Module Catalog

B.Sc. Sustainable Management and Technology
Academic Programs School of Management Location Straubing
Technische Universität München

www.tum.de/
Module Catalog: General Information and Notes to the Reader

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

Notes to the reader:

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

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

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

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[CS0248] Markets for Renewable Energies and Biobased Products | Märkte für erneuerbare Energien und biobasierte Produkte

Electives in Engineering and Natural Sciences | Electives in Engineering and Natural Sciences

[CS0065] Fundamentals of Thermodynamics | Grundlagen Thermodynamik

[CS0066] Introduction to Process Engineering | Introduction to Process Engineering

[CS0086] Wood-based Resources | Wood-based Resources

[CS0213] Environmental Resources in a Changing World | Environmental Resources in a Changing World

[CS0220] General Chemistry | Allgemeine Chemie [Chem]

[WZ1600] Physics | Physik [Phys]


[WZ1929] Cell Biology and Microbiology | Zell- und Mikrobiologie [MiBi]


[WZ1980] Production of Biogenic Resources | Produktion biogener Ressourcen
Required Modules | Required Modules

Module Description

CS0063: Microeconomics | Microeconomics [Micro I]

Version of module description: Gültig ab winterterm 2021/22

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Description of Examination Method:
In the exam (written, 120 minutes) students should demonstrate their ability to adequately interpret the microeconomic concepts and apply the methods worked on in class. By means of multiple-choice-questions, which are either embedded in a context/case/scenario or require prior computation, students' capacity to apply the learned solution strategies to new settings and draw correct economic implications is assessed. A non-programmable calculator is allowed.

Repeat Examination:
Next semester

(Recommended) Prerequisites:

Content:
This course provides an introduction to basic concepts of microeconomics. It deals with the behaviour of individual economic units, such as households, business firms, and public institutions. Another concern is how these units interact to form markets and industries. How can consumer decisions be explained and how can aggregate demand be derived from consumer choice? Which are the factors that determine the production decisions of companies? How do equilibrium prices emerge in competitive markets, how in monopoly markets? What is the effect of government interventions in markets (e.g. taxes, price controls)? How does market power affect social welfare? Which factors lead to market failure?

Intended Learning Outcomes:
After attending this module, students will be able to describe economic tradeoffs (particularly in choice under scarcity situations of consumers and firms). Moreover, they know strategies to solve
those tradeoffs and are capable of applying them to new situations. Students are able to explain the fundamental economic mechanisms underlying specialisation and trade (particularly in view of technological progress). Students can predict how government interventions (e.g. taxes, price controls) will affect simple competitive markets. They are able to explain why certain industries are prone to market concentration and how market power affects social welfare. They can distinguish which types of goods are efficiently provided on free markets, and which not.

**Teaching and Learning Methods:**
An interactive lecture introduces essential microeconomic concepts and theories and illustrates them with the help of topical empirical examples. Classroom experiments complement the classic bird-eye's perspective by nudging students to put themselves in the position of particular economic players, thereby requiring them to actively reflect the concepts introduced. Online surveys at the end of each chapter enable students to select which topics they would like to intensify in subsequent classes. In the accompanying exercise class, students practice, on specific problems and examples, the mathematical techniques needed to develop a deeper understanding of the economic concepts. In self-study students use the textbook to repeat the concepts introduced in class and apply them to additional examples.

**Media:**
Textbook, slides, exercise sheets, classroom experiments, online surveys

**Reading List:**

**Responsible for Module:**
Prof. Sebastian Goerg

**Courses (Type of course, Weekly hours per semester), Instructor:**
Economics I - Übung am Campus Straubing (Übung, 2 SWS)
Drobner C, Goerg S

Economics I am Campus Straubing (Microeconomics) (Vorlesung, 2 SWS)
Goerg S

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

CS0075: Management Science | Management Science

Version of module description: Gültig ab winterterm 2021/22

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Description of Examination Method:
Students mastery of the content taught in this module is checked with a 60 minutes written exam. Students are only allowed to use a non-programmable calculator. In the exam students have to answer questions, apply algorithms to solve problems, create mathematical models for small example problems, and discuss presented results. By this, the students have to demonstrate that they have understood and can apply the mathematical models and methods to solve business planning problems. The overall grade of the module is based on the result obtained in the written exam.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Knowledge of Mathematics and Statistics at the level as definend in the German Abitur

Content:
Management Science is about modelling, solving and analysing planning and decision problems using mathematical concepts. Management Science is used across different industries, departments and organizations. The lecture will treat the Management Science approach to decision making in general and the following topics in particular: Linear Programming, Mixed-Integer Programming, Graph Theory, Network Flow, Dynamic Programming and Decision Theory.

Intended Learning Outcomes:
After successful completion of the module, students are capable of modelling planning problems. They are able to solve small business problems manually by using models and methods of linear and integer programming, of graph theory, of network flow, of dynamic programming, and of decision theory.
Teaching and Learning Methods:
The module consists of a lecture and exercise courses, which are provided weekly, as well as a voluntary tutorial offered. In the lecture, the content is jointly developed with the students mainly by using slides. The exercise course repeats parts of the lecture contents by using examples. The tutorials are delivered by student teaching assistants for smaller groups which gives the student the opportunity to pose questions and receive immediately help from the teaching assistant.

Media:
Script, Presentation slides

Reading List:

Responsible for Module:
Prof. Alexander Hübner

Courses (Type of course, Weekly hours per semester), Instructor:
Management Science Lecture - Campus Straubing (Vorlesung, 2 SWS)
Ostermeier M

Management Science Exercise - Campus Straubing (Übung, 2 SWS)
Ostermeier M, Roth B
For further information in this module, please click campus.tum.de or here.
Module Description

CS0193: Foundations of Sustainable, Entrepreneurial & Ethical Business

Version of module description: Gültig ab winterterm 2021/22

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Description of Examination Method:

Repeat Examination:

(Recommended) Prerequisites:

Content:

Intended Learning Outcomes:

Teaching and Learning Methods:

Media:

Reading List:

Responsible for Module:
Prof. Claudia Doblinger
Courses (Type of course, Weekly hours per semester), Instructor:
Introduction to Entrepreneurship (Vorlesung, 2 SWS)
Doblinger C [L], Doblinger C, Fischer D

Introduction to Business Ethics (Vorlesung, 2 SWS)
Doblinger C [L], Doblinger C, Perlinger K
For further information in this module, please click campus.tum.de or here.
Module Description

CS0194: Mathematics | Mathematics

Version of module description: Gültig ab winterterm 2021/22

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Description of Examination Method:
Learning outcomes shall be verified in a written test (90 minutes). Knowledge questions check the treated mathematical methods, that they have understood and are able to apply them for specific case studies.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Knowledge in mathematics corresponding to basic knowledge of A-level students.

Content:
Selected mathematical methods required for calculations in the scientific, engineering or economic field, especially analysis (e.g. complete induction, differential and integral calculus, arithmetic progression and series), calculations with real and complex numbers as well as selected chapters of linear algebra (e.g. linear equation systems, matrices, eigenvalues and eigenvectors). Methods shall be presented during the lecture. Within the scope of the exercise their application shall be practised based on specific case studies.

Intended Learning Outcomes:
The students know the most important mathematical methods required for calculations in the scientific, engineering or economic field. They have understood these methods and are able to calculate specific case studies and perform basic mathematical proofs by means of complete induction.

Teaching and Learning Methods:
Lecture, presentation and associated exercises with independent processing and teamwork of specific examples.
Media:
Slide presentation, blackboard, lecture and exercise recording, discussion forums in e-learning platforms, Exercise Sheets

Reading List:
Höhere Mathematik in Rezepten, Christian Karpfinger

Responsible for Module:
Prof. Dominik Grimm

Courses (Type of course, Weekly hours per semester), Instructor:
Mathematics (Lecture) (Vorlesung, 2 SWS)
Grimm D [L], Grimm D

Mathematics (Exercise) (Übung, 2 SWS)
Grimm D [L], Grimm D, Haselbeck F, John M

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

CS0199: Statistics | Statistics

Version of module description: Gültig ab winterterm 2021/22

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Description of Examination Method:
Learning outcomes are verified in a written exam. The exam consists of assignments in which the students are to demonstrate that they understand the statistical methods conveyed as part of the module and are able to apply them to specific examples. Exam duration: 90 minutes

Repeat Examination:
End of Semester

(Recommended) Prerequisites:
Qualification for university entrance; good mathematical knowledge is an advantage.

Content:
Selected statistical methods required in natural sciences, engineering, or economics, especially from the fields of descriptive statistics (e.g., graphical representation of uni- and bivariate data, measures of location and spread, measures of association for bivariate data, descriptive linear regression), probability calculus, and statistical inference (e.g., confidence intervals, hypothesis tests). The methods are presented during the lecture and are applied to specific examples in the exercise classes.

Intended Learning Outcomes:
The students know the most important statistical methods required in natural sciences, engineering, or economics. They have understood these methods, are able to select and perform suitable statistical procedures for specific case studies, and can draw correct conclusions from the results. Furthermore, the students should be aware of the capabilities and limitations of the presented statistical methods and are able to perform simple statistical analyses using statistical software (e.g., R).
Teaching and Learning Methods:
Lecture using digital presentation and/or blackboard to convey contents and methods. In addition, concrete examples are discussed in the exercise classes through independent work or group work.

Media:
Slides, blackboard, exercise sheets, e-learning

Reading List:

Responsible for Module:
Prof. Clemens Thielen

Courses (Type of course, Weekly hours per semester), Instructor:
Statistics (Exercise) (Übung, 2 SWS)
Thielen C [L], Boeckmann J, Thielen C

Statistics (Lecture) (Vorlesung, 2 SWS)
Thielen C [L], Thielen C

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

CS0067: Macroeconomics | Macroeconomics [Macro I]

Version of module description: Gültig ab winterterm 2021/22

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Description of Examination Method:
The exam will be a written test (120 min.) at the end of the term. The exam is designed to assess the participants' capabilities to apply macroeconomic theory in order to discuss and solve real world problems of the economy as a whole. Participants should demonstrate their capacity for abstraction (thinking in economic models), concretization (calculating, interpreting and applying the results of the model, mathematical processing as well as graphical illustration.

Repeat Examination:
Next semester

(Recommended) Prerequisites:

Content:
This module provides an introduction to basic concepts of macroeconomics. It covers:
- key institutions of capitalism as an economic system (private property, firms, markets)
- technological change as a trigger for economic growth
- price-taking and competitive markets
- price-setting, rent-seeking and market disequilibrium
- market successes and failures
- markets, contracts and information
- credit, banks and money
- economic fluctuations and unemployment
- unemployment, inflation, fiscal and monetary policy
- technological progress and living standards
- the Great Depression, the golden age of capitalism and the global financial crisis
Intended Learning Outcomes:
After attending the module, students will be able to describe the composition and distribution of the Gross Domestic Product. They can analyze the economic mechanisms underlying unemployment as well as issues regarding monetary policy and inflation. Further, participants will learn to understand the economic crisis and the wealth differences among nations. Students are enabled to think in models and apply mathematical solutions when approaching economic problems.

Teaching and Learning Methods:
The module consists of a lecture and an exercise course. The lecture content will be delivered in a verbal presentation with the help of slides. Since the foundation of the lecture is a textbook including recent economic history, the teaching is full of real life examples. The content of the lecture is put into practice in the exercise course which applies the theoretical knowledge by basic mathematical calculations and graphical illustrations. Therefore, the module aims at encouraging participants to independently think about economic problems discussed in the lecture and in the current literature. Students are enabled to use the instruments (abstract and model thinking) for operationalizing economic problems and solve them in the conventional, mathematical manner.

This module is also offered at TUM Campus Straubing.

Media:
http://www.core-econ.org/

Reading List:

Responsible for Module:
Prof. Sebastian Goerg

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

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

CS0196: Sustainable Operations | Sustainable Operations

Version of module description: Gültig ab winterterm 2021/22

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**Description of Examination Method:**
The module examination consists of a written exam (90 min.). Permitted tool is a non-programmable calculator.

In the written exam, students demonstrate that they can apply various approaches to problem solving, building on their understanding of production and logistics planning in general. Using exemplary tasks from production or logistics planning, students demonstrate that they can interpret planning problems as well as relationships between different problems. Based on this, students will provide recommendations for a solution to these problems.

**Repeat Examination:**
Next semester

**(Recommended) Prerequisites:**
Fundamentals of Mathematics and Management Science are recommended

**Content:**
This is a basic module in which an overview of planning problems in production and logistics and methodologies for solving them will be developed. Students are familiarized with different levels of planning hierarchy (strategic, tactical, operational) and the planning problems at each level. Heuristics and additionally simple models of linear and mixed-integer programming are discussed and applied as methodologies for solving the planning problems in the area of production and in the area of logistics. The module includes these parts, among others:
- Strategic planning problems: e.g. location planning
- Tactical planning: designing the infrastructure of different production systems (workshop production, flow production, production centers)
- Operational planning problems: Demand forecasting models, main production program planning
- Material requirements planning
- Resource scheduling and control: lot size planning, machine scheduling planning, line-up sequences for flow production
- Transportation logistics: planning problems for determining tours, routes and packing schemes
- Material logistics: policies for inventory management and their extension to stochastic demands; strategic design of the logistics network; interfaces with predecessor or successor companies
- Procurement logistics: methods for the selection of suppliers
- Distribution logistics: setting up a suitable supply network; processes in the warehouse

**Intended Learning Outcomes:**

After participating in this basic module, students are able to understand interrelationships between various planning problems in production and logistics. Analyze selected planning problems of the strategic, tactical and operational level (for details see learning content) and apply potential solutions to manage them. In doing so, the students know essential management tasks in production and logistics planning and learn to evaluate the economic and sustainability-relevant significance of production and logistics-related decisions (e.g. the trade-off between inventory and setup costs or between costs, service and environmental protection).

**Teaching and Learning Methods:**

The learning methods include lectures, tutorials and in-depth literature. The lectures serve to teach theoretical basics including the completion of exercises. The tutorials accompanying the lectures deepen the contents of the lectures in smaller groups and include calculation of exercises mainly in individual work, partly also in group work. Literature for in-depth study will be announced and recommended in the lecture.

**Media:**

Presentations, Script

**Reading List:**

Günther, H.O., Tempelmeier, H. (2020), Supply Chain Analytics

**Responsible for Module:**

Prof. Alexander Hübner

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

For further information in this module, please click [campus.tum.de](http://campus.tum.de) or [here](http://campus.tum.de).
Module Description


Version of module description: Gültig ab summerterm 2021

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Description of Examination Method:

Written exam (90 minutes):

Students have to solve problems from the thematic field of the module by applying a system and life cycle perspective. They have to prove their ability to use the correct terminology and to describe the possibilities and limitations of material flow analysis and life cycle assessment. Moreover, they have to prove their ability to explain the relevance of material flow analysis and life cycle assessment for environmental management. In particular, they need to prove their ability to analyse and model material and energy flows, to determine data, to deal with uncertainty and to assess environmental impacts.

Learning aids: pocket calculator.

Repeat Examination:

Next semester

(Recommended) Prerequisites:

Content:

- Introduction to systems and life cycle thinking
- The four phases of life cycle assessment
  - Goal and scope definition
  - Life cycle inventory analysis
  - Life cycle impact assessment
  - Interpretation
- Software systems and databases for material flow analysis and life cycle assessment
• Material flow analysis
  o Method of material flow analysis
  o Material flow networks
  o Determination of mass flows and stocks
  o Material flow modelling
• Uncertainties and their handling
• Current trends and developments in material flow analysis and life cycle assessment
• Case studies

**Intended Learning Outcomes:**
At the end of the module students are able
... to define key terms of material flow analysis and life cycle assessment
... to explain the relevance of material flow analysis and life cycle assessment as tools for environmental management
... to describe the differences and similarities between life cycle assessment and material flow analysis regarding their methodologies and application contexts (country, region, city, company, industrial metabolism, product, service)
... to explain the concepts of material flow analysis, life cycle assessment and systems analysis regarding their procedures and their theoretical backgrounds
... to understand how to apply material flow analysis and life cycle perspective to various contexts and systems in order to assess their environmental performance
... to gather necessary information, to choose suitable methods, and to apply these for simple MFA and LCA studies
... to carry out simple MFA and LCA calculations by investigating underlying resource and energy flows associated with processes
... to discuss the quality of material flow analysis studies and life cycle assessment studies.

**Teaching and Learning Methods:**
Format: lecture and exercises to introduce the content, to repeat and deepen the understanding as well as practice individually and in groups. Some tutorials will be carried out computer-based.

Teaching / learning methods:
• Media-assisted presentations
• Group work/case studies
• Individual tasks
• Reading
• Computer lab exercises using MFA and LCA software systems

**Media:**
Digital projector, board, flipchart, online contents, case studies, computer lab

**Reading List:**

**Responsible for Module:**
Prof. Magnus Fröhling

**Courses (Type of course, Weekly hours per semester), Instructor:**
Basics of Material Flow Analysis and Life Cycle Assessment (Lecture) (Vorlesung, 2 SWS)
Fröhling M [L], Fröhling M

Basics of Material Flow Analysis and Life Cycle Assessment (Exercise) (Übung, 2 SWS)
Fröhling M [L], Huber J

For further information in this module, please click [campus.tum.de](http://campus.tum.de) or [here](#).
Module Description

WI001119: Business Law I | Business Law I
Version of module description: Gültig ab winterterm 2019/20

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

Description of Examination Method:
In the final assessment students will need to demonstrate to what extent they have met the Learning Objectives. This assessment will be held as a written exam of 120 minutes in which students are allowed to use the applicable statutory law. The exam consists of two parts which count for approximately 50 per cent each.

In the first part, students will be asked theoretical questions. This will demonstrate to what extent they have memorised and understood principles of the law of contracts (formation, discharge, and liability), torts, and company law under German, European and Common Law. Students will also be asked to apply their knowledge to known and fictional cases. This second part demonstrates if students have developed the required legal analytical skills. Students also need to demonstrate their ability to apply their knowledge to fact settings not discussed in the lecture, and to evaluate the legal consequences.

Repeat Examination:
Next semester

(Recommended) Prerequisites:

Content:
This module covers the legal essentials of running a business. It includes an overview of the legal framework in Germany and Europe, the formation and termination of contracts, selected types of contract (in particular, sale of goods), torts, property law, and company law. The module covers aspects of the German legal framework as well as the common law. This module is a prerequisite for "Business Law 2". It cannot be replaced with "Wirtschaftsprivatrecht 1".

Intended Learning Outcomes:
At the end of this module students will be able
(1.) to name and understand the rules and principles of both German business law and the common law which are most important for businesses,
(2.) to grasp and apply the legal principles regulating business activity, in particular regarding liability under tort, contract and company law;
(3.) to analyse legal implications of typical business situations and to identify their options;
(4.) to present the results of their analysis in a written analysis.

Teaching and Learning Methods:
The lecture will cover the theoretical aspects of the module in a discussion with the lecturer. The tutorial will focus on case studies. It will provide the opportunity to work individually or in groups on case scenarios (known and unknown), covering various issues of German and the common law. The purpose is to repeat and to intensify the content discussed in the lecture and to review and evaluate legal issues from different areas of law in everyday situations. Students will develop the ability to present these findings in a concise and well-structured written analysis.

Media:
Reader, Presentations (PPT), Cases

Reading List:

Responsible for Module:
Maume, Philipp; Prof. Dr.

Courses (Type of course, Weekly hours per semester), Instructor:
Business Law I - Case studies (WI001119) (Übung, 2 SWS)
Haffke L, Katopodi E, Primbs M

Business Law I (WI001119) (Vorlesung, 2 SWS)
Maume P
For further information in this module, please click campus.tum.de or here.
Module Description

CS0192: Accounting | Accounting

Version of module description: Gültig ab winterterm 2021/22

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

Description of Examination Method:
The examination of the students success consists of a written exam (90 min). Both submodules are equally important. Students may use a non-programmable calculator and a Handelsgesetzbuch (HGB) without additional notes as helping material.
• In the exam related to financial accounting, students show that they are able to correctly conduct individual financial statements, understand consolidated financial statements and apply consolidation principles as well as understand and apply balance sheet policy and analysis. This is done by means of conducting consolidations, and by solving arithmetic problems as well as theoretical problems regarding financial statements.
• In the exam related to controlling, students show that they can apply different approaches to problem solving - based on the understanding of controlling. By means of exemplary objects from controlling the students demonstrate that they can interpret planning problems and connections between different problems and that they are able to interpret their results and apply the learnt instruments.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
None

Content:
The module on financial accounting gives an overview over basic financial accounting, focusing on regulations regarding commercial accounting in individual and consolidated financial statements. In the first part of the module, basic principles of financial accounting are introduced, dealing with general economic accounting and special financial accounting. In the second part, individual financial statements in terms of commercial law are explained and regulations for annual accounts and annual reports are discussed in detail. The third part deals with consolidated financial
statements and consolidation principles as well as corresponding postings in accounting. In the fourth part of the module, fundamentals of balance sheet policy and analysis are discussed.

The module on controlling introduces students to the basics and instruments of Controlling. It covers the following topics:
(a) Description of controlling functions, tools of operative and strategic controlling
(b) Identification and application of key performance indicators
(c) Planning and monitoring: Operative, tactical and strategic planning and monitoring
(d) Case examples especially in business administration, environmental management and corporate social responsibility (CSR)

**Intended Learning Outcomes:**
The modul consists of two parts:
(1) Upon successful completion of the module on financial accounting, students are able to understand the construction of individual and consolidated financial statements and to apply the accounting regulations practically. They can read and draw up balance sheets. Students are also able to evaluate which enterprises have to put up consolidated financial statements and which subsidiaries have to be included. Furthermore, they can independently carry out different consolidations correctly.
(2) After participating in this introductory module on controlling, students will be able to remember and understand the basic concepts, tasks and conception of controlling systems and coordination systems, to analyze problems concerning the coordination of planning and control in management systems and to apply the newly acquired knowledge to solve these problems.

**Teaching and Learning Methods:**
The financial accounting module consists of a lecture and a corresponding exercise, which is integrated into the lecture. In the exercise the content of the lecture and its understanding is deepened and extended by exercises and case studies. The lectures content is conveyed by means of presentation, while in the tutorial parts students can practise how to apply theoretical concepts practically.

The controlling module consists of lectures, exercises and tutorials. During the lectures, the contents are delivered by presentations and discussions. The lectures are used to convey the theoretical. In the exercises, students apply the acquired knowledge in solving exercises and implementing case studies. Students deepen their understanding through working in small student groups as well as solving exercises on their own.

**Media:**
Presentations, text books, lecture notes, exercises, lecture notes
Reading List:
Meyer, Klaus: Bilanzierung nach Handels- und Steuerrecht, 22. Auflage, Herne 201
Einführung in das Controlling, Weber/Schäffer, Schäffer-Poeschel, 13. Auflage;
Controlling, Horváth, Vahlen Verlag, 13. Auflage;
Globales Life Cycle Controlling, Stibbe, Springer Gabler Verlag, 1. Auflage;
Corporate Social Responsibility und wirtschaftliches Handeln, Bruton, Erich Schmidt Verlag, 1. Auflage

Responsible for Module:
Prof. Alexander Hübner Prof. Hubert Röder

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

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

CS0200: Strategic and International Management & Organizational Behavior | Strategic and International Management & Organizational Behavior

Version of module description: Gültig ab winterterm 2021/22

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Description of Examination Method:
The examination is provided in the form of a written, graded written exam (120 min). The written exam consists of single-choice questions that test knowledge at different levels: Knowledge questions test recall and reproduction of learned concepts, e.g. by reproducing different change management models; Decision questions test the classification or interpretation of learned content, e.g. by contrasting and comparatively analyzing different strategies of internationally active companies; Application and scenario questions test whether students can apply the content learned in the lectures to practical problems and challenges, e.g. by developing proposed solutions in the context of a case description on the topic of conflict management. The overall grade will be determined through the performance in the written examination. Students are permitted to use a non-electronic dictionary (English - Native Language or English Thesaurus) during the exam. Beyond that, no aids such as lecture notes, personal notes, etc. are allowed.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Basics in Management

Content:
In accordance with the learning outcomes formulated above, the most important theories and methods of industrial and organizational psychology as well as strategic and international management are covered. Basic approaches and models of industrial and organizational psychology are used to understand the behavior of individual organizational members, teams and entire organizations. In addition, as globalization increases, companies in almost all industries and of all sizes are operating internationally and must incorporate this reality into their strategic
considerations. Not only is knowledge of international management necessary in the management of companies operating across borders, but the international dimension must also be taken into account in individual business functions. Therefore, a special focus is placed on the international dimension of the concepts to be dealt with. In detail, the following aspects will be addressed and made theoretically and practically useful: basics of employee management; basics and characteristics of strategic and international management; framework conditions of strategic and international management; effects of individual personality traits and motivation in organizations; ethical and moral behavior in organizations; structures and processes in work teams; change management in national and international organizations; theories of international corporate activity; strategies of internationally active companies; international dimension of individual business management functions; organizational culture in national and international comparison.

**Intended Learning Outcomes:**
After successful participation in the module, students will be able to understand and explain key concepts of industrial and organizational psychology as well as strategic and international management. In addition, students will be able to apply the gained knowledge to practical challenges and problems. Students will be able to identify and analyze challenges and problems in the areas of employee motivation, teamwork, decision-making behavior and communication with a special focus on international companies. Ultimately, they will be able to identify and demonstrate practical solutions to conflict management, change management, ethical problems and challenges in strategic and international management by applying the theoretical concepts learned.

**Teaching and Learning Methods:**
In the interactive lectures, the most important concepts, approaches and theories as well as their empirical evidence are taught and critically discussed with the students. The theoretical and methodological lecture contents are illustrated by examples and case studies and applied to practical problems. In addition, students are encouraged to engage intensively with the content and transfer the theories and methods covered through the analysis of instructional videos as well as individual assignments and/or work in small groups. Finally, the (self-) study of literature is planned.

**Media:**
Presentations (slides as download)
Videos
if applicable, current international scientific literature (English)
if applicable, case studies

**Reading List:**
Hill, C.W.L. (2014), International business: Competing in the Global Marketplace
Responsible for Module:
Prof. Claudia Doblinger

Courses (Type of course, Weekly hours per semester), Instructor:
Organizational Behavior (WI001121) am Campus Straubing (Vorlesung, 2 SWS)
Benzinger D

Strategic and International Management (WI001121) (Bachelor TUM-BWL) am Campus Straubing (Vorlesung, 2 SWS)
Doblinger C [L], Doblinger C, Kurowski S
For further information in this module, please click campus.tum.de or here.
Module Description

CS0001: Foundations of Programming | Foundations of Programming

Version of module description: Gültig ab winterterm 2021/22

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

Description of Examination Method:
Exam achievement shall be done in the form of a 90 minutes written test (either written or e-test). Knowledge questions check the treated basic concepts of programming and algorithms. Small programming and modelling tasks test the ability to apply the learned programming language in order to solve simple problems.

Repeat Examination:
Next semester

(Recommended) Prerequisites:

Content:
In the module following contents are treated exemplarily:
Python as programming language:
- Basic constructs of imperative programming (if, while, for, lists, dictionaries etc.)
- Object-oriented programming (inheritance, interfaces, polymorphism etc.)
- Exception handling
Basic algorithms and data structures:
- Complexity of algorithms
- Data structures for sequences (linked lists, stacks & queues)
- Recursion
- Hashing (chaining, probing)
- Search (binary search, balanced search trees)
- Sorting (Insertion-sort, selection-sort, quick-sort)
**Intended Learning Outcomes:**
After successful participation in this module students will be able to understand important fundamental concepts of programming, algorithms and data structures. They are enabled to apply the learnt concepts to develop own code and fundamental algorithms for scientific data analysis.

**Teaching and Learning Methods:**
Lectures to provide the students with all necessary fundamentals of programming and algorithms, which they will need to independently develop own analysis scripts and pipelines for scientific data analysis. In the exercises the students will work on different programming tasks and will write own code to analyse specific case studies and real-world data.

**Media:**
Slide presentation, blackboard, lecture and exercise recording, discussion forums in e-learning platforms; Exercise sheets, Working on the PC

**Reading List:**
Learning Scientific Programming with Python, Christian Hill
Data Structures & Algorithms in Python, Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser

**Responsible for Module:**
Prof. Dominik Grimm

**Courses (Type of course, Weekly hours per semester), Instructor:**
Foundations of Programming (Exercise) (Übung, 2 SWS)
Grimm D [L], Genze N, Grimm D

Foundations of Programming (Lecture) (Vorlesung, 2 SWS)
Grimm D [L], Grimm D

For further information in this module, please click [campus.tum.de](http://campus.tum.de) or [here](http://here).
Module Description

CS0197: Sustainable Investment and Financial Management | Sustainable Investment and Financial Management

Version of module description: Gültig ab winterterm 2021/22

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

Description of Examination Method:
The grading is based on a written exam with a duration of 120 minutes. To test whether the students acquired the theoretical basics in financial analysis and investment planning, questions are asked, where they have to prove their understanding of the introduced concepts. By using a calculator, the students for example have to analyze investment projects, create the optimal capital structure of projects or firms, evaluate bonds, stocks, or sustainability of investments.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
None

Content:
The module will give students a broad understanding of the instruments to analyze and evaluate investment opportunities such as:
- Financial Statement Analysis (balance sheet analysis, analysis of profit and loss account, statement of affairs)
- Investment Analysis (net present value method, actuarial return)
- Capital Budgeting (determination of free cashflows, choosing between alternatives)
- Cost of Capital (equity costs, borrowing costs, capital costs)
- Capital Structure

Furthermore, the students will be introduced to sustainability concepts in financial management such as social responsible investing, developments in finance and sustainability and ESG (Environment, Social, Governance) criteria for investments.
Intended Learning Outcomes:
Upon completion of this module students will be able to: (1) to name and apply important measures of company performance, (2) to analyze and choose investment projects, (3) to create the optimal capital structure of projects and firms, (4) restate and employ concepts of financial mathematics and (5) to evaluate financial instruments. The students will be trained in these methods by applications to sustainable financial management and discuss e.g., green investments. The course will prepare participants to understand major drivers and constraints of transforming the financial system to a more sustainable one. Furthermore, it will familiarize participants with the business, regulatory and technical perspective of sustainable finance and will acquaint them to take an active part in the discussion around the topic.

Teaching and Learning Methods:
The module will combine several teaching methods.
- Weekly Lecture: Presentation of theoretical basics and applied examples, supported by slides. As a better learning effect is reached by a dynamic learning environment, the student can join in live surveys with onlineTED.
- Exercise available on several dates: Calculation of selected exercises from the set of exercises in small groups so the students can directly ask questions about the calculations.
- Set of exercises with applied examples for individual practising of exercises.

Media:
Presentations, exercises with solutions

Reading List:
Schoenmaker, D (2020): Principles of Sustainable Finance
Thompson (2021): Principles and Practice of Green Finance: Making the Financial System Sustainable

Responsible for Module:
Prof. Alexander Hübner

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

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

CS0198: Green Marketing and Innovation Management | Green Marketing and Innovation Management

Version of module description: Gültig ab winterterm 2021/22

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Description of Examination Method:
The grading will be based on a written exam (120 min). By answering multiple choice questions students have to show that they have understood and can apply models and concepts related to markets aspects of innovation and to the organization of the innovation process. The questions also assess whether students remember and understand green marketing basics (including key terms, theories, frameworks, the use of marketing strategies and marketing mix instruments, and their interrelationship with core concepts in marketing). The questions may require calculations. Students may use a nonprogrammable calculator to do these calculations. Bonus points can be gained by participating in the optional course group work.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
None

Content:
Market aspects of innovation:
Innovation: Examples and particularities,
Innovation and the development of industries,
Sources of innovation,
Innovation strategy: Analysis of the market, technology and competition,
Acquisition of technology: Market, cooperation and networks

Organizing the innovation process:
The innovation process within the firm,
R&D, production and marketing,
Cooperation for innovation?
Motivation and incentive systems,
Promotors and champions,
Roles in the innovation process,
Opposition against innovation within the firm,
Integrating customers into the innovation process,
Measuring and controlling innovation.

Marketing Management:
Principles of marketing,
Marketing strategy and environment in green business environments,
Creating customer value, satisfaction, and loyalty in green markets,
Information management and market research,
Analyzing green consumer and business markets,
Competition and differentiation from competitors,
Segmenting, targeting, and positioning,
Creating and managing products and services, brand management,
Pricing,
Marketing communications,
Marketing channels,
Services

Intended Learning Outcomes:
At the end of the module, students will be able to (1) recognize and apply models and concepts related to the market aspects of innovation (e.g., modes of acquisition of technology) and to the organization of the innovation process (e.g., promotors and champions in the innovation process), (2) identify how they can be concretely used in companies and in the context of green innovation, (3) remember and understand the key terms used in green marketing, (4) explain common marketing theories and frameworks in this context, (5) describe and justify the use of both marketing strategies and marketing mix instruments, and (6) relate the strategies and use of instruments to core concepts in marketing, such as customer lifetime value, segmenting, targeting, and positioning, decision making styles, customer perceived value, satisfaction, and loyalty, as well as branding in the context of green marketing.

Teaching and Learning Methods:
The module consists of two lectures including one or two sessions held by guest speakers to refer to state of the art examples of green marketing and innovation. Students will be motivated to read the literature before and after each lecture and relate it to the content taught in class. Furthermore, they will be motivated to discuss the content in online forums that are made available to the students.

Learning activities: Literature research, (optional) group project
Media:
Lecture slides are available via Moodle. Presentation slides, online discussion forum

Reading List:
Afuah Innovation Management. strategies, implementation, and profits
Dodgson, Gann, Salter The Management of Technological Innovation (Chapter 4)
Teece Profiting from Technological Innovation: Implications for integration, collaboration, licensing and public policy
Stamm Structured Processes for Developing New Products
Hauschildt, Kirchmann Teamwork for innovation the "troika" of promotors

Responsible for Module:
Prof. Klaus Menrad

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

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

CS0073: Circular Economy | Circular Economy [CEC]

Version of module description: Gültig ab winterterm 2021/22

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

Description of Examination Method:
Written exam (90 minutes): Students have to analyse, assess and discuss (simplified) circular economy concepts and legislative frameworks on a local, regional, national and global level, determine starting points for an optimisation of these concepts and apply them to real-life use cases. Thereby, they have to take different points of view (environmental, product, (material flow) system, macroeconomic, business). In doing so, the students have to prove their ability to use the right vocabulary, and their knowledge on the motivation and key figures of circular economy.

Repeat Examination:
Next semester

(Recommended) Prerequisites:

Content:
The module covers the following topics:
• Circular Economy as a concept to approach sustainability needs
• History and policies related to the development of a circular economy
• CE Schools of thought
• Natural / biogeochemical material cycles as role models for the CE
• Assessing environmental impacts in a CE
• Assessing CE from a material perspective
• CE from a macroeconomic perspective
• Value Creation and emerging business models in a circular economy
• Design for Sustainability
• Special topics and use cases
Intended Learning Outcomes:
Students explain the importance of the circular economy within the context of resource shortages, climate change and further sustainability challenges. They discuss and understand the central concepts of a circular economy against their historical background covering both, traditional waste management and recycling approaches as well as more recent holistic concepts. They assess and discuss CE from an environmental, product, material, and economic perspective. Based on these competences, they can develop action approaches to transfer these concepts from theory into practice. They link independently urgent environmental problems of our time with the concept of the circular economy and design solution approaches based on their results. Regarding value creation in a circular economy, the students identify business opportunities, develop and discuss new innovative business models. They apply these concepts to specific use cases, and assess their implications from different perspectives.

Teaching and Learning Methods:
Format: lecture and exercises to introduce the content, to repeat and deepen the understanding as well as practice individually and in groups.

Teaching / learning methods:
- Media-assisted presentations
- Group work / case studies / reading of scientific publications with presentation
- Individual assignments and presentation to consolidate/repeat the learned contents
- Dismantling and recycling exercises in the CE-lab
- Plenary discussions to reflect the lecture contents

Media:
Digital projector, board, flipchart, online contents, case studies, computer lab

Reading List:
Recommended reading:
- Baker-Brown, Duncan (2017): The re-use atlas a designer’s guide towards a circular economy
- Schaub, Georg; Turek, Thomas (2016):
**Responsible for Module:**
Prof. Magnus Fröhling

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

For further information in this module, please click [campus.tum.de](http://campus.tum.de) or here.
Module Description


Version of module description: Gültig ab winterterm 2021/22

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</table>

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

Description of Examination Method:
Grading is based on a 100% multiple-choice exam (120 minutes) with about 50-60 questions at the end of the lecture. The questions will be of different character and allow students to show that they have understood basic concepts of empirical research and that they can analyze and evaluate research design and research outputs on their empirical and conceptual accuracy.

Extra credit (Mid term assignment)
Accompanying this class, you will be able to participate in two types of work to earn extra credit toward your grade. This means that completing this work is not mandatory, and full marks can be achieved without participating. The first assignment is a teamwork task and focuses on the comprehension of a chosen empirical paper on either a problem from the management or policy literature. Each student has to write a short summary (1-2 pages). The second assignment is an individual task and is about the systematic creation and processing of a data set. The workload for this task is on average about 4-6 hours. Both extra assignments help to improve class performance and can improve the final grade. Participating successfully in these assignments may improve the final grade by 0.3.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Mathematics, Statistics

Content:
This course aims to enable students to understand empirical research. The course explains how research works and how to identify sources that meet a certain level of academic rigor to be trustworthy. This is important as only trustworthy information should become a source of learning and a foundation of managerial or political decision making.
To reach this goal the course will cover the following topics:
• Research ethics
• Research question and their implications
• Paper reading, positioning, and contributions
• Correlation and causality
• Choosing a research design
• Qualitative research
• Quantitative analysis & quantitative research design
• Using existing scales and data
• Data preparation and descriptive statistics
• Advanced quants

Intended Learning Outcomes:
This module will give you an introduction to empirical research methods, including the higher aims of empirical research, the standards it needs to meet, and a set of methods that you can directly apply. By the end of the module, you will thus be able to understand the scientific process. They will be able to evaluate whether a result or statement is robust and indeed trustworthy. In doing so, not only will they be able to more critically evaluate everyday information, but they will also be prepared to participate in the scientific process. Students improving their ability to read and understand academic work. This module prepares for future research seminars or the final thesis.

Knowledge Objectives
After the module students will be able to:
• understand the nature of the scientific process
• explore different approaches toward solving (scientific) problems
• use and apply selected empirical research methods (e.g., for seminar of final theses)
• understand the structure and evaluate the quality of academic papers
• (in parts) create their own research projects

Skills Objectives
• improve diagnostic and analytical skills
• think creatively about how best to solve complex problems
• build up critical thinking as well as judgment and interpretation skills
• learn how to evaluate different strategic options
• work together efficiently and effectively in groups

Learning Objectives
At the end of this module, students will be able to demonstrate understanding, critical assessment and application of the following:
• assess (pseudo-)scientific work
• understand and evaluate potential approaches toward answering academic questions
• utilize tools and techniques of empirical research for their own future studies
**Teaching and Learning Methods:**
The module consists of lectures and exercises. The lecture is based on slides and blackboard utilizing additional interactive elements. In the exercise, which takes place in the computer pool, students work on their own with data and learn how to utilize different software packages. Students will be very involved in the exercises and deepen their understanding of the topics covered in the lectures.

**Media:**
Powerpoint, Board, Videos, Flipchart, Debates

**Reading List:**
For each session, practice-sheets will be provided. These sheets will also contain information on reading materials that elaborate on what we cover in class. We recommend the following textbooks (on which we will also draw to some degree for the lecture):


**Responsible for Module:**
Prof. Sebastian Goerg

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

For further information in this module, please click [campus.tum.de](http://campus.tum.de) or [here](https://www.campus.tum.de).
Module Description

CS0204: Project Studies | Project Studies

Version of module description: Gültig ab winterterm 2021/22

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<th>Module Level:</th>
<th>Language:</th>
<th>Duration:</th>
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</table>

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

Description of Examination Method:
The project study is a practical task which either a single student or a team of 2-5 students work on. The students deal with a specific task of a company, agency or any other similar institution (including research projects at university chairs) and work out the state of the current research on the given issue and describe their own specific solution to the given task. Based on scientific knowledge and methodical skills, the students evolve the task. The project study is supported by a professor of the TUM Campus Straubing as well as representatives of the firm, agency, and institution respectively. The students present the results of their study in a written term paper. Grading will especially take into account the overall working outcome of the project with respect to the initial problem set, the selection and application of the chosen methodology as well as the discussion of the main findings. In case of team work, each student's individual contribution to the written paper and the project's success must be identifiable and assessable.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Basic knowlege in Business Administration and Economics

Content:
In the project study, students acquire hands-on experience by working with companies/institutions/agencies on a particular assignment, for example:
- sustainability analyses of single activities or projects
- the application of optimization tools for problems out of the logistic sector,
- the description of a marketing strategy.
They structure the project and employ their methods and theories to develop results of practical value for the company/institution/agency. The project is supervised jointly by mentors from the
respective partner company/agency and the professor of the TUM Campus Straubing. The project study should be accomplished in about three to six months.

**Intended Learning Outcomes:**
After successfully completing the module students are able to work on a project in a systematic and academic manner. In case of team work, students can contribute a significant part to the work output of their team. They accomplish their task within a given time-frame. The students can identify and express problem sets. Furthermore they can term appropriate methodologies for problem solving and transfer them to a proper solution. Finally they can choose and apply the appropriate methodologies to solve the given problem.

**Teaching and Learning Methods:**
Working on a solution for the given project in a team or individually encourages students to deal soundly with a practical issue. Thus, they can apply their knowledge gained in their study on real issues firms struggle with. Further, they are able both to communicate the evolution of the project and to present the solution to the supervisors from the company/institution and the university.

**Media:**
literature, presentations

**Reading List:**
Relevant literature will be selected and communicated specifically for the project.

**Responsible for Module:**
Prof. Alexander Hübner

**Courses (Type of course, Weekly hours per semester), Instructor:**
For further information in this module, please click [campus.tum.de](http://campus.tum.de) or [here](#).
Module Description

CS0195: Applications in Sustainable Management and Technology | Applications in Sustainable Management and Technology

Version of module description: Gültig ab winterterm 2021/22

<table>
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<th>Module Level: Bachelor</th>
<th>Language: English</th>
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Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The students work together in teams and deal with a specific question from practice. For this purpose, the students explain the current state of science and describe the specifics of their own research work. They also formulate the procedure for dealing with their practical problem and outline the solution steps. The results are documented in a written project work.

Repeat Examination:

(Recommended) Prerequisites:
None

Content:
The course conveys skills to develop solutions to specific problems in real business in case studies in the area of sustainability and enterprise planning. These relate to topics such as performance evaluation of supply chains, controlling, human resource or other functions.

Intended Learning Outcomes:
At the end of the module, students are able to understand basic and advanced problems of sustainable management and technologies. The intended learning outcomes of this course are to be able (1) to obtain insights from practice, (2) understand the motivation and barriers of sustainability within a business context, (3) learn to assess appropriate approaches to solve a sustainability issue in practice and (4) to communicate and discuss solutions in spoken and written language.
**Teaching and Learning Methods:**
The course combines different learning methods: (1) presentations by the instructor and practioneers to brush up and deepen the participants' knowledge on sustainable management and technologies; (2) papers and presentations by the participants to document and communicate the problem and their solution; (3) coaching for the participants by experienced researchers to convey methodological skills to them; (4) written reports on peers' papers to develop the participants' communication skills and for critical reflection.

**Media:**
Current literature, lectures, presentations

**Reading List:**

**Responsible for Module:**
Prof. Alexander Hübner

**Courses (Type of course, Weekly hours per semester), Instructor:**
For further information in this module, please click campus.tum.de or here.
Module Description

CS0203: Communication Skills | Communication Skills

Version of module description: Gültig ab winterterm 2021/22

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<th>Module Level:</th>
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Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:

Students can choose between a number of courses addressing different communicative challenges. The examination is not graded (Studienleistung) and can be an oral assessment or a written exam. Please find detailed information regarding course examinations, content, learning outcomes, literature and teaching and learning methods in the individual course description (Lehrveranstaltungsbeschreibung) in TUMonline.

For example:
The oral assessment or presentation assess students’ ability to transport their point of view in a comprehensible and well-structured manner. Students show that they can communicate scientific or business issues in a careful but effective way. They communicatively create a situation of mutuality independent of culture-specific particularities. Answering questions students show that they can advocate their angle on a topic using communication methods.

A list of up-to-date information in which courses students may earn credits will be provided by the program management (Studienkoordination) at the beginning of the semester.

Repeat Examination:

Next semester

(Recommended) Prerequisites:

Content:

Students can choose between a number of courses addressing different communicative challenges:

(1) Presentation & Moderation Techniques:
- use and effect of voice, language and body language
- managing the impact on employees and customers
- defining explicit goals and objectives
- responsibilities, role and self-perception of an facilitator
- strategies how to conduct a fruitful discussion

(2) Conflict Management & Conduct of Negotiations
- conflict types
- causes and development of conflicts
- systematic conflict analysis (e.g. stages of escalation after Glasl)
- conflict patterns
- concepts of negotiation strategies,
- conflict de-escalation

(3) Business Plan
- developing a business plan
- assessment of business ideas
- analyzing market & competition
- pitching business idea

(4) Intercultural Communication
- share information across different cultures and social groups
- interact with people from other cultures
- understand customs from people of different countries

(5) Language Courses
(offered by TUM Language Center or courses completed abroad equivalent to 3 ECTS)
- learn a foreign language
- be more open to another culture
- assessment of business ideas; analysing market & competition

**Intended Learning Outcomes:**
Upon successful completion of the module students are able to (1) efficiently and appropriately communicate business and scientific topics to others such as employees or an audience. (2) They are able to present and discuss complex issues referring to a scientific basis within groups or in front of an audience and (3) lead a discussion. Furthermore, they are able to (4) tackle conflict situations and (5) manage to communicatively find a solution.

**Teaching and Learning Methods:**
To sharpen their communication skills the focus in these courses is to practice in different situations and settings. Depending on the selected course, students will e.g. hold short presentations, pitches or exercise in role-plays. To deepen and strengthen these learning experiences peers and instructors will give immediate feedback.
Media:
PowerPoint slides, moodle, videos, online learning materials

Reading List:
- Ant, Marc; Nimmerfroh, Maria Christina; Reinhard, Christina (2014); Effiziente Kommunikation - Theorie und Praxis am Beispiel "Die 12 Geschworenen"; Springer Gabler
- Alan Barker (2013); Improve Your Communication Skills; Kogan Page Publishers

Responsible for Module:
Prof. Alexander Hübner

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

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

Electives in Management and Technology | Electives in Management and Technology

Module Description

CS0005: Introduction to Development Economics | Introduction to Development Economics

Version of module description: Gültig ab winterterm 2018/19

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<th>Module Level:</th>
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Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The examination is provided in the form of a written examination. The students should be able to evaluate and justify detailed theories, methods and concepts of development economics by means of examples. The students show, that they are able to analyze empirical evidence on economic development.

Type of examination: written, no additional tools allowed, duration of examination: 60 minutes

Repeat Examination:
Next semester

(Recommended) Prerequisites:
VWL (WZ1683)

Content:
What is development? What is poverty, inequality and justice? What role do natural resources play for prosperity in developing countries? What are the determinants of poverty at the micro level? What role do demography, formal and informal institutions, labor, property rights, access to capital or microfinance play in developing countries? What role do natural resources and agriculture play in development? These are some of the questions that decision makers in both developed and developing countries have to discuss on a daily basis. This course provides the theoretical basis and empirical evidence for the analysis of such questions against the background of current development policy issues.
Intended Learning Outcomes:
After studying the module, the students can use the development economy to understand what is hindering development and what factors lead the development to success. They can apply basic theories, concepts, and analytical techniques associated with microeconomics. Students learn to understand the difference between growth and development, measurement of inequality, the importance of agriculture and natural resources in developing countries, and poverty and population issues. The students are able to analyze empirical evidence on economic development and to critically read the literature in the field of economic development.

Teaching and Learning Methods:
The module consists of a lecture and an exercise. The interactive lecture takes place by means of PowerPoint and panel painting. In addition, articles from newspapers and journals are integrated into the lectures. In the exercise, the students discuss theoretical concepts and their empirical relevance individually and / or in groups from different perspectives on the basis of the submitted references. Web lectures by internationally renowned experts and researchers will be integrated into the lecture.

Media:
Presentations, slide scripts, Articles, online lecture examples

Reading List:

Responsible for Module:
Faße, Anja; Prof. Dr.

Courses (Type of course, Weekly hours per semester), Instructor:
Introduction to Development Economics (Lecture) (Vorlesung, 2 SWS)
Faße A [L], Faße A

Introduction to Development Economics (Tutorial) (Übung, 2 SWS)
Faße A [L], Faße A

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

CS0027: Behavioral Economics | Behavioral Economics

Version of module description: Gültig ab winterterm 2018/19

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<th>Module Level:</th>
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<td>Bachelor</td>
<td>English</td>
<td>one semester</td>
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Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
There will be a written exam with a duration of 60 minutes, to show that students acquired detailed knowledge of behavioral economics and are able to apply it insights to relevant problems.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
VWL/Economics

Content:
This course provides a general introduction to behavioural economics and discusses its relevance to problems in the area of environmental policies. The first half of this course covers basic concepts of behavioural economics, discusses the short-comings of the economic standard theory, and illustrates how behavioural economics supplements the standard theory. In the second part of the course, the learned concepts will be applied to environmental policies and topics in environmental economics (e.g., green nudges, eco-labels, defaults,...)

Intended Learning Outcomes:
The students learn the basic concepts in behavioral economics. They will be able to identify possible applications to environmental policies and in the area of environmental economics.

Teaching and Learning Methods:
The lecture will be performed as ex-cathedra teaching to provide the students will all necessary fundamentals. Within the tutorial the students learn through example calculations and homework how to transfer and apply this knowledge. Lectures and tutorials will be supplemented with classroom experiments
Media:
Folien, Übungsblätter, zusätzliche Literatur (Buchkapitel und Artikel)

Reading List:

Responsible for Module:
Goerg, Sebastian; Prof. Dr. rer. pol.

Courses (Type of course, Weekly hours per semester), Instructor:
Behavioral Economics (München) (Vorlesung mit integrierten Übungen, 4 SWS)
Goerg S [L], Goerg S, Kopsacheilis O
For further information in this module, please click campus.tum.de or here.
Module Description

CS0061: Seminar in Behavioral Economics | Seminar in Behavioral Economics

Version of module description: Gültig ab summerterm 2019

<table>
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<tr>
<th>Module Level: Bachelor</th>
<th>Language: English</th>
<th>Duration: one semester</th>
<th>Frequency: summer semester</th>
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Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The learning results are tested in form of a written thesis. The students write a theoretical and/or empirical thesis that addresses a current research problem in the area of Behavioral Economics. They prove that they have understood the content of the current academic literature and are able to understand the required empirical analyses.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Behavioral Economics

Content:
After being introduced to adequate research designs in the area of behavioral economics, students explore the academic literature on a chosen topic. The topics are typically related to human behavior in an economic context and potential behavioral interventions. Potential topics are:
- Green Nudges
- Social Comparison
- Choice Architecture

Intended Learning Outcomes:
After successful completion of the module the students are able to derive a current academic research questions and to respond to it by using the relevant literature in the area of Behavioral Economics. In addition to the required literature analysis based on peer-reviewed academic journals, the students are able to interpret the relevant empirical analyses, to critically review studies, and to identify the potential relationship of different strands of research.
Teaching and Learning Methods:
The students will be familiarized with the basics to conduct literature reviews in the area of Behavioral Economics. Students work on a research question and learn to summarize the current state of research. Thereby students learn how to critically review current research results and research designs. The students apply these contents to their own research questions in the thesis. The students present their results in front of the other seminar members, and discuss their results with the group. The students have to write a seminar thesis in order to learn how to write an academic paper based on a relevant research questions.

Media:
Presentation, Power-Point Slides

Reading List:
Relevant research articles are provided

Responsible for Module:
Sebastian Goerg

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

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

CS0072: Policy and Innovation | Policy and Innovation

Version of module description: Gültig ab summerterm 2019

<table>
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<th>Module Level: Bachelor</th>
<th>Language: English</th>
<th>Duration: one semester</th>
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Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The grading is based on a written exam (90 Minutes). The written form of the exam allows a comprehensive assessment of students' knowledge and understanding of the basic principles of policy and innovation. They will answer questions about the concepts explaining the strategies and options that policymakers and firms have in order to promote the usage of renewable resources. They will also answer questions about policy effects on the innovation activities of different actors and evaluate the implications for technology development and diffusion.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Entrepreneurship, Introduction to Innovation Management

Content:
The module introduces students into basic principles of the topic of policy and innovation from a global and international perspective. Students will be equipped with basic knowledge on:
- definitions about policy and innovation
- assessment of political incentives, especially related to climate change and renewable resources
- relation to sustainability, networks, ecosystems and social innovation.
Beyond that, students will engage in break-out group workshops to personally experience the process of developing business models in the context of climate change / renewable resources. Students give presentations to the audience and discuss their results.

Intended Learning Outcomes:
Following the completion of the course, the students will be familiarized with theoretical concepts and empirical methods to:
- assess policy effects on the innovation activities of different actors and evaluate the implications for technology development and diffusion
- identify and evaluate business opportunities and design business concepts/plans in the context of renewable resources / climate change
- understand institutional and technological barriers that affect large-scale system transformations and be able to develop scenarios for policy and firms to meet environmental and societal goals

**Teaching and Learning Methods:**
The module will combine several learning methods.
- The basic knowledge as well as real world examples and case studies will be provided through the lecture.
- Discussions in the lecture and active participation are encouraged and will contribute to deepen the understanding of the concepts introduced.
- In the tutorial, the academic concepts will be discussed and applied in case studies. The students will further apply (part of) their theoretical knowledge to real-world problems and present their results in teams. This format fosters team work.
- Students will get additional background knowledge from the scientific literature in private reading.

**Media:**
Presentation, Power-Point Slides, Case Studies

**Reading List:**

**Responsible for Module:**
Claudia Doblinger claudia.doblinger@tum.de

**Courses (Type of course, Weekly hours per semester), Instructor:**
For further information in this module, please click campus.tum.de or here.
Module Description

CS0158: Seminar in Innovation and Technology Management | Seminar in Innovation and Technology Management

Version of module description: Gültig ab summerterm 2020

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<td>winter/summer semester</td>
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<tr>
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<td>180</td>
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Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The learning results are going to be proved in form of a written thesis. The students write a theoretical and/or empirical thesis that addresses a current research problem in the area of Innovation and Technology Management. They prove that they have understood the content of the current academic literature and are able to conduct empirical analyses.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Entrepreneurship, Introduction to Innovation Management

Content:
Current research questions from the area of Innovation and Technology Management, e.g., Ecosystems, sustainable innovation, digitization

Intended Learning Outcomes:
After successful completion of the module the students are able to derive a current academic research questions and to respond to it by using the relevant literature in the area of innovation and technology management. The research questions are typically related to the promotion of sustainable innovation or entrepreneurship within ecosystems. In addition to the required literature analysis based on peer-reviewed academic journals, the students are able to conduct and interpret relevant empirical analyses such as regressions.

Teaching and Learning Methods:
Teaching methods: The students will be familiarized with the basics to conduct literature reviews in the area of innovation and technology management and to conduct and interpret empirical
analyses such as regressions using statistical programs like STATA. The students apply these contents to their own research questions in the thesis. The students present their results in front of the other seminar members, and discuss their results with the group. The students have to write a seminar thesis in order to learn how to write an academic paper based on a relevant research questions in the area of innovation and technology management.

**Media:**
Presentation, Power-Point Slides, Case Studies

**Reading List:**
Relevant research papers will be provided

**Responsible for Module:**
Prof. Claudia Doblinger

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

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

CS0248: Markets for Renewable Energies and Biobased Products | Märkte für erneuerbare Energien und biobasierte Produkte

Version of module description: Gültig ab winterterm 2021/22

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<th>Module Level:</th>
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Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The exam performance is effected by a written test. Through comprehension questions it is reviewed whether the students have understood principles of market development in the covered markets. The students answer questions regarding the development and current situation on the markets of renewable energies and biogenic products as well as the most important factors that influence this market development. The students prove that they have understood the interest and behaviour of actors being active on these markets by answering corresponding questions. Exam duration: 90 minutes.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Basic know-how to the functioning of markets

Content:

A) Introduction and overview

B) Markets for renewable energies
- Regenerative electricity
- Regenerative heat /cooling
- Sustainable mobility
- Sector coupling

C) Markets for biobased products
- Chemical markets
- Building & Living
- Biomaterials
- Other markets (e.g. paper, cardboard, carton, natural cosmetics)

**Intended Learning Outcomes:**
After attending the module, students will be able to show the developments of markets for energy and biobased products and discuss market development. Students are familiar with the relevance, size, and important influencing factors on the renewable energy markets as well as markets for material use of biogenic resources. They are able to compare these markets, to capture important determinants of market development, and to identify the use of fossil and regenerative energies as well as the use of biomass for material applications in a macroeconomic and societal context thus developing strategies for future use.

**Teaching and Learning Methods:**
The lecture will be done using PowerPoint with specifically worked out presentation scripts. In addition, published studies and statistical data related to the development and situation on the targeted markets will be integrated into the lectures. Furthermore, current topics are discussed with students.

**Media:**
Slide presentation, Lecture recordings; Interactions using Moodle; selected journal articles; current topic-related news, videos

**Reading List:**


**Responsible for Module:**
Thomas Decker

**Courses (Type of course, Weekly hours per semester), Instructor:**
Märkte für erneuerbare Energien und biobasierte Produkte (Vorlesung, 4 SWS)
Decker T, Emberger-Klein A, Menrad K
For further information in this module, please click [campus.tum.de](http://campus.tum.de) or [here](http://here).
Electives in Engineering and Natural Sciences | Electives in Engineering and Natural Sciences

Module Description

CS0065: Fundamentals of Thermodynamics | Grundlagen Thermodynamik

Version of module description: Gültig ab winterterm 2021/22

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<th>Module Level:</th>
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Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
The exam performance is effected by a written test. The students solve thermodynamical arithmetic problems and answer questions regarding the definitions and relations of thermodynamics. The students prove that they have understood the basic principles of thermodynamics by setting up and solving equations. Non-programmable calculators and a handed-out formulary are allowed aids. Exam duration: 90 minutes.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Mathematics

Content:
State variables, thermodynamic system, 1st and 2nd law, equations of state for ideal gases and fluid of constant density, process cycles, efficiencies, phase diagrams of pure substances

Intended Learning Outcomes:
After successful completion of the module the students know the 1st and 2nd law of thermodynamics; the are able to use thermal and caloric equations of state for ideal substance classes; they understand thermodynamic phenomena of phase change and related diagrams; they can apply the ideal gas law and the 1st and 2nd law to technical problems.
Teaching and Learning Methods:
The module consists of lectures and parallel tutorials. Contents of the lecture shall be imparted in speech and by presentation. To deepen their knowledge students shall be encouraged to study the literature and examine with regards to content the topics. In the exercises performed as part of the module learned theory shall directly be applied with a practical orientation by means of arithmetic examples.

Media:
Presentations, slide scripts, exercises

Reading List:
P. STEPHAN, K. SCHABER, K. STEPHAN, F. MAYINGER: Thermodynamik, Band 1
Einstoffsysteme

Responsible for Module:
Jakob Burger burger@tum.de

Courses (Type of course, Weekly hours per semester), Instructor:
Grundlagen Thermodynamik / Angleichung Ingenieurwissen (Vorlesung) (Vorlesung, 2 SWS)
Burger J [L], Burger J, Göttl Q, Voggenreiter J

Grundlagen Thermodynamik / Angleichung Ingenieurwissen (Übung) (Übung, 2 SWS)
Burger J [L], Burger J, Göttl Q, Voggenreiter J

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

CS0066: Introduction to Process Engineering | Introduction to Process Engineering

Version of module description: Gültig ab winterterm 2021/22

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

Description of Examination Method:
The exam performance is effected by a written test. Through comprehension questions it is reviewed whether the students have understood the basic principles of process engineering. The students solve balance arithmetic problems and answer questions regarding the definitions and relations of material and energy balances. The students prove that they have understood the basics of conceptual process design by selecting suitable process units for a given separation task and by drawing of the process flowsheet. Non-programmable calculators and a handed-out formulary are allowed aids. Exam duration: 90 minutes.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Mathematics

Content:
Most important unit-operations: reactors, distillation, extraction, crystallization, absorption, membranes, filtration, evaporation. Material and energy balances of single units and whole processes. Conceptual process design.

Intended Learning Outcomes:
After successful completion of the module the students know the most important separation technologies of process engineering; they are able to balance them with respect to material and energy; they understand basics of reaction engineering; they can safely select unit operations and describe their mode of operation.
Teaching and Learning Methods:
The module consists of lectures and parallel tutorials. Contents of the lecture shall be imparted in speech and by presentation. To deepen their knowledge students shall be encouraged to study the literature and examine with regards to content the topics. In the exercises performed as part of the module learned theory shall directly be applied with a practical orientation by means of arithmetic examples.

Media:
Presentations, slide scripts, exercises

Reading List:

Responsible for Module:
Prof. Jakob Burger

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

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

CS0086: Wood-based Resources | Wood-based Resources

Version of module description: Gültig ab winterterm 2021/22

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<th>Module Level:</th>
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Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Exam achievement shall be done in the form of a test. Product pathways of forestry and forest industry shall be reflected here. Classification of economic and ecological aspects of forestry and forest industry from cultivation to material and energetic use shall be explained by using examples of particular cases. Recognition of wood and wood materials shall be shown. The relation of knowledge of forestry and forest industry with regard to knowledge of different woods and wood utilisation will be evaluated at a ratio of 1 to 1. The answers require own formulations from the respective technical jargon of forestry and forest industry.
Type of exam: In writing. Exam duration: 90 minutes

Repeat Examination:
Next semester

(Recommended) Prerequisites:

Content:
The module aims at providing in-depth knowledge to the students in the field of forestry and forest industry from harvest to the use of wood. Special emphasis is given to the interfaces concerning wood use (sawing, wood materials and paper industry) and energy wood production. In a further aspect differences of woods shall be addressed from a microscopic point of view through to their field of application in the manufacturing industry. Therefore, students learn to classify woods microscopically and macroscopically.

Intended Learning Outcomes:
After attending the module the student shall be able to characterise the product pathways in forestry from crop establishment through to material and energetic use of wood. He distinguishes different forms of economy and is able to classify them according to economic, social and
ecological aspects. He recognises differences of woods, knows various new products produced from wood and understands their production paths and their markets.

**Teaching and Learning Methods:**
The course attendance of forestry and wood consists of a lecture and exercises. For this purpose powerpoint presentations and practical training material shall be used. A study trip to wood processing plants including lectures from qualified personnel providing information from experience on site with common rounds of questions provides in-depth knowledge of the production paths. A so-called wood block determination, i.e. the determination of wood by means of different genuine wood samples, will be performed by a magnifying glass 10x.

**Media:**
The following forms of media apply: Script, powerpoint, films, for determination exercises also branches and leaves of shrubs to be determined. Study trip to companies with guided tour of processing and treatment of wood. Determination of wood with a magnifying glass 10x.

**Reading List:**
Jörg van der Heide, 2011: Der Forstwirt. (The Forester) Publisher: Ulmer (Eugen); Auflage: 5th edition. (September 26, 2011)
Language: German
ISBN-10: 3800155702

**Responsible for Module:**
Prof. Cordt Zollfrank

**Courses (Type of course, Weekly hours per semester), Instructor:**
Wood-based Resources (Lecture) (Vorlesung, 2 SWS)
Zollfrank C [L], Röder H, Zollfrank C

Wood-based Resources (Exercise) (Übung, 2 SWS)
Zollfrank C [L], Röder H, Zollfrank C

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

CS0213: Environmental Resources in a Changing World | Environmental Resources in a Changing World

Resource availability, dependency and sustainable usage

Version of module description: Gültig ab winterterm 2021/22

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

Description of Examination Method:
Students demonstrate their knowledge and understanding of the relevance of environmental resources, their limited availability, and approaches for a sustainable usage of resources in form of a written examination (90 minutes). Students deliver definitions, describe and outline relevant processes for selected environmental resources regarding their formation, utilization, supply, and sustainable use.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Knowledge and/or interest in Geology and Physics are valuable.

Content:
The course focuses on the different areas of life at which environmental resources play a critical role, such as drinking and irrigation water supply, energy provision, strategic mineral use (such as rare earth elements) as well as clean land and building materials for healthy living. Thereby, an introduction to relevant expert knowledge such as formation, deposition, and utilization of relevant resources will be made. After understanding formation of resources, their availability under current and future use in a changing environment can be assessed in special consideration of current and future demand on the resource production/provision.

Intended Learning Outcomes:
After successful completion of the module, students understand the ecological and economic value of different environmental resources, the dependency from these resources and pressure
upon these resources through a changing world, such as climate and societal changes. Students comprehend the application of different sustainability criteria.

Students prepare short, practice-oriented tasks as homework in a project team (group work). Thereby, they acquire the ability to view and assess information within a limited period of time and solve practice-oriented questions. The edited information and results are passed on to the other participants accordingly with the focus on sharing results in the form of a written report as well as team work.

**Teaching and Learning Methods:**
The content is taught in lectures and presentations. In addition, case studies and exercises will be discussed. Students should be encouraged to individual literature study and discussions on the theme.

**Media:**
Lecture, Power Point presentation, blackboard, case examples, topics prepared and presented by participants

**Reading List:**


**Responsible for Module:**
Prof. Thomas Vienken

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

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

CS0220: General Chemistry | Allgemeine Chemie [Chem]

Version of module description: Gültig ab winterterm 2021/22

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

Description of Examination Method:
The performance test will be in the form of a written examination rendered. The students should demonstrate in the exam the understanding of the structure of chemical compounds and their typical reactions and chemical conversions. It will also be tested the ability to formulate reaction equations, calculate reaction kinetic and thermodynamic parameters, as well as to transfer the acquired knowledge about the structure and reaction behavior of chemical substance groups to new chemical questions. No auxiliary means are allowed in the exam. 90 min examination time

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Knowledge of chemistry, mathematics and physics, which correspond to the basic course knowledge of the gymnasiale upper school

Content:
General principles of inorganic and physical chemistry: Atomic and molecular construction, structure of compounds, acid / base equilibria, redox reactions, thermodynamics, reaction kinetics and catalysis, fundamentals on electrochemistry, selected reactions of inorganic chemistry

Intended Learning Outcomes:
The students will know and understand the basic principles of chemical reactions and will be able to formulate correct reaction equations and simple reaction kinetic and thermodynamic calculations. Moreover, they will be able to apply the knowledge acquired with model reactions about chemical transformations of chemical substances and substance groups to answer new chemical questions. The successful participation in the module will enable the students to participate in the module of basic organic chemistry
**Teaching and Learning Methods:**
Lectures and corresponding exercises with self-analysis and workup of specific case studies. In relation to the teaching content exercise sheets are disbursed on which the students work in self-study before the tutorials. The solution and discussion takes place in the tutorials. At the postprocessing of the lecture especially while the exercises are solved the students keep themselves intensive busy with the teaching contents of the lecture and reach in this way a understanding of the structure and reaction behavior of chemical substance groups and practise the formulation of reaction equations.

**Media:**
Blackboard, presentation (using script), exercises.

**Reading List:**
1) Theodore L., H. Eugene LeMay, Bruce E. Bursten, Chemie Studieren Kompakt, 10. aktualisierte Auflage, Pearson Verlag, München
2) Charles E. Mortimer, Ulrich Müller, Chemie, 10., überarbeitete Auflage, Thieme Verlag, Stuttgart

**Responsible for Module:**
Prof. Herbert Riepl

**Courses (Type of course, Weekly hours per semester), Instructor:**
Allgemeine und anorganische Chemie (Übung) (Übung, 2 SWS)
Riepl H [L], Able T, Hüsing T, Laudage T, Riepl H, Urmann C

Allgemeine und anorganische Chemie / Angleichung Chemie (Vorlesung) (Vorlesung, 2 SWS)
Riepl H [L], Able T, Hüsing T, Laudage T, Riepl H, Urmann C
For further information in this module, please click campus.tum.de or here.
Module Description

WZ1600: Physics | Physik [Phys]

Version of module description: Gültig ab winterterm 2015/16

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

Description of Examination Method:
Achievement of desired learning objectives shall be verified in a written final exam (90 minutes). In this respect, the students demonstrate that they know and understand the concepts of mechanics, thermal engineering, electricity and optics. By using specific physical issues (mainly computational tasks), the students demonstrate that they are able to also use acquired concepts in a solution-oriented way in simple cases.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Good A-level knowledge of mathematics

Content:
The module of physics provides an introduction into classical physics. The module introduces into the math-based approach of physics for nature description. The module outlines the basics of mechanics, thermal engineering, electricity and optics, makes them clear by means of examples and further practices them by self-employed work.

Intended Learning Outcomes:
The module serves to acquire physical basics. The students know and understand the basic concepts of mechanics, thermal engineering, electricity and optics and can apply these concepts in simple cases. Therefore, a solid basis is created for the course participants that is necessary to understand the subsequent content of teaching (e.g. thermodynamics, energy technology).
Teaching and Learning Methods:
Lecture (speech by teaching staff including writing on the board, PP media, books and other written material), exercise (self-employed work on exercises related to the topics of the lecture in small groups with tutors) for further practising of the concepts which were presented in the lecture.

Media:
Writing on the board, presentations, slide scripts

Reading List:
Paul A. Tipler: Physik (Physics), Spektrum (Panoply), Akademischer Verlag Heidelberg, Berlin, Oxford

Responsible for Module:
Kainz, Josef; Prof. Dr.

Courses (Type of course, Weekly hours per semester), Instructor:
Physik (Übung) (Übung, 2 SWS)
Kainz J [L], Härtl S, Kainz J, Lugauer F, Sun J

Physik (Vorlesung) (Vorlesung, 2 SWS)
Kainz J [L], Kainz J

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


Version of module description: Gültig ab winterterm 2021/22

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Description of Examination Method:
The performance test will be in the form of a written examination rendered. The students should demonstrate in the exam the understanding of the structure of organic chemical compounds and their typical reactions and chemical conversions. It will also be tested the ability to formulate reaction equations, as well as to transfer the acquired knowledge about the structure and reaction behavior of organic chemical substance groups to new chemical questions. No auxiliary means are allowed in the exam. 90 min examination time

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Knowledge of chemistry, mathematics and physics, which correspond to the basic course knowledge of the gymnasiale upper school

Content:
General principles of organic chemistry:
Structure of organic compounds, carbon-atom hybridization, important functional groups, nomenclature and structure of organic molecules, selected reactions of organic chemistry for important groups of substances including central natural substances.

Intended Learning Outcomes:
The students will know and understand the basic principles of organic chemical reactions and will be able to formulate correct organic reactions. Moreover, they will be able to apply the knowledge acquired with model reactions about chemical transformations of organic chemical substances and substance groups to answer new chemical questions. The successful participation in the module
will also enable the students to participate in the practical course and the module advanced organic chemistry.

**Teaching and Learning Methods:**
Lectures and corresponding exercises with self analysis and workup of specific case studies. In relation to the teaching content exercise sheets are disbursed on which the students work in self-study before the tutorials. The solution and discussion takes place in the tutorials. At the postprocessing of the lecture exspecially while the exercises are solved the students keep themselves intensive busy with the teaching contents of the lecture and reach in this way a understanding of the structure and reaction behavior of organic chemical substance groups and practise the formulation of reaction equations.

**Media:**
Blackboard, presentation (using script), exercises

**Reading List:**
K.P.C. Vollhardt, N.E. Schore, Organische Chemie, Verlag VCH Weinheim

**Responsible for Module:**
Prof. Cordt Zollfrank

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

For further information in this module, please click [campus.tum.de](http://campus.tum.de) or [here](http://example.com).
Module Description

WZ1929: Cell Biology and Microbiology | Zell- und Mikrobiologie [MiBi]

Version of module description: Gültig ab winterterm 2017/18

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Description of Examination Method:
The learning results are proved in a written test in which the students are to call up and remember important principles of biology without using additives. In addition the students prove that they are able to recognize and solve a problem in a certain time by answering the comprehension questions on covered basic cell and microbiology processes. Answering questions requires mainly the use of own formulations thereby the correct recall of important technical terms is additionally reviewed. During the examination the tasks are set in both languages and the processing of the examination tasks can take place either in German or English. Exam duration: 90 minutes

Repeat Examination:
Next semester

(Recommended) Prerequisites:

Content:
Basics of cell biology (cellular structure (cell wall, plasma membrane, endomembrane system, nucleus), differences between prokaryotic and eukaryotic organisms, theoretical basics of microscopy, transport processes, genetic flow of informations and basics of molecular genetics (e.g. DNA structure, transcription, translation, DNA duplication), basics of biological taxonomy using the example of selected production organisms (e.g. E.coli, S.cerevisiae, algae, fungi), usage of microorganisms in industrial biotechnolgy (e.g. ethanol fermentation, ABE fermentation, protein synthesis)

Intended Learning Outcomes:
After having participated in the module units the students possess basic knowledge about the structure and function of biomolecules. They know important elements of pro- and eukaryotic cells and can differentiate between these life forms. They know the basics of the genetic flow of
informations and of the most important metabolic pathways and can grade bacteria, fungi and plants to higher-ranking systematic groups. After completion of the module the participants know different microorganisms, can describe their properties and understand basic cellular processes. Furthermore, the students can reflect biological terms, define processes and are able to use their knowledge to solve problems.

**Teaching and Learning Methods:**
The teaching contents are imparted by a talk of the lecturer, supported by PowerPoint and blackboard sketches.

**Media:**
PowerPoint, blackboard work

**Reading List:**

**Responsible for Module:**
apl. Prof. Erich Glawischnig

**Courses (Type of course, Weekly hours per semester), Instructor:**
Zell- und Mikrobiologie (Vorlesung, 3 SWS) Glawischnig E [L], Glawischning E
For further information in this module, please click campus.tum.de or here.
**Module Description**

**WZ1978: Green Chemistry | Green Chemistry**

Version of module description: Gültig ab winterterm 2021/22

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**Description of Examination Method:**
The achievement of the learning outcomes will be tested in a written exam and in a seminar. The students are expected to be able to reproduce the course contents correctly and transfer them to different contexts in written form.

The written exam has a duration of 90 minutes. Aids are not permitted. In addition, the contents of the course will be enhanced in a seminar. The proportion of the written exam to the module grade is 80 %. In the seminar, students analyze selected case studies from current literature in the context of Green Chemistry with respect to their sustainability and present these to their co-students and instructor in an oral presentation with short discussion and a brief written composition. The proportion of the seminar grade to the module grade is 20 %.

**Repeat Examination:**
Next semester

**(Recommended) Prerequisites:**
Basics of chemistry, physics and biology

**Content:**
The module contains an introduction to the basics of environment-friendly 'green' synthesis routes for chemical products. The 12 basic principles of 'green engineering' will be covered. Sustainably production and treatment, process optimizations and innovative technological approaches and optimized separation methods will be discussed. The different processes will be presented with respect to relevant environment aspects, sustainability and energy- as well as raw materials consumption.

**Intended Learning Outcomes:**
After completion of the module, the students are able to describe the basic principles of environment-friendly and sustainable production of chemicals and demonstrate them at the
examples of selected process chains. They can determine and present specific resource requirements with respect to energy, raw- and auxiliary materials as well as the yields during production, emissions into air, water and soil, as well as amounts of wastewater and solid waste. They are also able to couple syntheses to preceding and subsequent processing steps. Thus, they can assess the sustainabilities of production processes autonomously.

**Teaching and Learning Methods:**
Lecture with blackboard and slide presentations for the development of technical concepts. Seminar with written tests. Self-study is essential to consolidate the course contents.

**Media:**
Lecture, blackboard, slides, group work

**Reading List:**

**Responsible for Module:**
Zollfrank, Cordt; Prof. Dr. rer. silv.

**Courses (Type of course, Weekly hours per semester), Instructor:**
For further information in this module, please click [campus.tum.de](http://campus.tum.de) or [here](http://here).
Module Description

WZ1980: Production of Biogenic Resources | Produktion biogener Ressourcen

Version of module description: Gültig ab winterterm 2018/19

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<td>150</td>
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Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Exam achievement shall be done in the form of a test. In this test it shall be proved that students are capable of describing important requirement for the required biogenic resources and are capable to develop important rules for the production of the raw materials in a limited time. On the basis of different examples (e.g. algae productions) and scenarios the students shall discuss pros and cons and the possibilities for the transformation of the different biomass to products.

Type of exam: In writing
Exam duration: 90 min.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
None

Content:
The module aims at providing in-depth knowledge to the students in the production and cultivation of renewable raw materials. Beside the areal-bound production by agriculture and forest, production processes such as Algae bioreactors where integrated. Differences, advantages and disadvantages and possible perspectives are discussed.

Essential crop characteristics shall be discussed for the treated crops and if required differences shall be addressed by various product use (energy and/or industrial crops). As to crops important performance parameters (yields etc.) shall be debated and integration into a concrete cultivation system (farm) be discussed. For this purpose pros and cons shall be worked out and possible actions shall be discussed for optimizing cultivation. For selected topics current main points of research shall be presented and results discussed.
Intended Learning Outcomes:
After having participated in the module units the students know the most important biogenic resources for renewable raw materials.
- They are capable of describing important requirement for the required biogenic resources and are capable to develop important rules for the production of the raw materials
- For the desired raw materials, the required starting materials or biomass can be described (e.g. in the form of agricultural crops (example starch production: cereals, maize)). Based on the agricultural and wood production of raw materials students can characterize the cropping system and cultivation methods
- They are able to describe possible effects on the environment for selected main crops (cereals, corn, oil crops)
- The students know selected research activities in the field of renewable raw materials and are able to analyse their results concerning their relevance and significance

Teaching and Learning Methods:
The module shall primarily be held as a lecture. For different courses it will be completed by individual and group projects. Demonstration of research activities and presentation of the cultivation by practitioners is partly performed by external guests (lecture, presentation). Further reading and questions for follow-up will be made available for different teaching units in moodle.

Media:
Lecture, presentations, (individual and group projects)

Reading List:

Responsible for Module:
Siebrecht, Norman; Dr. agr.

Courses (Type of course, Weekly hours per semester), Instructor:
Produktion biogener Ressourcen / Grundlagen Pflanzenproduktion/ Angleichung Anbau (Vorlesung, 4 SWS)
Siebrecht N [L], Siebrecht N
For further information in this module, please click campus.tum.de or here.
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