evolving from the understanding and postprocessing of the lectures, which is supported by regular question-sessions. Furthermore, the students demonstrate their competence to answer the questions in a concise and clearly written way supported by drawings. The questions are in English and German, the answers can be given in one or the other of these languages. The passing of the exam is prerequisite for allowance for MoOncHA.

MoOncHA is a homework written in English.

With the completion of the homework the successful (passed) students show that they have gained the competence to study on his/her own, compare and appreciate his/her notes with the pertinent literature in all ten fields covered in the lecture (see below in content), can work and complete the work in a given time-frame, follow constructions and put all their research in a given format. This way, the students will have the competence to meet basic expectations of a science-associated/ related job. Assessment criteria are the correctness of the expected formats, suitable and fitting

choice of literature, and sufficiently correct topic-related content. The homework assignment has to be submitted as ppt and pdf-converted file. In addition, a pdf-file containing the used original papers has to be submitted.

Wiederholungsmöglichkeit:

Folgesemester

(Empfohlene) Voraussetzungen:

basics of biochemistry, molecular biology, genetics. Other modules are not a pre-requisite.

Inhalt:

Topics

- 1.) Introduction to Molecular Oncology, Terminology, Problems in Tumor Biology Research;
- 2.) Tissue Homeostasis, Causes of Tumorigenesis, Maintenance of Genomic Stability;
- 3.) Oncogenes (Oncogene Discovery Methods, Definitions, Classes of Oncogenes, Oncogenic Mode of Action);
- 4.) Tumor Suppressor Genes (Discovery and Examples, Mode of Action);
- 5.) Epigenetics (Definitions, Histone and DNA Modifications, CpG Islands);
- 6.) The Microenvironment of the Cell (Components of a Tumor, Tumor Stroma as Therapeutic Target, Structure and Function of Major Molecules of the Extracellular Matrix, Cell/ECM Interaction, Cell/Cell Interaction);
- 7.) Mechanisms of the Metastasis Cascade (Steps of the Cascade, Angiogenesis, Angiogenic and Metabolic Switch, Invasion
Tumor-Associated Inflammation, Epithelial-Mesenchymal Transition, Seed and Soil Hypothesis, Pre-Metastatic Niche);
- 8.) Proteases/ and Protease Inhibitors (Physiological and Patho-physiological Functions of Proteases and Protease Inhibitors, Clinical Trial Concept of Pharmacological Intervention, Regulation of Proteases, sroteases as Prognostic Marker, Development of Synthetic Protease. Inhibitors, Optimization of Synthetic Protease Inhibitors,);
- 9.) Specific Methodology in Molecular Oncology (in vivo Models, Biochemical/Molecular Detection Methods of Proteases and Protease Inhibitors, Zymography, Genetically Engineered Mouse Models of Cancer, in vitro Migration and Invasion Models);
- 10.) TIMP-1 (Structure and Functions in Cancer and other Inflammatory Diseases, TIMP-1 as a Cytokine). Problems of tumor research.

Lernergebnisse:

Upon completion of the module, students are able to understand the research and to know the principle questions and implications addressed in upcoming publications in the field of Molecular Oncology. 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 and researchers. 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 well-prepared for job-related questions even in other research fields in the life sciences.

Lehr- und Lernmethoden:

First part: Lecture-talk supported by power point slides, partly including the development of schemes at the blackboard. Study of the script and, importantly, the notes taken from what is said, suggested follow-ups in the literature.

Second part: In depth work and literature research on specific topics in the homework. Reiteration and extension of topics of the lecture by studying independently.

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 research encompasses the selection of one original paper per topic from a certain publication year given at the beginning of the semester. The students will ask and answer three questions to quotes or terms from the respective paper. The levels of the questions are: 1. Reproduction (can be answered on the basis of the lecture notes and/or script); 2. Association (can be answered on the basis of the understanding of the lecture notes and/or script); and 3.) Transfer (can be answered when knowledge from the lecture is applied to a new problem within the topic). The question should be in English and German, the answers in English or German. The homework should be done in the subsequent semester after MolOnc1.

Medienform:

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

Literatur:

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, 2. Auflage, ISBN: 978-0-8153-4528-2

Modulverantwortliche(r):

Krüger, Achim; Apl. Prof. Dr.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Molekulare Onkologie 1MED (Vorlesung, 2 SWS)

Krüger A [L], Krüger A

Molekulare Onkologie I Hausarbeit (Seminar, 2 SWS)

Krüger A [L], Krüger A

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

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

Modulbeschreibungsversion: Gültig ab Wintersemester 2022/23

Modulniveau: Bachelor	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Sommersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 90	Präsenzstunden: 60

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

Building on competences gained in case-specific lectures (literature analysis, systematic assessments of concepts) the students participate in a written exam (Klausur) and give an own presentation in the context of an interdisciplinary workshop. By answering the questions in the examination, the students show that they know the multi-facetted challenges of sustainable land use and nutrition and that they consider the whole supply chain. During the workshop (usually Friday + Saturday), students dive deeper in a specific aspect of sustainable land use and nutrition. They learn here how to prepare a scientific presentation, including literature search and how to present the results to an international audience. Talks on specific topics comprise 10 min per student plus 5 min discussion und questions per student, while the topics are generated from the case studies introduced during the lectures. The students also demonstrate that they are able to analyze a given topic based on existing literature. 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 limitations and without helping material.

The final grade is a combined grade from the written examination (40 %) and from the presentation (60 %).

Wiederholungsmöglichkeit:

Semesterende

(Empfohlene) Voraussetzungen:

Inhalt:

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.

Lernergebnisse:

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 can name the barriers to achieve sustainable land use and nutrition, but can also describe strategies to improve sustainability. They are able to reproduce sustainability concepts, analyze their appropriateness and develop them for application to new problems. They understand that only a comprehensive perspective will lead to sustainable concepts for land use and nutrition.

Lehr- und Lernmethoden:

Students learn and discuss along a supply chain about specific challenges to sustainable land-use and nutrition. Case-specific lectures are furnished with up to date case-study papers, the students have to analyse and interpret. Based on the competences gained, they prepare own studies/presentations on a selection of topics, which they then present on a 2-days workshop to their teachers and colleagues.

Medienform:

PowerPoint, research literature on moodle, Handouts

Literatur:

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

Modulverantwortliche(r):

Knoke, Thomas; Prof. Dr. rer. silv.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Modulbeschreibung

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

Modulbeschreibungsversion: Gültig ab Wintersemester 2023/24

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Wintersemester
Credits:* 5	Gesamtstunden: 150	Eigenstudiums- stunden: 90	Präsenzstunden: 60

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

Oral exam of approximately 20 min, in which the students answer questions and discuss relevant topics of the lecture. The content of the oral exam is exclusively based on the lecture slides, which will be made available at the beginning of each lecture block. In the oral exam, the students are expected to demonstrate that they have reached the qualification objectives laid out in the module descriptions, understood the central concepts of the subject matters covered by the exam, and are able to apply them to specific problems. The oral examination will be held as individual oral examination. The grade of the exam is based on how well the student understood and reflects the topic of the lectures, how positively the student contributed to the discussion in the exam, how accurate and complex the questions are answered, whether the topics were understood and elaborated correctly, and whether the student understood and reflected the connections between the topics.

Wiederholungsmöglichkeit:

Semesterende

(Empfohlene) Voraussetzungen:

participation in the lecture "Energy Balance Regulation" from the 1st term is recommended

Inhalt:

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.

Lernergebnisse:

At the end of the course, the students understand and can explain the most common signal mechanisms underlying the regulation of energy metabolism. The students will further know and can explain the origin, function, and signal mechanisms of the most common hormones implicated in regulation of food intake, energy expenditure, and glucose metabolism. 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.

Lehr- und Lernmethoden:

teaching methods: lecture (2 SWS), seminar (2 SWS):

The lecture (2SWS) is best described as interactive frontal teaching, 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

lecture, 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

chosen 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 to 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

Medienform:

PowerPoint, Flipchart

Literatur:

Modulverantwortliche(r):

Müller, Timo; PD Dr. rer. nat.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

The theoretical and practical basics of systemic energy balance regulation (Vorlesung, 2 SWS)

Müller T

The theoretical and practical basics of systemic energy balance regulation (Seminar, 2 SWS)

Müller T

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

Master's Thesis | Master's Thesis

Modulbeschreibung

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

Modulbeschreibungsversion: Gültig ab Wintersemester 2024/25

Modulniveau: Master	Sprache: Englisch	Semesterdauer: Einsemestrig	Häufigkeit: Wintersemester/ Sommersemester
Credits:* 30	Gesamtstunden: 900	Eigenstudiums- stunden: 750	Präsenzstunden: 150

* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

Beschreibung der Studien-/ Prüfungsleistungen:

The examination of the module Master's Thesis is done in form of a scientific paper. By completion of the Master's Thesis, students demonstrate that they are able to investigate defined scientific questions on their own, with support from an experienced supervisor. They show that 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.

For the Master thesis, the student will conduct research on a scientific problem defined by the supervisor. Under his/her supervision, the student specifies the objectives and aims of the research to address this problem and generates a work plan (gant chart) for the required research tasks. The student is supported by the supervisor to carry out the research tasks in a largely self-sustained manner following good scientific practice (<https://www.gs.tum.de/en/gs/doctoral-candidates/good-scientific-practice/>). The student actively participates in the examination colloquium to discuss the objectives, report on the progress and steer the work plan according to the feedback. 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.

Wiederholungsmöglichkeit:

(Empfohlene) Voraussetzungen:

Work on the master's thesis should commence after successful completion of all module examinations.

Inhalt:

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.

Lernergebnisse:

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-the-art knowledge. In conducting their art of science they follow the rules of good scientific practice.

Lehr- und Lernmethoden:

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.

Medienform:

Literatur:

Modulverantwortliche(r):

Klingenspor, Martin; Prof. Dr. rer. nat.

Lehrveranstaltungen (Lehrform, SWS) Dozent(in):

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte campus.tum.de oder [hier](#).

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