

Module Catalog

B.Sc. Sustainable Management and Technology

Degree Program B.Sc. Sustainable Management and Technology

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.

Index of module handbook descriptions (SPO tree)

Alphabetical index can be found on page 109

[20211] Sustainable Management and Technology | Sustainable Management and Technology

Required Modules Required Modules	5
[CS0063] Microeconomics Microeconomics [Micro I]	5 - 6
[CS0075] Management Science Management Science	7 - 8
[CS0193] Foundations of Sustainable, Entrepreneurial & Ethical Business Foundations of Sustainable, Entrepreneurial & Ethical Business	9 - 11
[CS0194] Mathematics Mathematics	12 - 13
[CS0199] Statistics Statistics	14 - 15
[CS0067] Macroeconomics Macroeconomics [Macro I]	16 - 17
[CS0196] Sustainable Operations Sustainable Operations	18 - 19
[CS0071] Material Flow Analysis and Life Cycle Assessment Material Flow Analysis and Life Cycle Assessment [MFA&LCA]	20 - 22
[CS0192] Accounting Accounting	23 - 25
[CS0200] Strategic and International Management & Organizational Behavior Strategic and International Management & Organizational Behavior	26 - 28
[CS0001] Foundations of Programming Foundations of Programming	29 - 30
[CS0197] Sustainable Investment and Financial Management Sustainable Investment and Financial Management	31 - 32
[CS0198] Green Marketing and Innovation Management Green Marketing and Innovation Management	33 - 35
[CS0073] Circular Economy Circular Economy [CEC]	36 - 38
[CS0202] Empirical Research Methods Empirical Research Methods	39 - 41
[CS0204] Project Studies Project Studies	42 - 43
[CS0195] Applications in Sustainable Management and Technology Applications in Sustainable Management and Technology	44 - 45
[CS0081] Modelling and Optimization Modelling and Optimization	46 - 47
[CS0203] Communication Skills Communication Skills	48 - 50
[WI001119] Business Law Business Law [BusLaw]	51 - 52
Elective Modules Elective Modules	53
Electives in Management and Technology Electives in Management and Technology	53
[CS0005] Introduction to Development Economics Introduction to Development Economics	53 - 54
[CS0027] Behavioral Economics Behavioral Economics	55 - 56
[CS0061] Seminar in Behavioral Economics Seminar in Behavioral Economics	57 - 58
[CS0064] Environmental Management Environmental Management [EM]	59 - 60
[CS0072] Policy and Innovation Policy and Innovation	61 - 62

[CS0080] Case Study Seminar in Supply Chain Management Case Study Seminar in Supply Chain Management	63 - 64
[CS0082] Supply Chain Simulation Supply Chain Simulation	65 - 66
[CS0127] Methods for Evidence Based Policy and Management Methods for Evidence Based Policy and Management	67 - 68
[CS0158] Seminar in Innovation and Technology Management Seminar in Innovation and Technology Management	69 - 70
[CS0226] Corporate Strategy Corporate Strategy	71 - 72
[CS0246] Practical Research Experience Practical Research Experience	73 - 74
[CS0248] Markets for Renewable Energies and Biobased Products Märkte für erneuerbare Energien und biobasierte Produkte	75 - 76
Electives in Engineering and Natural Sciences Electives in Engineering and Natural Sciences	77
[CS0065] Fundamentals of Thermodynamics Grundlagen Thermodynamik	77 - 78
[CS0066] Introduction to Process Engineering Introduction to Process Engineering	79 - 80
[CS0086] Wood-based Resources Wood-based Resources	81 - 82
[CS0180] Concepts of Physics and Chemistry in Nature Concepts of Physics and Chemistry in Nature	83 - 84
[CS0213] Environmental Resources in a Changing World Environmental Resources in a Changing World	85 - 86
[CS0220] General Chemistry Allgemeine Chemie [Chem]	87 - 88
[WZ1600] Physics Physik [Phys]	89 - 90
[WZ1924] Basic Organic Chemistry Grundlagen Organische Chemie [OrgChem]	91 - 92
[WZ1929] Cell Biology and Microbiology Zell- und Mikrobiologie [MiBi]	93 - 94
[WZ1978] Green Chemistry Green Chemistry	95 - 96
[WZ1980] Production of Biogenic Resources Produktion biogener Ressourcen	97 - 98
General Electives General Electives	99
TUM Language Center TUM Language Center	99
[SZ0213] Chinese B1.1 Chinesisch B1.1	99 - 100
[SZ0425] English - Introduction to Academic Writing C1 English - Introduction to Academic Writing C1	101 - 102
[SZ0488] English - Gateway to English Master's C1 English - Gateway to English Master's C1	103 - 104
[SZ1201] Spanish A1 Spanisch A1	105 - 106
Bachelor's Thesis Bachelor's Thesis	107
[CS0205] Bachelor's Thesis Bachelor's Thesis	107 - 108

Required Modules | Required Modules

Module Description

CS0063: Microeconomics | Microeconomics [Micro I]

Version of module description: Gültig ab winterterm 2021/22

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

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

Description of Examination Method:

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:

Robert S. Pindyck and David L. Rubinfeld, Microeconomics, 8th Edition, Pearson, 2013 (ISBN 13: 978-0-13-285712-3). AND Robert S. Pindyck und David L. Rubinfeld, Mikroökonomie, 8. Aufl., Pearson Studium, 2013 (ISBN-13: 978-3868941678).

Responsible for Module:

Prof. Sebastian Goerg

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

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

Economics I - Übung am Campus Straubing (Übung, 2 SWS)

Stöhr V

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

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

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

Description of Examination Method:

Students 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:

Bradley, S.P., A.C. Hax und T.L. Magnanti: Applied Mathematical Programming, Addison-Wesley, 1977.

Domschke W and A. Drexl: Einführung in Operations Research, 9th Ed., Springer, 2015.

Hillier FS and Lieberman GJ: Introduction to Operations Research, 9th ed., McGraw-Hill, 2010.

Winston WL: Operations Research, 5th Ed., Thomson, 2004.

Responsible for Module:

Prof. Alexander Hübner

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

Management Science Lecture - Campus Straubing (Vorlesung, 2 SWS)

Hübner A [L], Schäfer F

Management Science Exercise - Campus Straubing (Übung, 2 SWS)

Hübner A [L], Schäfer F

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

Module Description

CS0193: Foundations of Sustainable, Entrepreneurial & Ethical Business | Foundations of Sustainable, Entrepreneurial & Ethical Business

Version of module description: Gültig ab winterterm 2021/22

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

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

Description of Examination Method:

The examination performance will be in the form of a written exam (120 minutes). The written exam provides a comprehensive assessment of whether students know and understand the basic principles of entrepreneurship and sustainability. They answer questions about the concepts that explain the mindset of entrepreneurial individuals and the management of entrepreneurial firms. They also answer questions about basic definitions of specific types of entrepreneurship and entrepreneurial behavior related to environmental and social problems. In addition, students will be assessed on their knowledge of basic principles and models of ethical economic behavior and their ability to use and develop knowledge of entrepreneurship. They answer questions on basic definitions and theories of ethical behavior and evaluate ethical behavior in an economic context.

Repeat Examination:

Next semester

(Recommended) Prerequisites:

Content:

The module introduces students into basic principles of the topic of entrepreneurship from a global and sustainability perspective. Students will be equipped with basic knowledge on:

- definitions, regional aspects, and special forms of entrepreneurship
- understanding of ecological and social problems and entrepreneurial approaches to solving them
- entrepreneurial individuals, including their personality, creativity, idea development, cognition, opportunity recognition, decision making, affect, and moving forward from failure
- entrepreneurial firms, including their growth strategies, strategic alliances, and resources.

Beyond that, students will engage in break-out group workshops to personally experience the process of opportunity recognition and development. In these workshops, teams apply concepts from the academic literature to real-world business issues to solve environmental and/or social problems. Furthermore, students give presentations to the audience and discuss their results. In addition, the module introduces basic problems, arguments, and theoretical approaches of business ethics. It investigates the chances of realizing moral norms at the intersection of entrepreneurship/economics and ethics. Basic is the analysis of ethical decision processes in corporations and the detailed investigation of situations and alternatives of action. Topics involve reputation, trust and social capital as well as corruption, environmental protection, and global ethical concepts. This part ends with a critical discussion of different research approaches in the debate on business ethics.

Intended Learning Outcomes:

Students know basic concepts of entrepreneurship and sustainability including basic definitions, psychological processes and characteristics of entrepreneurs as well as possible development paths of entrepreneurial firms and are able to explain them. Furthermore, students transform and apply this knowledge to real cases. They are able to find entrepreneurial solutions for ecological and/or social problems in real cases, taking into account the theories of entrepreneurial processes.

Furthermore, students understand the ethical significance of economic theories, reflect on ethical aspects in economics and apply ethical theories in an economic, social and ecological context. Students are able to draw conclusions from the known theories and concepts and to behave ethically in everyday business life.

Teaching and Learning Methods:

The module combines several learning methods.

- The basic knowledge as well as real world examples 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.
- Workshops in smaller groups enable the students to apply (part of) their theoretical knowledge to real-world problems. This format additionally fosters creativity and team work.
- Students will get additional background knowledge from the scientific literature in private reading.

Media:

Presentations and PowerPoint slides

Reading List:

Hisrich, R. D., Peters, M. P., & Shepherd, D. A. (2010). *Entrepreneurship* (8th ed.). New York: McGraw-Hill.

Read, S., Sarasvathy, S., Dew, N., Wiltbank, R. & Ohlsson, A.-V. (2010). *Effectual Entrepreneurship*. New York: Routledge Chapman & Hall.

Lütge, C., Uhl, M. (2018). *Wirtschaftsethik*. München: Vahlen.

Crane, A., Matten, D., Glozer, S., Spence, L. (2019): *Business Ethics*. Oxford: Oxford University Press

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

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

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

Description of Examination Method:

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 (Exercise) (Übung, 2 SWS)

Grimm D [L], Grimm D

Mathematics (Lecture) (Vorlesung, 2 SWS)

Grimm D [L], Grimm D

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

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

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

Description of Examination Method:

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:

Fahrmeir, Heumann, Künstler, Pigeot, Tutz: Statistik - Der Weg zur Datenanalyse, 8. Auflage, Springer Spektrum (2016).

Caputo, Fahrmeir, Künstler, Lang, Pigeot, Tutz: Arbeitsbuch Statistik, 5. Auflage, Springer Verlag (2009).

Diez, Cetinkaya-Rundel, Barr: OpenIntro Statistics, 4th edition, <https://www.openintro.org/book/os/> (2019).

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

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

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

Description of Examination Method:

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:

The CORE Project (2016): 'The Economy', in: Azm Premji University, Friends Provident Foundation, HM Treasury, Institute for New Economic Thinking, Open Society Foundations, SciencesPo, UCL (eds.), University College London.

Responsible for Module:

Prof. Andreas Pondorfer

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

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

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

Description of Examination Method:

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

Ghiani, G., Laporte, G., Musmanno R. (2013), Introduction to Logistics Systems Management, 2. Aufl., Wiley

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

CS0071: Material Flow Analysis and Life Cycle Assessment | Material Flow Analysis and Life Cycle Assessment [MFA&LCA]

Version of module description: Gültig ab summerterm 2021

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

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

Description of Examination Method:

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
 - o Goal and scope definition
 - o Life cycle inventory analysis
 - o Life cycle impact assessment
 - o 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:

- Baccini, P. & Brunner, P.H. (2012): Metabolism of the Anthroposphere: Analysis, Evaluation, Design. MIT Press.

- Brunner, P.H. & Rechberger, H. (2016): Handbook of Material Flow Analysis: For Environmental, Resource, and Waste Engineers. CRC Press.
- Curran, M.A. (2015): Life Cycle Assessment Student Handbook, Scrivener Publishing.
- Fröhling, M.; Hiete, M. (2020): Sustainability and Life Cycle Assessment in Industrial Biotechnology. Springer, Cham.
- Guinée, J.B. (2002): Handbook on life cycle assessment: operational guide to the ISO standards. Kluwer, Dordrecht.
- Hauschild, M.Z. & Huijbregts, M.A.J. (2015): Life Cycle Impact Assessment (LCA Compendium - The Complete World of Life Cycle Assessment), Springer, Cham.
- Hauschild, M.; Rosenbaum, R.K.; Olsen, S.I. (2018): Life Cycle Assessment: Theory and Practice. Springer, Cham.
- Jolliet, O., Saade-Sbeih, M. (2015): Environmental Life Cycle Assessment. CRC Press.
- Klöpffer, W. & Grahl, B. (2014): Life Cycle Assessment (LCA), Wiley-VCH.

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 or [here](#).

Module Description

CS0192: Accounting | Accounting

Version of module description: Gültig ab winterterm 2021/22

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

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

Description of Examination Method:

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:

Buchholz, Rainer: Grundzüge des Jahresabschlusses nach HGB und IFRS, 7. Aufl., München 2011

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:

Financial Accounting (Vorlesung, 2 SWS)

David G

Controlling (Vorlesung) (Vorlesung, 2 SWS)

Röder H [L], Kondrasch J, Röder H, Roth B

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

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

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

Description of Examination Method:

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:

Cavusgil, S.T., Knight, G., Riesenberger, J. R. (2008), International Business: strategy, management, and the new realities

Hill, C.W.L. (2014), International business: Competing in the Global Marketplace

Landy, F.J., & Conte, J.M. (2013). Work in the 21st century. Hoboken, NJ: Wiley.

Wood, J. M. (2016). Organisational behavior: Core concepts and applications. Milton, Australia: Wiley

Responsible for Module:

Prof. Claudia Doblinger

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

Organizational Behavior (WI001121) am Campus Straubing (Vorlesung, 2 SWS)

Cantner F, Goerg S

Strategic and International Management (WI001121) (Bachelor TUM-BWL) am Campus Straubing (Vorlesung, 2 SWS)

Doblinger C [L], Seitz J

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

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

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

Description of Examination Method:

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], Eiglsperger J, Genze N, Grimm D, Haselbeck F

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

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

Module Description

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

Version of module description: Gültig ab winterterm 2021/22

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

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

Description of Examination Method:

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:

Berk/DeMarzo (2020), Corporate Finance, 3rd. Edition, Pearson.

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

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

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

Description of Examination Method:

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, customerperceived 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 promoters

Kotler/Keller/Brady/Goldman/Hansen (2016): Marketing Management, 3rd European ed., Pearson: Harlow.

Kotler/Armstrong (2018): Principles of Marketing, 17th ed., Pearson: Harlow.

Homburg (2017): Marketingmanagement. Strategie – Instrumente – Umsetzung – Unternehmensführung, 6. Aufl., Gabler: Wiesbaden.

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

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

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

Description of Examination Method:

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:

- Ayres, Robert U. (2002): A handbook of industrial ecology
- Baccini, Peter (1991): Metabolism of the Anthroposphere, Springer
- Baker-Brown, Duncan (2017): The re-use atlas a designer's guide towards a circular economy
- Charter, Martin (2019): Designing for the circular economy, Routledge
- De Angelis, Roberta (2018): Business Models in the Circular Economy: Concepts, Examples and Theory, Palgrave Macmillan
- Franco-García, María-Laura ; Carpio-Aguilar, Jorge Carlos ; Bressers, Hans: Towards Zero Waste: Circular Economy Boost, Waste to Resources, Springer
- Larsson, Mats (2018): Circular Business Models: Developing a Sustainable Future
- Schaub, Georg; Turek, Thomas (2016):
- Energy Flows, Material Cycles and Global Development: a Process Engineering Approach to the Earth System, Springer
- Webster, Ken (2017): The Circular Economy - A Wealth of Flows, Ellen MacArthur Foundation Publishing

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 or [here](#).

Module Description

CS0202: Empirical Research Methods | Empirical Research Methods

Version of module description: Gültig ab winterterm 2021/22

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

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

Description of Examination Method:

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 or 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 excersises. The lecture is based on slides and blackboard utilizing additional interactive elements. In the exersice, 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 excersises and deepen their understand 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):

- Singleton, R. A., Straits, B. C., & Straits M. M. 1993 (or newer). Approaches to Social Research (≥ 2 nd ed.). Oxford University Press. (Abbreviated "ASR" in preparation sheets)
- In German: Backhaus, K., Erichson, B., Plinke, W., & Weiber, R. 2010 (or newer). Multivariate Analyse-methoden: Eine anwendungsorientierte Einführung (≥ 13 th ed.). Berlin: Springer.
- Salkind, N.J. 2008 (or newer). Statistics for people who think they hate statistics (≥ 3 rd ed.). Thousand Oaks, CA: Sage.
- Hair, J. F., Jr., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. 2005 (or newer). Multivariate data analysis (≥ 6 th ed.). Upper Saddle River, NJ: Prentice Hall.

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

CS0204: Project Studies | Project Studies

Version of module description: Gültig ab winterterm 2021/22

Module Level: Bachelor	Language: German/English	Duration: one semester	Frequency: winter/summer semester
Credits:* 12	Total Hours: 360	Self-study Hours:	Contact Hours:

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 knowledge 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:

Projektstudium | project studies (Orientierungsveranstaltung, 1 SWS)

Hübner A [L], Hübner A, Winkler T

For further information in this module, please click 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

Module Level: Bachelor	Language: English	Duration: two semesters	Frequency: winter/summer semester
Credits:* 3	Total Hours: 90	Self-study Hours: 60	Contact Hours: 30

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

Description of Examination Method:

The 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 practitioners 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:

Petra Molthan-Hill (2017), The Business Student's Guide to Sustainable Management: Principles and Practice (The Principles for Responsible Management Education Series)

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

CS0081: Modelling and Optimization | Modelling and Optimization

Version of module description: Gültig ab winterterm 2021/22

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

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

Description of Examination Method:

The examination is based on an exam (50% of evaluation) and a project work (50% of evaluation).

The 45min written exam tests the understanding of the modeling techniques discussed in the course. 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 project paper serves the assessment of the understanding of the modeling language. For the project paper the participants get a randomly assigned fictive, extensive decision problem. For this problem, the following has to be prepared:

- a modeling of the problem as a mathematical program, as well as explanation of the program
- an implementation of the program in OPL
- a verbal and graphical explanation of the of the results for the original problem

The grading of the project paper is done by the following criteria:

- Correctness of modeling and implementation as well as of the results (60% of examination)
- Clarity, comprehensibility and efficiency of the implementation (30% of evaluation)
- correct language, typesetting and outer form of the paper (10% of evaluation)

Repeat Examination:

Next semester

(Recommended) Prerequisites:

Management Science

Content:

This course is about modeling, solving and analyzing planning and decision problems using mathematical concepts. The concepts are 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: Basics of linear optimization, introduction to optimization and corresponding languages (e.g., OPL), techniques of binary modeling, optimization of graph problems, problems with multiple objective functions, basic techniques of stochastic optimization and interfaces to other applications.

Intended Learning Outcomes:

After successful completion of the module students are capable of modelling planning problems. Students learn to model real life business problems e.g. from production and logistics by applying mathematical programming techniques. They can independently implement mathematical models by using an optimization language (e.g., OPL) on a PC and they are able to solve the models in Optimization Studio and interpret the results. Furthermore, they deepen their knowledge in several different modeling techniques.

Teaching and Learning Methods:

The module consists of a lecture and exercise courses, which are provided weekly. 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 and offering the opportunity to program problems individually. The exercises give the student the opportunity to pose questions and receive immediately help from the teaching assistant.

Media:

Script, Presentation slides

Reading List:

Kallrath, Josef and John M. Wilson: Business Business optimisation using mathematical programming. Macmillan, Basingstoke, 1997
Popp, Andreas: Modellierung und Optimierung mit OPL. epubli, 2015
Taha, Hamdy A.: Operations Research: an introduction. 8th ed., Pearson Prentice Hall, Upper Saddle River (NJ), 2007

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

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

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

Description of Examination Method:

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](#).

Module Description

WI001119: Business Law | Business Law [BusLaw]

Version of module description: Gültig ab summerterm 2022

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

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

Description of Examination Method:

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. 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:

Robbers, An Introduction to German Law (6th ed., 2017)

Responsible for Module:

Maume, Philipp; Prof. Dr.

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

Business Law 1 (WI001119) am Campus Straubing (Vorlesung, 2 SWS)
Kirner H, Reichardt L, Schulitz S

Business Law 1 (WI001119) am Campus Straubing - Exercise (Übung, 2 SWS)

Kirner H, Reichardt L, Schulitz S

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 2022/23

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

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

Description of Examination Method:

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:

Microeconomics (CS0063)

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:

Alain de Janvry, Elisabeth Sadoulet (2016). Development Economics - Theory and Practice. Routledge; Michael Todaro, Stephen Smith (2012). Economic Development, Pearson.

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 summerterm 2022

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

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

Description of Examination Method:

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 winterterm 2021/22

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

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

Description of Examination Method:

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:

Seminar in Behavioral Economics (Seminar, 4 SWS)

Goerg S [L], Cantner F, Goerg S, Stöhr V

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

Module Description

CS0064: Environmental Management | Environmental Management [EM]

Version of module description: Gültig ab summerterm 2019

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

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

Description of Examination Method:

Written exam (90 minutes): By solving problems from the thematic field of the module students have to prove their understanding of the basics of corporate environmental management, their ability to apply environmental management methods and their verbal skills in the field. In the solution of the problems they need to demonstrate their ability to identify and analyse environmental impacts of corporate activities, to apply the managerial toolset provided by the ISO 14000 series and the Environmental Management and Audit Scheme (EMAS) to (simplified) practical problems. In addition, they need to show that they are able to discuss the application of these methods in practice and to derive further research needs. Learning aids: pocket calculator.

Repeat Examination:

Next semester

(Recommended) Prerequisites:

Content:

The module contains units covering the following topics:

- Environmental impacts of industrial and business activities,
- Societal, economic and legal frameworks of environmental protection,
- Motivation for businesses for applying environmental management approaches and methods,
- Environmental Management Systems (e.g. ISO 14000 series, EMAS),
- Methods and tools for environmental management (indicators, reporting, life cycle assessment), and
- Recent and emerging topics in environmental management.

Intended Learning Outcomes:

Students understand basics of corporate environmental management and its relevance for companies, application potentials and their implementation. They discuss these in context of business and research, reflect it critically and derive consequences for companies and research.

Teaching and Learning Methods:

Format: Lecture with tutorial to introduce, train and deepen the contents of the module.

Teaching / learning methods:

- Media-assisted presentations
- Group work / case studies with presentation
- Individual assignments and presentation

The teaching and learning methods are combined specifically for the treated topics. Typically, a thematic impulse or overview is given with a media-assisted presentation. Individual or group work assignments provide the possibility to apply the acquired competencies, to repeat and deepen these as well as to prepare the transfer to other fields.

Media:

Digital projector, board, flipchart, online contents, case studies

Reading List:

Recommended reading:

- Theodore (2017): Environmental management, Chapman and Hall/CRC.
- Antweiler (2014): Elements of environmental management, Univ. of Toronto Press.
- Belchem (2014): Manual of Environmental Management, Taylor and Francis.
- Amilleri (2017): Corporate sustainability, social responsibility and environmental management, Springer.
- Mitchell (2002): Resource and environmental management, Prentice Hall.
- Mulvihill and Harris (2017): Environmental management: critical thinking and emerging practices, Taylor and Francis.

Responsible for Module:

Magnus Fröhling magnus.froehling@tum.de

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

Environmental Management (Lecture) (Vorlesung, 2 SWS)

Fröhling M [L], Fröhling M

Environmental Management (Exercise) (Übung, 2 SWS)

Fröhling M [L], Heinrich V

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

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

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

Description of Examination Method:

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:

Fagerberg, J.; Mowery, D.C.; Nelson, R.R. (eds.), 2005: The Oxford Handbook of Innovation. Oxford University Press, Oxford.

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

CS0080: Case Study Seminar in Supply Chain Management | Case Study Seminar in Supply Chain Management

Version of module description: Gültig ab Sommerterm 2022

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

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

Description of Examination Method:

Repeat Examination:

(Recommended) Prerequisites:

Content:

Intended Learning Outcomes:

Teaching and Learning Methods:

Media:

Reading List:

Responsible for Module:

Prof. Alexander Hübner

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

Fallstudienseminar in Supply Chain Management (Seminar, 4 SWS)

Hübner A [L], Hübner A, Ostermeier M, Riesenegger L, Winkler T

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

Module Description

CS0082: Supply Chain Simulation | Supply Chain Simulation

Version of module description: Gültig ab summerterm 2019

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

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

Description of Examination Method:

Because of the mediation of competences and the interactive character of the module using the supply chain simulation „The Fresh Connection“ several group presentations are part of the evaluation:

- Introductory presentation for a supply chain topic (30 minutes / 50% of the evaluation)
- Short presentation concerning decision alternatives within a round of the simulation (10 minutes / 20% of the evaluation)
- Presentations of the decisions made within the respective rounds of the simulation, the lessons learnt and the results (15 minutes / 30% of the evaluation)

Repeat Examination:

Next semester

(Recommended) Prerequisites:

Operations Research

Content:

The module is an innovative combination of mediation of theoretical background knowledge, practice and experience using the supply chain simulation „The Fresh Connection“. The topics in detail:

- Basics and decision making in supply chain management
- Supplier Management
- Demand Management
- Capacity and Production Management
- Inventory Management and Planning
- Supply Chain Mapping and component characteristics
- Supply Chain Strategy
- Variables and KPI's on strategic and tactical level

- External Collaboration

Intended Learning Outcomes:

The students will obtain a practice oriented overview of basics, decisions and interrelations in supply chain management. The students will achieve the ability to understand influencing factors and consequences of supply chain decisions with the help of the simulation “The Fresh Connection“. The students will achieve the competence for autonomous academic self study and application-oriented presentation of content. A focus of the mediation of competences is on work in cross-functional teams.

Teaching and Learning Methods:

Lecture, Web-based supply chain management simulation and learning environment, Self study and group work with presentation of result

Media:

Lecture, simulation software, presentations

Reading List:

Fisher, M.L. , What is the right supply chain for your product?, Harvard Business Review, March-April 1997

Christopher, M. , Logistics and Supply Chain Management, creating value-added networks, Prentice Hall, 2005

Chopra, S. and Meindl, Supply Chain Management, Pearson Education, third edition, 2007

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

CS0127: Methods for Evidence Based Policy and Management | Methods for Evidence Based Policy and Management

Version of module description: Gültig ab summerterm 2022

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

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

Description of Examination Method:

Assessment will be based on a written report. With the report students will demonstrate that they understand policy evaluations and are able to summarize them effectively. In the report, students work with an academic policy paper, which they replicate, critically evaluate and summarize for an interested lay audience. They may choose from a list of papers discussed in class or they may write about a paper they choose themselves with prior approval from the lecturer.

Repeat Examination:

Next semester

(Recommended) Prerequisites:

Microeconomics, Statistics, Empirical Research Methods

Content:

In this course students learn the fundamental skills of economic policy analysis.

Firstly, students will learn to evaluate the impacts of existing public policies (or natural experiments) by using two widely used econometric techniques, difference-in-difference (DiD) and regression discontinuity design (RDD). Secondly, students will learn about the role of experimental methods, such as randomized controlled trials, field experiments, and lab experiments, for the impact evaluation of economic policies.

The methods will be introduced based on research papers which cover areas of development economics, environmental economics, behavioural economics, labor economics, managerial economics, public economics, and political economics. For example, papers could cover diverse topics such as the impact of subsidies for renewable and low-carbon energy technologies or behavioural intervention like nudges to reduce energy consumption of private households.

Intended Learning Outcomes:

In this module, students will develop the ability to empirically evaluate the economic consequences of interventions and policies. At the end of the module, have a good understanding on common policy analysis tools and be able to compare the merits and disadvantages of different policies or interventions. They will be able to estimate the likely consequences of proposed policies. Students will understand the nature of scientific evidence and how to translate this into management and policy advice. They can explain and apply the econometric methods used for economic policy analysis. Students understand the challenges of evidence-based policy advice and are able to critically assess existing studies.

Teaching and Learning Methods:

The module consists of a lecture and an exercise.

The lecture is designed as an interactive frontal lesson (PowerPoint, blackboard), as a large number of policy evaluations will be discussed together with the applied methods. Thereby, the lecture will also revisit and combine topics and methods covered in previous modules, e.g. Microeconomics, Environmental Economics, and Empirical Methods. During the exercise, students will gather data, manage datasets, and analyse them with STATA. In particular, during each exercise, students will go through a research/policy paper, its publicly available data, and replicate its basic findings (many economic and scientific journals publish their datasets for replication purposes). In groups, students will write short policy reports summarizing the academic papers and their own replications.

The lecture and exercise are designed to introduce students to the methods of policy evaluations and how to apply them.

Media:

Presentations, slide scripts, computer, statistic software (STATA)

Reading List:

Will be provided and is based on research and policy papers

Responsible for Module:

Prof. Andreas Pondorfer

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

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

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

Description of Examination Method:

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:

Seminar in Innovation and Technology Management - Digitalization and Sustainability (Seminar, 4 SWS)

Doblinger C [L], Seitz J, Perlinger K

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

Module Description

CS0226: Corporate Strategy | Corporate Strategy

Version of module description: Gültig ab winterterm 2022/23

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

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

Description of Examination Method:

Group Project and Group Presentations: 60%; Online Exam (60 min.): 40%

Repeat Examination:

(Recommended) Prerequisites:

Basic knowledge of business administration

Content:

Students are introduced into the topic of corporate strategy based on a thorough understanding of what strategy means in the context of corporate management. Further, students learn about key management analysis tools and whose application to real life scenarios by the means of case studies. Subsequently, corporate strategy is looked at from a regional, national and international perspective including the notion of innovation and the formation of competitive advantage.

Intended Learning Outcomes:

The students obtain knowledge in

- gaining a broad understanding about core themes of corporate strategy, related processes and theoretical underpinnings,
- understanding strategic analysis tools in the context of case studies and further examples
- developing a critical understanding of strategy in the context of corporate management with the objective to improve strategic decision making, and
- obtaining the ability to develop managerial reports based on the above.

The student enhance their skills in

- evaluating presented information in a critical manner based on the information presented in the course,

- applying strategic analysis tools and interpret the results of such analysis,
- presenting the results of his/her work in a concise way to a larger audience, and
- connecting local/regional/national corporate strategy topics to an international context.

The student obtain further general qualifications in

- having insights into relevant topics and issues in the context of corporate strategy,
- applying relevant theoretical frame works to case studies and demonstrate an in-depth understanding of the results,
- planning and executing relevant project work in a timely fashion in the context of a group project,
- presenting and contextualizing relevant information, theories and issues of the corporate strategy domain (oral and written),
- discussing relevant information and topics with peers as part of the course, and
- connecting the concept of innovation to corporate strategy and business success

Teaching and Learning Methods:

The basic concepts are presented with slide-based lectures. The models and methods are presented and illustrated by means of exercise examples, including practical applications in corporate strategy management. These contents form the basis for a critical consideration from a theoretical-conceptual and practical-application-oriented point of view. Current research papers, case studies and textbooks are used as the basis for this.

Media:

Core text book, case studies, academic journal articles, lecture slides, relevant online content

Reading List:

Exploring Strategy by Johnson, Whittington and Scholes

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

CS0246: Practical Research Experience | Practical Research Experience

Version of module description: Gültig ab winterterm 2021/22

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

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

Description of Examination Method:

Grading is based on a project work. The project work consists of a written project report. The student works on a specific problem set. The student runs through several project stages: problem definition, division of work/tasks, decision making processes, and realization. Throughout this process, the student shows that she/he can develop appropriate strategies to cope with the set of problems. She/he shows the ability able to compose the state of research. In addition she/he demonstrates the ability to develop their own specific approach for a solution based on scientific knowledge as well as methodical skills.

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 analyses and discussion of the main findings. The project work is set up in a way which enables the identification and evaluation of each student's individual contribution to the project's success.

Repeat Examination:

Next semester

(Recommended) Prerequisites:

Basic knowledge in Business Administration and Management

Management Science (CS0075)

Sustainable Operations (CS0196)

Case Study Seminar in SCM (CS0080)

Content:

The research study consists of a specific problem statement or challenge. This challenge may have a research related or practical character. The research project and its findings regarding the outlined problem set are based on students' academic knowledge gained through their Bachelor study programs. Examples of topics covered in the context of a include (non-exhaustive list) for

example analyzing potential sales volumes with data mining techniques, identifying potential optimization actions or applying algorithms for certain business problems.

Intended Learning Outcomes:

After successful participation in the module, students obtain basic knowledge to work on research projects in an academic manner. Students understand on how to complete a research project in particular in identification research gaps, developing research questions, selecting appropriate research methods and apply them to actual research problem. Students obtain capabilities to deepen and apply theoretical concepts to the identified problem set and apply analytical solution finding skills. Students become able to manage resources, and deadlines through timely submission of the enumerated tasks in stages throughout their research projects.

Teaching and Learning Methods:

The development of the solution of the research question encourages the students to deal soundly with an academic subject based on their previously acquired academic knowledge. The project may happen at the premises of a respective company/institution or from a remote location. Participants are able to communicate the evolvement of the project by composing a project report and preparing a presentation of their solutions to the supervisors. With regards to content the research study takes an approximate time of 12-14 weeks.

Media:

literature, presentations

Reading List:

Project Management Institute (2013): A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Fifth Edition

Further literature based on the specific topic

Responsible for Module:

Prof. Alexander Hübner

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

Practical Research Experience (Forschungspraktikum, 4 SWS)

Hübner A [L], Hübner A

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

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

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

Description of Examination Method:

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 fossile 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:

Quaschnig, Volker (2020): Erneuerbare Energien und Klimaschutz: Hintergründe – Techniken und Planung – Ökonomie und Ökologie – Energiewende. 5. Auflage. Hanser Verlag: München.

FNR (2014): Marktanalyse Nachwachsender Rohstoffe. Schriftenreihe Nachwachsender Rohstoffe 34. Gülzow.

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 or [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

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

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

Description of Examination Method:

The 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; they 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

16. Auflage, Springer, Berlin (2006); H.D. BAEHR, S. KABELAC: Thermodynamik, 13. Auflage,
Springer, Berlin (2006)

Responsible for Module:

Jakob Burger burger@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

CS0066: Introduction to Process Engineering | Introduction to Process Engineering

Version of module description: Gültig ab winterterm 2021/22

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

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

Description of Examination Method:

The 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, evaporator. 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

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:

Worthof & Siemes: Grundbegriffe der Verfahrenstechnik: Mit Aufgaben und Lösungen, 2012.

Schwister & Leven: Verfahrenstechnik für Ingenieure: Ein Lehr- und Übungsbuch, 2014.

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

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

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

Description of Examination Method:

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

ISBN-13: 978-3800155705; D. Fengel, G. Wegener: Wood Verlag Kessel, www.forstbuch.de

Responsible for Module:

Prof. Cordt Zollfrank

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

Wood-based Resources (Exercise) (Übung, 2 SWS)

Zollfrank C [L], Röder H, Zollfrank C

Wood-based Resources (Lecture) (Vorlesung, 2 SWS)

Zollfrank C [L], Röder H, Zollfrank C

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

Module Description

CS0180: Concepts of Physics and Chemistry in Nature | Concepts of Physics and Chemistry in Nature

Version of module description: Gültig ab summerterm 2022

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

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

Description of Examination Method:

The performance test will be in the form of a written examination. The students should demonstrate in the exam the understanding of the physicochemical principles governing natural systems. They will be asked about

Basic concepts of physical chemistry applied to energy conversion in natural systems and to the structure of biomolecules. No auxiliary means are allowed in the exam. 120 min examination time

Repeat Examination:

End of Semester

(Recommended) Prerequisites:

This course will intend to consolidate basic concepts in Physics, Mechanics, Chemistry, and Mathematics having the focus on Nature examples. As such, basic knowledge in Physics, Chemistry, Mechanics, and Mathematics is required.

Content:

The module aims at providing in-depth knowledge to the students in the field of Physics and Chemistry applied to Biology. The focus on basic physical and chemical laws, concepts, principles and processes, including chemical bonding, chemical kinetics, spectroscopy, thermodynamics, thermochemistry, mechanics, optics, among others. The students will be able to apply them to understand the functionality of biological compounds/materials towards a more practical vision of Nature and its possible technological application.

The course will be divided into several topics related to the chemical structure of proteins, sugars, and other bio compounds, the formation of micro and macro self-assembled structures, light manipulation, heat management, mechanics, and electrical control. Each topic will be addressed refreshing the most important physical and chemical concepts followed by their relevance in the structural and functional aspects of these materials and their possible application in technology.

Intended Learning Outcomes:

At the end of the module students will be able to analyse biological systems using a physicochemical perspective; describe the different ways energy is transformed and used by natural systems (thermally, optically, mechanical etc.). They will be able to analyse the structure of proteins and other biomolecules and to identify the forces that define their functionality. They will be able to apply these concepts to understand bio-based and bio-inspired technologies.

Teaching and Learning Methods:

This course attendance includes lectures and exercises. For this purpose, powerpoint presentations, practical training materials, and open discussion seminars will be used.

Media:

The following forms of media apply: powerpoint, films, and blackboards.

Reading List:

1. Physical Chemistry for the Biological Sciences, 2nd Edition Gordon G. Hammes, Sharon Hammes-Schiffer, Wiley, 2015, ISBN: 978-1-118-85900-1
2. Physical Chemistry for the Life Sciences, 2nd Edition Peter Atkins and Julio De Paula Oxford University Press ISBN: 978-0-19-956428-6
3. Introduction to Biophotonics Paras N. Prasad Wiley 2003, ISBN: 0-471-28770-9.
4. Introduction to Biomechanics Duane Knudson Springer 2007 ISBN: 978-0-387-49311-4

Responsible for Module:

Prof. Dr. Rubén D. Costa Dr. Juan Pablo Fuenzalida Werner

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

Concepts of Physics and Chemistry in Nature (Exercise) (Übung, 2 SWS)
Costa Riquelme R [L], Costa Riquelme R, Fuenzalida Werner J

Concepts of Physics and Chemistry in Nature (Lecture) (Vorlesung, 2 SWS)

Costa Riquelme R [L], Costa Riquelme R, Fuenzalida Werner J

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

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

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

Description of Examination Method:

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:

H. Hettiarachchi & R. Ardakanian (eds.), 2016: Environmental Resource Management and the Nexus Approach. Managing Water, Soil, and Waste in the Context of Global Change. Springer, Cham.

Dassargues, A. (2018): Hydrogeology: Groundwater Science and Engineering, CRC Press, 1st edition.

Grotzinger, T. & Jordan, T. (2014): Understanding Earth. W.H. Freeman & Company, 7th edition

Responsible for Module:

Prof. Thomas Vienken

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

Environmental Resources in a Changing World (Vorlesung, 4 SWS)

Vienken T [L], Vienken T

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

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

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

Description of Examination Method:

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

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

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

Description of Examination Method:

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:

U. Harten: Physik, Einführung für Ingenieure und Naturwissenschaftler (Physics, Introduction for Engineers and Scientists), 4th edition 2009, Springer

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 (Vorlesung) (Vorlesung, 2 SWS)

Kainz J [L], Kainz J

Physik (Übung) (Übung, 2 SWS)

Kainz J [L], Kainz J, Lugauer F, Sun J

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

Module Description

WZ1924: Basic Organic Chemistry | Grundlagen Organische Chemie [OrgChem]

Version of module description: Gültig ab winterterm 2021/22

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

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

Description of Examination Method:

The 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 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 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 or [here](#).

Module Description

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

Version of module description: Gültig ab winterterm 2017/18

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

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

Description of Examination Method:

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 biotechnology (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:

„Allgemeine Mikrobiologie“ von Georg Fuchs von Thieme, Stuttgart (Broschiert - 11. Oktober 2006)
"Brock Mikrobiologie" von Michael T. Madigan und John M. Martinko, Pearson, 11. Auflage (2008)
"Biologie" von Neil A. Campbell und Jane B. Rice, Pearson, 8. Auflage (2011)

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], Glawischnig 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

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

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

Description of Examination Method:

The 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:

Jiménez-González, Constable, Green Chemistry and Engineering, Wiley-VCH, 2010

Responsible for Module:

Prof. Herbert Riepl

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

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

Module Description

WZ1980: Production of Biogenic Resources | Produktion biogener Ressourcen

Version of module description: Gültig ab winterterm 2018/19

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

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

Description of Examination Method:

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 requirements for the required biogenic resources and are capable of developing 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:

Lütke- 2006: Lehrbuch des Pflanzenbaus, Band 2: Kulturpflanzen, Verlag Th. Mann Gelsenkirchen.

Diepenbrock, Ellmauer, Leon, 2009 : Ackerbau, Pflanzenbau und Pflanzenzüchtung. Ulmer Verlag. Pflanzenbau, Ein Lehrbuch - Biologische Grundlagen und Technik der Pflanzenproduktion, Gerhard Geisler, Paul Parey Verlag: Parasitäre Krankheiten und Schädlinge an landwirtschaftlichen Kulturpflanzen, Ulmer Verlag, G.-M. Hoffmann und H. Schmutterer
Diepenbrock 2014: Nachwachsende Rohstoffe, Ulmer UTB, Stuttgart
Kaltschmitt et al. 2009: Energie aus Biomasse, Springer, Heidelberg

Responsible for Module:

Siebrecht, Norman; Dr. agr.

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

Produktion biogener Ressourcen (Vorlesung, 4 SWS)

Siebrecht N [L], Siebrecht N

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

General Electives | General Electives

TUM Language Center | TUM Language Center

Module Description

SZ0213: Chinese B1.1 | Chinesisch B1.1

Version of module description: Gültig ab summerterm 2022

Module Level: Bachelor/Master	Language: Language taught	Duration: one semester	Frequency: irregularly
Credits:* 3	Total Hours: 90	Self-study Hours: 60	Contact Hours: 30

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

Description of Examination Method:

In den Prüfungsleistungen werden die in der Modulbeschreibung angegebenen Lernergebnisse geprüft.

Die Klausur beinhaltet Fragen zur Anwendung von Wortschatz und Grammatik, zu Lese- und Hörverstehen sowie Aufgaben zur freien Textproduktion in Schriftzeichen/Pinyin und wird in Form von Präsenzprüfungen oder (Portfolio-)Prüfungsaufgaben abgehalten. Hilfsmittel erlaubt.

Mündliche Reaktionsfähigkeiten werden anhand der Anwendung entsprechender Redemittel in schriftlichen Dialogbeispielen überprüft und/oder in Form einer Audio-/Videodatei. In diesem Fall beachten wir die Datenschutzgrundverordnung (DSGVO, Art. 12 -21).

Repeat Examination:

(Recommended) Prerequisites:

Bestanden Abschlussklausur A2.2 oder gleichwertige Vorkenntnisse

Content:

In diesem Modul erlernen die Studierenden komplexere Grammatikstrukturen. Sie lesen komplexe Texte über spezielle Themen, Landeskunde und Kultur. Die Übungen umfassen Textanalyse und Satzumformulierung.

Intended Learning Outcomes:

Die Studierenden können nach Abschluss komplexe Satzstrukturen verwenden und die richtige Wortwahl treffen. Sie sind in der Lage, über spezielle Themen zu referieren. Sie erreichen das Niveau von HSK 3 (standardisierte chinesische Sprachprüfung).

Teaching and Learning Methods:

Einzelarbeit, Partnerarbeit, Gruppenarbeit, Referate
Hausaufgaben zur Vor- und Nachbearbeitung sind freiwillig und fördern die Beherrschung der Zielsprache.

Media:

Lehrbuch, Übungsblätter, Audio-CD und multimedial gestütztes Lehr- und Lernmaterial

Reading List:

Lehrbuch wird in der Veranstaltung bekanntgegeben

Responsible for Module:

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

Chinesisch B1.1 (Vorlesung, 2 SWS)

Lee M

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

Module Description

SZ0425: English - Introduction to Academic Writing C1 | Englisch - Introduction to Academic Writing C1

Version of module description: Gültig ab summerterm 2022

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

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

Description of Examination Method:

Performance, testing the learning outcomes specified in the module description, is examined by a cumulative portfolio of competence and action-oriented tasks. This includes three writing assignments (each 30%) covering various essay genres such as process description, comparison/contrast, problem/solution, requiring argumentation, persuasion and analysis, as well as a final exam (10%). Students will be graded on their ability to present content clearly and succinctly taking readers' needs and writing conventions into consideration.

As the course may be offered in various formats (online or classroom) the form and conditions of the final exam (with or without aids) will vary. Where audio or video is recorded, we observe the Basic Data Protection Regulation (DSGVO, Art. 12 -21).

Repeat Examination:

(Recommended) Prerequisites:

Ability to begin work at the C1 level of the GER as evidenced by the placement test at www.moodle.tum.de.

Content:

This course will help students learn to express themselves more correctly and persuasively in written English. There will be a focus on forming correct sentences and paragraphs, working towards the production of longer texts of the type students will be expected to write during their academic studies. They will also learn to evaluate and interpret the written texts of others.

Intended Learning Outcomes:

After completion of this module students will be able to write academic texts with greater fluency and accuracy and with fewer grammatical errors. They will be able to engage the rules of composition to construct logical and mature descriptions, explanations, and claims of the sort they will need throughout their academic years and beyond.

Corresponds to C1 of the CER.

Teaching and Learning Methods:

This course makes use of peer group revision (students give each other feedback on their texts), working through multiple drafts, and evaluation of model texts to help students develop their academic writing skills.

Media:

Peer groups, handouts, textbook, online resources.

Reading List:

Handouts and selected extracts from published sources will be used in the course. Key literature will be advised by the teacher and/ or listed in the course description.

Responsible for Module:

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

Englisch - Introduction to Academic Writing C1 (Seminar, 2 SWS)

Field B, Schenk T, Schrier T, Starck S

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

Module Description

SZ0488: English - Gateway to English Master's C1 | Englisch - Gateway to English Master's C1

Version of module description: Gültig ab summerterm 2022

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

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

Description of Examination Method:

Performance, testing the learning outcomes specified in the module description, is examined by a cumulative portfolio of competence and action-oriented tasks. These include multiple drafts of an argumentative research paper (alternatively: two assignments) to allow students to develop written skills by means of a process of drafting and revising texts (50% total), an oral presentation (including a handout and visual aids 25%), and a final written examination (25%). No aids may be used during the examination.

Where audio or video is recorded, we observe the Basic Data Protection Regulation (DSGVO, Art. 12 -21).

Repeat Examination:

(Recommended) Prerequisites:

C1 level according to the online placement test

Content:

This course includes note-taking, discussions, academic writing and presenting a topic on a related field of study focusing on skills such as avoiding plagiarism, ethics, hedging language, and formulating research questions.

Intended Learning Outcomes:

Upon finishing this course you will be able to follow lectures in English with little difficulty and summarize the main ideas. You will be sufficiently comfortable with English as to be able to write longer papers and critical essays in English, making use of general argumentation and rhetorical conventions.

Corresponds to C1 of the CER.

Teaching and Learning Methods:

This course involves practising study situations (participating in seminars, tutorials, note-taking in lectures), pair-work & group-work in an English-speaking academic environment.

Media:

Internet, handouts, online material

Reading List:

Responsible for Module:

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

Englisch - English for Academic Purposes: Gateway to English Master's C1 (Seminar, 2 SWS)
Bhar A, Clark R, Hamzi-Schmidt E, Ritter J, Schrier T, Stapel M, Starck S, Wellershausen N

Englisch - English for Environmental Engineering: Gateway to English Master's C1 (Seminar, 2 SWS)
Clark R

Englisch - English for Geodesy: Gateway to English Master's C1 (Seminar, 2 SWS)
Clark R

Englisch - English for Civil Engineering: Gateway to English Master's C1 (Seminar, 2 SWS)
Clark R

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

Module Description

SZ1201: Spanish A1 | Spanisch A1

Version of module description: Gültig ab summerterm 2022

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

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

Description of Examination Method:

In den Prüfungsleistungen werden die in der Modulbeschreibung angegebenen Lernergebnisse geprüft. Sie beinhalten Aufgaben zur Rezeption (Lese- und Hörverstehen) sowie zur Produktion (Wortschatz und Grammatik sowie freie Textproduktion) und werden in Form von kommunikativen kompetenz- und handlungsorientierten (Portfolio-) Prüfungsaufgaben abgehalten. Hilfsmittel erlaubt. Mündliche Produktion wird anhand der Anwendung entsprechender Redemittel in schriftlichen Dialogbeispielen überprüft und/oder in Form einer Audio-/Videodatei abgehalten. Hierzu beachten wir die Datenschutzgrundverordnung (DSGVO, Art. 12 -21).

Repeat Examination:

(Recommended) Prerequisites:

keine

Content:

In diesem Modul werden Grundkenntnisse in der Fremdsprache Spanisch vermittelt, die es den Studierenden ermöglichen, sich in vertrauten und alltäglichen Grundsituationen trotz noch geringer Sprachkenntnisse zurechtzufinden. Dabei werden interkulturelle und landeskundliche Aspekte berücksichtigt.

Die Studierenden lernen, einfache Fragen zur Person/Familie zu stellen und zu beantworten, Anmeldeformulare mit persönlichen Daten auszufüllen, über Studium, Beruf und Freizeitaktivitäten zu sprechen, Gefallen, Interessen und Vorlieben auszudrücken, Orte zu beschreiben etc. Sie lernen/üben grundlegendes Vokabular zu diesen Themen und berichten in einfach strukturierten Hauptsätzen über Alltägliches im Präsens. Es werden u.a. folgende Themen der Grammatik behandelt: Präsens regelmäßiger und (einige) unregelmäßiger Verben, bestimmte und unbestimmte Artikel, Demonstrativpronomen, Verneinung einfacher Sätze etc.

Es werden Strategien vermittelt, die eine Verständigung in alltäglichen Grundsituationen ermöglichen.

Intended Learning Outcomes:

Das Modul orientiert sich am Niveau A1 „Elementare Sprachverwendung“ des GER.

Der/die Studierende kann nach der Teilnahme an der Modulveranstaltung einfache Fragen über vertraute Themen stellen und beantworten. Er/sie kann sich auf einfache Art verständigen, wenn die Gesprächspartnerinnen oder Gesprächspartner langsam und deutlich sprechen und bereit sind zu helfen. Er/sie kann einfache schriftliche Mitteilungen zur Person machen.

Teaching and Learning Methods:

Das Modul besteht aus einem Seminar, in dem die angestrebten Lerninhalte mit gezielten Hör-, Lese-, Schreib- und Sprechaufgaben in Einzel-, Partner und Gruppenarbeit kommunikativ und handlungsorientiert erarbeitet werden. Durch die Kombination dieser Aufgaben wird die Interaktion mit den Partnern unterstützt und gefordert. Die Studierenden erwerben Teamkompetenz durch kooperatives Handeln in gemischten Gruppen.

Es werden Möglichkeiten aufgezeigt, den Lernprozess in der Fremdsprache Spanisch eigenverantwortlich und effektiver zu gestalten und damit die eigenen Lernfähigkeiten zu verbessern.

Durch kontrolliertes Selbstlernen grundlegender grammatischer Phänomene und Kommunikationsmuster in der Fremdsprache mit vorgegebenen (online-) Materialien werden die im Seminar vermittelten Grundlagen vertieft.

Freiwillige Hausaufgaben (zur Vor- und Nacharbeitung) festigen das Gelernte.

Media:

Lehrbuch; multimedial gestütztes Lehr- und Lernmaterial, auch online.

Reading List:

Lehrbuch (wird in der Lehrveranstaltung bekanntgegeben).

Responsible for Module:

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

Spanisch A1 (Seminar, 2 SWS)

Galan Rodriguez F, Garcia Garcia M, Gonzalez Sainz C, Guerrero Madrid V, Hernandez Zarate M, Lopez Agudo E, Martinez Wahnou A, Rey Pereira C, Rodriguez Garcia M, Tapia Perez T, Zuniga Chinchilla L

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

Bachelor's Thesis | Bachelor's Thesis

Module Description

CS0205: Bachelor's Thesis | Bachelor's Thesis

Version of module description: Gültig ab winterterm 2021/22

Module Level: Bachelor	Language: German/English	Duration: one semester	Frequency: winter/summer semester
Credits:* 12	Total Hours: 360	Self-study Hours: 360	Contact Hours: 0

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

Description of Examination Method:

The Bachelor's Thesis is a final paper with a duration of 3 months, where the students concentrate on a specific topic in business administration and economics. Here the students frame the state of research and discourse and evolves the own specific topic. Based on scientific knowledge and methodical skills, students autonomously describe the topic. The Bachelor's Thesis is supported by a professor of the TUM School of Management.

Repeat Examination:

Next semester

(Recommended) Prerequisites:

The Thesis can be filed after the successful completion of 84 Credits in the basics of business administration and the project study.

Content:

The Bachelor's Thesis focuses on a research topic in business administration and economics, usually at the interface to engineering and natural sciences. The Thesis is always supervised by a professor of TUM School of Management, often in co-operation with an organization of industry or research. The topic of the Thesis is created so that it can be treated extensively within three months.

Intended Learning Outcomes:

At the end of the module "Bachelor's Thesis" students are able to handle and develop a project in an autonomous, systematic and scientific way. Therefore the students deploy scientific knowledge and methodical skills to the specific subject. They script the state-of-the-art knowledge, based on

research, and classify the findings within the scientific and/or practical discussion. The students are able to cope with new and complex subjects in an autonomous way.

Teaching and Learning Methods:

The creation of the thesis encourages the students to deal soundly with a scientific subject. Therefor they apply the knowledge and methodical skills, acquired during the studies, and create an elaborated scientific documentation within the set time frame.

Media:

Literature, presentations

Reading List:

specific literature based on the topic

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](#).

Alphabetical Index

A

[CS0192] Accounting Accounting	23 - 25
[CS0195] Applications in Sustainable Management and Technology Applications in Sustainable Management and Technology	44 - 45

B

Bachelor's Thesis Bachelor's Thesis	107
[CS0205] Bachelor's Thesis Bachelor's Thesis	107 - 108
[WZ1924] Basic Organic Chemistry Grundlagen Organische Chemie [OrgChem]	91 - 92
[CS0027] Behavioral Economics Behavioral Economics	55 - 56
[WI001119] Business Law Business Law [BusLaw]	51 - 52

C

[CS0080] Case Study Seminar in Supply Chain Management Case Study Seminar in Supply Chain Management	63 - 64
[WZ1929] Cell Biology and Microbiology Zell- und Mikrobiologie [MiBi]	93 - 94
[SZ0213] Chinese B1.1 Chinesisch B1.1	99 - 100
[CS0073] Circular Economy Circular Economy [CEC]	36 - 38
[CS0203] Communication Skills Communication Skills	48 - 50
[CS0180] Concepts of Physics and Chemistry in Nature Concepts of Physics and Chemistry in Nature	83 - 84
[CS0226] Corporate Strategy Corporate Strategy	71 - 72

E

Electives in Engineering and Natural Sciences Electives in Engineering and Natural Sciences	77
Electives in Management and Technology Electives in Management and Technology	53
Elective Modules Elective Modules	53
[CS0202] Empirical Research Methods Empirical Research Methods	39 - 41
[SZ0488] English - Gateway to English Master's C1 Englisch - Gateway to English Master's C1	103 - 104

[SZ0425] English - Introduction to Academic Writing C1 Englisch - Introduction to Academic Writing C1	101 - 102
[CS0064] Environmental Management Environmental Management [EM]	59 - 60
[CS0213] Environmental Resources in a Changing World Environmental Resources in a Changing World	85 - 86

F

[CS0001] Foundations of Programming Foundations of Programming	29 - 30
[CS0193] Foundations of Sustainable, Entrepreneurial & Ethical Business Foundations of Sustainable, Entrepreneurial & Ethical Business	9 - 11
[CS0065] Fundamentals of Thermodynamics Grundlagen Thermodynamik	77 - 78

G

[CS0220] General Chemistry Allgemeine Chemie [Chem]	87 - 88
General Electives General Electives	99
[WZ1978] Green Chemistry Green Chemistry	95 - 96
[CS0198] Green Marketing and Innovation Management Green Marketing and Innovation Management	33 - 35

I

[CS0005] Introduction to Development Economics Introduction to Development Economics	53 - 54
[CS0066] Introduction to Process Engineering Introduction to Process Engineering	79 - 80

M

[CS0067] Macroeconomics Macroeconomics [Macro I]	16 - 17
[CS0075] Management Science Management Science	7 - 8
[CS0248] Markets for Renewable Energies and Biobased Products Märkte für erneuerbare Energien und biobasierte Produkte	75 - 76
[CS0071] Material Flow Analysis and Life Cycle Assessment Material Flow Analysis and Life Cycle Assessment [MFA&LCA]	20 - 22

[CS0194] Mathematics Mathematics	12 - 13
[CS0127] Methods for Evidence Based Policy and Management Methods for Evidence Based Policy and Management	67 - 68
[CS0063] Microeconomics Microeconomics [Micro I]	5 - 6
[CS0081] Modelling and Optimization Modelling and Optimization	46 - 47

P

[WZ1600] Physics Physik [Phys]	89 - 90
[CS0072] Policy and Innovation Policy and Innovation	61 - 62
[CS0246] Practical Research Experience Practical Research Experience	73 - 74
[WZ1980] Production of Biogenic Resources Produktion biogener Ressourcen	97 - 98
[CS0204] Project Studies Project Studies	42 - 43

R

Required Modules Required Modules	5
--	---

S

[CS0061] Seminar in Behavioral Economics Seminar in Behavioral Economics	57 - 58
[CS0158] Seminar in Innovation and Technology Management Seminar in Innovation and Technology Management	69 - 70
[SZ1201] Spanish A1 Spanisch A1	105 - 106
[CS0199] Statistics Statistics	14 - 15
[CS0200] Strategic and International Management & Organizational Behavior Strategic and International Management & Organizational Behavior	26 - 28
[CS0082] Supply Chain Simulation Supply Chain Simulation	65 - 66
[CS0197] Sustainable Investment and Financial Management Sustainable Investment and Financial Management	31 - 32
[CS0196] Sustainable Operations Sustainable Operations	18 - 19

T

TUM Language Center | TUM Language Center

99

W

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

81 - 82