TUM School of Management
Technische Universität München

Module Catalog

M.Sc. Finance and Information Management (FIM)
TUM School of Management
Technische Universität München

www.tum.de/
www.mgt.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 66

Required Modules | Pflichtmodule

Students must successfully complete 12 credits from the following required modules.

Module Description

WI001271: Entrepreneurship | Entrepreneurship

Version of module description: Gültig ab winterterm 2020/21

Module Level: Master	**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 examination consists of several exam courses (Prüfungsparcour). A semester-long project work, which ends in the delivery of a business plan and in a presentation. The presentation includes a prototype-demo of the developed product or service and a reflection on how innovative entrepreneurs from the guest lectures lead high-tech organizations. Through the projectwork, it is assessed how well the participants can identify and implement business opportunities. In teams students recognize the needs and demands of the customers. Through customer feedback, field interviews and contextual observations they synthesize the identified needs to translate them into clear and significant customer benefits. Students develope business models to learn how to bring the idea to the market and position the business with respect to competition. They learn the systematic and iterativ approach of the Business Design for business model, team and technology development.
Specifically with the examination deliverables, the participants demonstrate to what extent they have developed the following competences:
- In their business plan participants formulate in a concise and structured way how they developed an understanding about the actual customers and markets for their business idea.
- In their pitch presentation participants present their business idea before a jury of experts. The presentation includes a demo of the prototype for the developed product or service and a refelction on how innovative entrepreneurs lead high-tech organizations.
Grading:
- 30% Prototype: As close to functional prototype as possible, must be interactive
- 30% Business plan read deck of 7 to 10 slides
- 40% 8-minute Pitch Presentation

Repeat Examination:
Next semester

(Recommended) Prerequisites:
- Knowledge: No special requirements, willingness to participate
- Abilities: Identifying opportunities; team work; communication; commitment; reliability; proactiveness
- Skills: openness; analytical thinking; visual thinking; self-motivation; networking

Content:
In a creative atmosphere, the participants learn to think through and present a business idea in the structured form of
a business plan in order to solve a customer problem. For that purpose, fundamental chapters of a business plan are
developed. Participants will network with people from the entrepreneurial environment of TUM, i.e. as they connect with the guest lecturers.
The matter is developed in the following steps:
- The fundamentals of innovation
- Overview: Developing a business plan
- Consumer and consumer value
- Business model
- Assessment of business ideas
- Market & competition
- Pitching business ideas
- Presentation practice: customer, customer value, market USP
- Forming powerful business teams
- Protection of intellectual property
- selected sessions from guest lecturers

Intended Learning Outcomes:
At the end of the seminar the students will be able to:
- understand the difference between idea, invention, and innovation;
- understand the use of an iterative approach in the development of business opportunities;
- evaluate opportunities for business ideas and apply business concepts by prototyping, e.g. with the help of a
business plan;
- evaluate business ideas and identify business opportunities;
- segment markets and analyze potential niche markets;
- evaluate own business idea with the help of customer feedback, observations from stakeholders, and interviews;
- identify a real customer problem and create customer benefit with ideas for a solution.
- understand effectual entrepreneurship;
- understand basic economic terms, such as Intellectual Property, Cashflow, Venture Capital, Controlling;
- understand Design Thinking methodology;
Moreover through guest speakers' lectures participants will be empowered to:

- realize opportunities and challenges associated with the founding and managing of technology- and growth-oriented
companies;

Teaching and Learning Methods:
The module is held in seminar-style: The lecturers are entrepreneurs, serial founders, coaches, and former managing directors.
- Interdisciplinarity: Participants form cross-disciplinary teams to ensure a balanced mix of expertise and skills in the
team.
- Action-based learning: All participants are encouraged to be proactive and to learn through experience.
- Learning by doing: Each team develops a real business idea or one chosen for the seminar. Particular attention is
paid to truly understanding the customer, for example, by interviews, observation, or expert discussion.
- Prototyping: Using simple prototypes, the teams develop their business idea and make them tangible.
- Online Networking: The work in the seminar is accompanied by online tools to support the team-building and to generate ideas. The seminar is also accompanied by guest lectures of outstanding founders, entrepreneurs, managers, or investors.
- Elevator Pitch Training: Through the practice of elevator pitches, participants develop skills for short and effective presentation of their business ideas.
- Presentation Training: Each team presents and defends their business idea twice before an expert-jury and receives feedback on presentation style and content.

Media:
- Videos
- Slides
- Handouts (distributed online)
- Case studies
- Intranet
- Online Project Pool
- Online discussion forum (e.g., for questions and feedback on guest lectures)

Reading List:
- Timmons, Jeffry A. / Spinelli, Stephen (2009): New Venture Creation,7thedition, McGraw Hill Professional
- Horowitz, Ben (2014): The Hard thing About Hard Things, HarperBusiness
- Kawasaki, Guy (2004): The Art of the Start, Penguin Publishing Group
- Moore, Geoffrey A. (2002).: Crossing the Chasm, HarperCollins
- Osterwalder, Alexander / Pigneur, Yves (2010): Business Model Generation: A Handbook for Visionaries, Game

Changers, and Challengers, John Wiley & Sons
- Ries, Eric (2011): The Lean Startup, Penguin Books Limited
- Thiel, Peter (2014): Zero to One: Notes on Startups, or How to Build the Future, Crown Business
- Read, S., Sarasvathy, S., Dew, N., Wiltbank, R., & Ohlsson, A. V. (2011). Effectual Entrepreneurship. Taylor & Francis (Part 1, S.1-70)
- Schönenberger, Helmut (2006): Kommunikation von Unternehmertum. Eine explorative Untersuchung im universitären Umfeld. Deutscher Universitätsverlag, Wiesbaden.
- Münchener Business Plan WEttbewerb: Der optimale Businessplan, München

Responsible for Module:
Bücken, Oliver; Dipl.-Kfm. (Univ.)

Courses (Type of course, Weekly hours per semester), Instructor:
Geschäftsidee und Markt - Businessplan-Grundlagenseminar (WI000159) (Seminar, 2 SWS)
Heyde F [L], Heyde F

Innovative Entrepreneurs - Leadership of High-Tech Companies (WI000285) (Vorlesung, 2 SWS)
Schönenberger H [L], Schönenberger H
For further information in this module, please click campus.tum.de or here.

Module Description

WI001287: Basics of FIM | Basics of FIM

Version of module description: Gültig ab winterterm 2020/21

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

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

Description of Examination Method:
The module examination is based on a written exam (60 min). Students have to show their understanding of the core concepts being presented within the different courses. Students have to prove their understanding of the quantitative methods being part of the lectures. The exam might also include calculations.

Repeat Examination:
End of Semester

(Recommended) Prerequisites:

Content:
Basics of Finance, financial management as key function of corporations, core methods of value- and risk management, impact of long- and short-term orientation in corporate management, impact of financial decisions on customers, employees and the society, static and dynamic concepts of investment analysis, management of interest rate risks in investment decisions, basics of securities analysis and portfolio theory, asset allocation, portfolio selection theory and options, concepts of probability calculation, stochastic processes in discrete and continuous time (random walk, Poisson processes, arithmetic and (geometric) Brownian motion).
Basic principles of Information Systems and their use in Businesses, basics of programming and software engineering (Java, SQL).

Intended Learning Outcomes:
After finishing this module Students will recognize the basics of financial management, business process management, value management and risk management. They will be aware of the importance of the corresponding functions in companies and of the impact of the decisions from these functions on customers, employees and the society. Students will understand the basics

of interest rates and financial products such as equity, bonds and options and how favorable portfolios can be composed of financial products. They will be able to demonstrate the basic stochastic processes which are used to model financial products. They are able to analyze the role of business information systems for companies.

Teaching and Learning Methods:
The courses within the module consist of lectures with integrated tutorials. The topics of the lectures are presented via slides. Students are strongly recommended to prepare exercise sheets at home in order to understand and reflect the topics which are part of the courses.

Media:
Presentation slides, lecture notes, scientific papers, white board, exercise sheets, case studies, software tools

Reading List:
Berk Jonathan, DeMarzo Peter (2020): Corporate Finance.
Klebaner, Fima C. (2012): Introduction to Stochastic Calculus with Applications
Karatzas, Ioannis, Shreve, Steven: Brownian Motion and Stochastic Calculus
vom Brocke J, Rosemann M (2015) Handbook on Business Process Management 1: Introduction, Methods, and Information Systems. 2. Aufl., Springer, Berlin
Dumas M, La Rosa M, Mendling J, Reijers HA (2018) Fundamentals of Business Process Management. Springer, Berlin

Responsible for Module:
Loos, Benjamin; Prof. Dr. rer. pol.

Courses (Type of course, Weekly hours per semester), Instructor:
Investment & Financing (FIM) (WI001287) (Vorlesung, 2 SWS)
Nardini M, Bayer C, Braun R, Egger A, van Dun C, Wagon F

Business & Information Systems Engineering (FIM) (WI001287) (Vorlesung, 2 SWS)
Röglinger M, van Dun C, Bayer C, Egger A, Wagon F

Stochastic Processes (FIM) (WI001287) (Vorlesung, 2 SWS)
Zagst R, Rauscher M, Bayer C, Egger A, van Dun C, Wagon F
For further information in this module, please click campus.tum.de or here.

Core area | Kernbereich

At least 48 credits must be selected from the core area within the framework of the elective modules. These examination credits can be partially completed at the University of Bayreuth. These modules are accordingly assigned a module number beginning with the abbreviation WIBT. The applicable elective module catalog will be announced by the Faculty of Business and Economics in a suitable manner in good time before the start of lectures.

Module Description

WI000234: Value-based Management | Value-based Management

Version of module description: Gültig ab summerterm 2017

Module Level: 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:
The examination is a written and marked exam (120 minutes) in which only a non-programmable calculator is allowed. The purpose of the exam is to verify the provided theoretical competences. By exemplary business situation or compensation schemes, the students prove that they can test and evaluate the suitability of certain instruments of value-based management. In concrete cases, students are asked to apply the concept of residual income and potential accounting adjustments, to calculate important key indicators of value-based management and to show relationships between them and their effects in incentive schemes. The students are supposed to realize occurring problems and to suggest solutions.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Basic lectures in external accounting, Controlling, investment and financing

Content:
This module covers the different aspects of implementing value-based management in a company. The focus of the course lies on the concept of residual income as corporate and business unit performance measure:
-Calculation of Economic Value Added (EVA) as the prevailing residual income measure in practice including the most relevant accounting adjustments and their calculation.
- Introduction to the problems and proposed solutions of calculating the cost of capital.
- Discussion of the suitability of residual income as a goal congruent performance measure.
- Design of compensation schedules to achieve the different and sometimes conflicting goals of management compensation: alignment, wealth leverage, retention and minimizing shareholders' cost of compensation.

- Diverse means of compensation, like stock options and bonus plans incl. different payout rules and bonus banks, are taken into consideration.
- Implementation of a company's performance measurement system using financial and non-financial value drivers.

Intended Learning Outcomes:
The learning outcomes of this module are: (1) students will be able to remember and understand the concept of residual income and value creation; (2) they will be able to analyze accounting problems and problems related to incentives (compensation components and basis of assessment); (3) they will be able to apply the newly acquired knowledge to solve these problems when designing and implementing value-based management for a company; (4) Therefore, students evaluate different goals of management compensation and identify the suitability of different tools such as employee stocks, stock options, the residual income with different accounting adjustments as a performance measure or the application of a bonus bank.

Teaching and Learning Methods:
The module consists of a lecture and an exercise course. During the lectures the contents are delivered by presentations and discussions. In the exercise course the students apply the acquired knowledge in solving exercises and implementing case studies. As a preparation of the exercise courses, students solve exercises and the solutions are presented and discussed during the exercise courses. Some exercises are solved in groups or individually and subsequently discussed in the exercise course.

Media:
Presentations, text books, lecture notes, exercises, case studies

Reading List:
Young, S. David and O'Byrne, Stephen F.: EVA and Value-Based Management: A Practical Guide to Implementation, New York et al. 2001.

Further recommendations given in lecture.

Responsible for Module:
Friedl, Gunther; Prof. Dr.

Courses (Type of course, Weekly hours per semester), Instructor:
Value-based Management (Vorlesung), 2 SWS
Value-based Management (Übung), 2 SWS
Professor Gunther Friedl
Peter Schäfer
For further information in this module, please click campus.tum.de or here.

Module Description

IN2028: Business Analytics and Machine Learning | Business Analytics and Machine Learning

Version of module description: Gültig ab summerterm 2021

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

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

Description of Examination Method:
The examination takes the form of a written 90 minutes test, in which students solve problems to prove they understand the functioning of various methods and their assumptions. Participants demonstrate their ability to interpret the results of different statistical processes and to evaluate their model quality in the exercises. The correct responses require the independent construction of analytical solutions with the help of techniques learned in the module.

Repeat Examination:
End of Semester

(Recommended) Prerequisites:
MA0901 Linear Algebra for Informatics, MA0902 Analysis for Informatics, IN0018 Discrete Probability Theory or MA9712 Statistics for Business Administration

Content:
Regression Analysis, Regression Diagnostics, Generalized Linear Models, Naïve Bayes, Decision Tree Classifiers, Data Preparation, Causal Inference, Model Selection, Ensemble Methods, Clustering, High-Dimensional Problems, Neural Networks, Convex Optimization

Intended Learning Outcomes:
After successful completion of the module students are familiarized with common methods of classification, numerical prediction and clustering. They know the assumptions of these processes and understand their functioning, as well as their typical operational applications. Participants are able to analyze data sets with the programming language R and can interpret the results of these analyses.

Teaching and Learning Methods:
The module consists of a lecture and a content-aligned tutorial. The lecturer presents the content of the module, parts of the corresponding literature and application examples from practice interactively. Students are accustomed with the statistical and machine learning methods and learn to differentiate their usage. In the tutorial participants solve exercises in supervised work and evaluate the respective techniques. In addition, they practice to solve common problems by working with data in teamwork together with their tutor. Students learn to develop their own, data-based solutions. Participants particularly train their technical abilities with programming environments such as R or Python.

Media:
Script, exercise sheets, PowerPoint, PC and E-Learning platform

Reading List:
- Trevor Hastie, Jerome Friedman, Robert Tibshirani: Elements of Statistical Learning, Springer.
- Ian Witten, Eibe Frank, Mark Hall, Christopher Pal: Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kauffman.
- James H. Stock and Mark W. Watson: Introduction to Econometrics, Pearson Education.
- Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani: An Introduction to Statistical Learning, Springer.

Responsible for Module:
Bichler, Martin; Prof. Dr.

Courses (Type of course, Weekly hours per semester), Instructor:
Business Analytics and Machine Learning (IN2028) (Vorlesung, 2 SWS)
Bichler M

Übungen zu Business Analytics and Machine Learning (IN2028) (Übung, 2 SWS)
Bichler M [L], Boschko D, Ewert M, Knörr J, Kohring N
For further information in this module, please click campus.tum.de or here.

Module Description

MA9972: Discrete Time Finance (FIM) | Discrete Time Finance (FIM)

Version of module description: Gültig ab winterterm 2020/21

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

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

Description of Examination Method:
The module examination is based on a written exam (90 minutes). By answering questions in text form, students have to show their understanding of the concepts of discrete-time mathematical modeling of financial markets and their capability to apply these concepts. They have to analyze mathematical models of financial markets and solve given problems. Students have to determine whether markets contain arbitrage, replicate and price given financial derivatives and develop hedging strategies. The questions may include mathematical proofs and calculations.

Repeat Examination:

(Recommended) Prerequisites:
Knowledge in Optimization and Stochastic Processes

Content:
Single-Period Financial Markets, Multi-Period Financial Markets, Absence of Arbitrage and Completeness, The Binomial or Cox-Ross-Rubinstein Model, Pricing of Contingent Claims

Intended Learning Outcomes:
At the end of the module students are able to understand the fundamentals of mathematical finance in discrete time. They understand the principles of arbitrage theory and are able to price financial derivatives and hedge against their risk in single- as well as multi-period financial markets.

Teaching and Learning Methods:
The module consists of the lecture supplemented by an exercise session. The lecture material is presented with slide presentations and mathematical proofs are presented on the blackboard. The students are encouraged to study course references and course subjects. The exercise session consists of theoretical and computer-oriented exercises. In the theoretical exercises students

will work under instructor assistance on assignments, sometimes in teamwork. In computer-oriented exercises students simulate price processes of financial assets and determine the prices of derivatives. The exercises contribute to a better understanding of the lecture materials.

Media:
presentation slides, white board

Reading List:
S.R. Pliska: Introduction to Mathematical Finance: Discrete Time Models, Blackwell Publishers Inc., 2000.
Shreve, S.E.: Stochastic calculus for Finance I: The Binomial Asset Pricing Model. Springer Finance, 2004. N.H. Bingham und R. Kiesel: Risk-Neutral Valuation: Pricing and Hedging Financial Derivatives, Springer Finance, 2004.
J.C. Hull: „Optionen, Futures, und andere Derivative“, Pearson Studium, 2006
J.C. Hull: Options, Futures, and Other Derivatives, Prentice-Hall, 2006.
P. Wilmott: Quantitative Finance, John Wiley & Sons, 2001.

Responsible for Module:
Zagst, Rudi; Prof. Dr.

Courses (Type of course, Weekly hours per semester), Instructor:
Discrete Time Finance (FIM) [MA9972] (Vorlesung, 2 SWS)
Zagst R, Bayer C, Wahl M

Exercises for Discrete Time Finance (FIM) [MA9972] (Übung, 2 SWS)
Zagst R, Wahl M, Bayer C
For further information in this module, please click campus.tum.de or here.

Module Description

MA9973: Continuous Time Finance (FIM) | Continuous Time Finance (FIM)

Version of module description: Gültig ab winterterm 2020/21

Module Level: 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:
The module examination is based on a written exam (90 minutes). By answering questions in text form, students have to show their understanding of the concepts of continuous-time mathematical modeling of financial markets and their knowledge of the properties of important models. By doing calculations and mathematical proofs, students have to demonstrate their ability to practically work with the mathematical objects presented in the course and apply these mathematical objects to solve financial problems like pricing and hedging of derivatives. They have to discuss numerical methods for simulation, pricing and hedging. (If there are only few participants, an oral examination might be held instead of a written exam).

Repeat Examination:

(Recommended) Prerequisites:
MA9972 - Discrete Time Finance
Knowledge in Stochastic Processes recommended

Content:
Stochastic processes, Itô calculus, financial markets, arbitrage and completeness, pricing and hedging of contingent claims, Black-Scholes model and generalizations, pricing of exotic options, stochastic volatility and jump models, numerical methods (Monte Carlo simulation, Fourier pricing, etc.)

Intended Learning Outcomes:
After successful completion of the module, students are aware of the foundations of Itô-calculus and can apply mathematical theorems like the Girsanov, Lévy, and Radon-Nikodym theorems. They are able to understand the theoretical background of financial models in continuous time,

including the notion of no-arbitrage, completeness, and the risk neutral valuation principle. Within the seminal model of Black and Scholes (and its generalization) for the description of stock prices, students are able to analyze financial markets for arbitrage opportunities and completeness; they are also able to price derivatives such as European options and to determine hedging strategies. Moreover, students know about more advanced modeling approaches, including their advantages and disadvantages, and understand the necessary numerical methods for working with these. Students are also able to implement numerical methods in a programming software like Matlab or R.

Teaching and Learning Methods:
Lectures with slide presentations and mathematical proofs on the blackboard, exercise sheets with problems for preparation in homework, tutorials for discussion of solutions to exercise sheets, computer based programming tutorials in which students implement numerical methods (instructor assisted).

Media:
Presentation slides, whiteboard, assignment sheets, programming software like Matlab or R

Reading List:
R. Zagst: Interest Rate Management, Springer Finance, 2002.
N.H. Bingham und R. Kiesel: Risk-Neutral Valuation: Pricing and Hedging Financial Derivatives, Springer Finance,2004.
S.E. Shreve: Stochastic Calculus for Finance II: Continuous-Time Models, Springer Finance, 2004.
J.C. Hull: Options, Futures, and Other Derivatives, Prentice-Hall, 2006.
M. Musiela und M. Rutkowski: Martingale Methods in Financial Modelling, Vol. 36, Springer, 2005.

Responsible for Module:
Zagst, Rudi; Prof. Dr.

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

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

Module Description

WIBT0001: Business Process Management & Digital Innovation | Business Process Management & Digital Innovation

Version of module description: Gültig ab winterterm 2020/21

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

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

Description of Examination Method:
The module examination is based on an oral exam of at least 20 min per student. By answering questions in oral form, students have to show their understanding of the core concepts of Digital Innovation and Business Process Management as well as their knowledge of the scientific papers discussed in the lecture. Moreover, students must be able to report on their own insights from applying software tools in the tutorials. The oral examination will typically be for groups of three students at the same time in order for the students to show their ability to use technical terms correctly in an academic discussion.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
none

Content:
Students are engaged in selected core concepts of Digital Innovation (e.g., Design Thinking, Value Proposition Design, Business Model Development), Business Process Management (e.g., Process Mining, Process Digitalization, Ambidextrous Business Process Management, Customer-Centric Process Improvement) as well as boundary-spanning topics (e.g., digital innovation processes, stage gate process). The topics may slightly change per semester in line with current research topics.

Intended Learning Outcomes:
The module examination is based on an oral exam of at least 20 min per student. By answering questions in oral form, students have to show their understanding of the core concepts of Digital Innovation and Business Process Management as well as their knowledge of the scientific papers

discussed in the lecture. Moreover, students must be able to report on their own insights from applying software tools in the tutorials. The oral examination will typically be for groups of three students at the same time in order for the students to show their ability to use technical terms correctly in an academic discussion.

Teaching and Learning Methods:
The module consists of a lecture with integrated tutorials. The topics of the lecture are presented via slides. In order to have the students deal in more depths with the topics, these are critically discussed in the group on a regular basis. At the same time, selected scientific papers are discussed together with the students. The scientific papers must be prepared by the students for such discussions according to predefined questions. Within the tutorials, the solutions to exercise sheets are developed in close cooperation with the lecturers. The exercise sheets contain mathematical exercises and case studies. Furthermore, software tools, e.g., for process mining are introduced by the lecturers and applied by the students in the context of the case studies.

Media:
Presentation slides, lecture notes, scientific papers, exercise sheets, case studies, software tools

Reading List:
Ciriello, R.F., Richter, A., Schwabe, G., 2018. Digital Innovation. Business & Information Systems Engineering 60 (6), 563–569. https://doi.org/10.1007/s12599-018-0559-8.
vom Brocke J, Rosemann M (2015) Handbook on Business Process Management 1 + 2, 2. Aufl., Springer, Heidelberg
Kerpedzhiev, G.D., König, U.M., Röglinger, M. and Rosemann, M., 2020. An exploration into future business process management capabilities in view of digitalization. Business & Information Systems Engineering, pp.1-14.

Responsible for Module:
Maximilian Röglinger

Courses (Type of course, Weekly hours per semester), Instructor:
Business Process Management & Digital Innovation (FIM) (WIBT0001) (Vorlesung mit integrierten Übungen, 4 SWS)
Röglinger M, Oberländer A, Buck C, Bayer C
For further information in this module, please click campus.tum.de or here.

Module Description

WIBT0002: Digital Energy Management | Digital Energy Management

Version of module description: Gültig ab winterterm 2020/21

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

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

Description of Examination Method:
The module examination is based on a 90 minutes written exam. The written exam may be replaced by an oral examination, however, if the number of participants is low. By answering questions in written form, students show their understanding of the role of information systems for today's and future's energy system, and hence, of exemplary concepts and approaches in the areas of smart markets, smart grid, smart factory, smart mobility, and smart home. By doing calculations, students demonstrate their ability to work with and apply the mathematical methods presented during the lectures and the tutorials. They must also discuss the presented concepts and approaches. Students can bring a non-programmable and non-finance calculator, and two self-prepared (hand- or machine-written) double-sided DIN-A4 sheets with notes (i.e., in total four pages with notes). Papers discussed in class can be brought to the exam as long as they do not contain any notes (highlights are allowed).

Repeat Examination:
Next semester

(Recommended) Prerequisites:

Content:
In the first part of the module, students learn about physical and technical basics of energy supply, energy transmission, and energy demand. Moreover, the module addresses the basics of sustainable electricity markets and relevant sectors, e.g., mobility. In the second part of the module, students learn and discuss how digital technologies can help overcome challenges of modern energy systems, for example, the highly relevant topics of a low-carbon energy transition or lowering CO2 emissions. The lecture presents insights from various energy-related areas, e.g., smart markets, smart grid, smart factory, smart mobility, and smart home.

Intended Learning Outcomes:
Students understand the key challenges of low-carbon energy transitions. Moreover, they know potential solutions that digital technologies and information systems can offer for these challenges. Based on this knowledge, students can evaluate and classify basic techno-economic issues in the context of energy management. Besides lecture-style teaching, we use interactive elements such as discussions of current digital trends, joint analysis of scientific papers, and exercises. Students thus not only acquire theoretical knowledge but also gain practically relevant qualifications.
The lecture prepares students for jobs in strategic IT management, energy management, consulting, research or business model development, energy-start-ups, utilities, and energy-related companies.

Teaching and Learning Methods:
The course consists of lectures and complementary, interactive tutorials. Exercises are available online before each tutorial, and we develop solutions collaboratively with the students during the tutorials. However, students should prepare for the exercises in advance to identify questions and to allow for detailed discussions of the identified issues. In the lectures, we discuss topics from a scientific and often quantitative perspective. Students should thus have a basic understanding of mathematical and statistical models. They should also be willing to follow mathematical reasoning and comprehend quantitative research papers. Moreover, we present different approaches and methods to assess various real-world problems and show how scientific results can inform real-world decision-makers.

Media:
presentation, lecture notes, excersises, moodle

Reading List:
Goebel C, Jacobsen H-A, del Razo V, Doblander C, Rivera J, Ilg J, Flath C, Schmeck H, Weinhardt C, Pathmaperuma D, Appelrath H-J, Sonnenschein M, Lehnhoff S, Kramer O, Staake T, Fleisch E, Neumann D, Strüker J, Erek K, Zarnekow R, Ziekow H, Lässig J (2014) Energy Informatics. Bus Inf Syst Eng 6:25–31
Watson RT, Boudreau MC, Chen AJ (2010) Information Systems and Environmentally Sustainable Development: Energy Informatics and New Directions for the IS Community. MIS Quarterly 34:23–38

Responsible for Module:
Jens Strüker

Courses (Type of course, Weekly hours per semester), Instructor:
Digital Energy Management (FIM) (WIBT0002) - Exercise (Übung, 2 SWS)
Wagon F, Bayer C

Digital Energy Management (FIM) (WIBT0002) (Vorlesung, 2 SWS)
Weibelzahl M, Wagon F, Strüker J, Körner M, Bayer C
For further information in this module, please click campus.tum.de or here.

Module Description

WIBT0003: Digital Disruption, Innovation and Transformation | Digital Disruption, Innovation and Transformation

Version of module description: Gültig ab winterterm 2020/21

Module Level: 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:
The module's examination consists of a group presentation and a term paper. Concerning the group presentation, the students have to present their findings, followed by a discussion. The presentation has to be didactically well-structured and must focus on the students' core findings. The students moderate their discussion and must answer questions by the audience (i.e., the lecturers, advisors, and other seminar groups). Students must also actively participate in the discussions moderated by other seminar groups. The assessment considers both the group-wise and the individual performance of the examinees. Thereby, the students have to demonstrate their ability to collaborate in a goal-oriented manner, create structured presentations, and present the content of these presentations in oral form. By writing the term paper, students have to show their understanding of the research problem and their ability to develop and discuss innovative solutions. They have to demonstrate their academic writing skills and their ability to present academically advanced ideas clearly and concisely.

Repeat Examination:
Next semester

(Recommended) Prerequisites:

Content:
The seminar focuses on current research topics in digitalization that are relevant from both an industry and an academic perspective. As particular sub-topics of the broad field “digitalization”, the seminar focuses on Business Process Management, Customer Relationship Management, Strategic IT Management, Energy and Critical Infrastructures, Digital Life, IT-supported Financial Management, IT-Security and Data Protection, and Innovation Management. The concrete topics

of the seminar can differ each year and are published separately before the seminar using a structured topic template.

Intended Learning Outcomes:
After a successful completion of the module, students are able to develop innovative solutions to demanding research problems in digitalization in a goal oriented, structured, and self-dependent manner. Moreover, students have advanced their skills related to academic writing, presentation of research results, and teamwork.

Teaching and Learning Methods:
The students have to work on the given topic both in their group and in close collaboration with the advisor. To do so, the students read related work, create own ideas, and prepare these ideas for the presentation with the advisor. The advisor provides the students repeated feedback and provides guidance on the directions in which the students' ideas should be further developed. Approaching an academic and/or practical question in teams and developing an own approach enables students to evaluate existing approaches and analyze strengths and weaknesses to create own academic ideas in an interdisciplinary team.

Media:
Presentations, term paper

Reading List:
The literature depends on the concrete seminar topics.

Responsible for Module:
Maximilian Röglinger

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

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

Module Description

WI001267: Advanced Corporate Finance | Advanced Corporate Finance

Version of module description: Gültig ab winterterm 2020/21

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

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

Description of Examination Method:
At the end of the course there will be closed#book final exam. Duration of the exam will be 60 min. This exam consists of theoretical questions regarding advanced concepts in corporate finance. Students will have to evaluate and apply common concepts and techniques used in corporate finance.
The exam questions will be in English. Students can choose to answer them in German or English.The course grade will be based on the final exam only.

Repeat Examination:
Next semester

(Recommended) Prerequisites:

Content:
• Real options: Identification and binomial pricing
• Valuation: Valuation theorems, introduction to DCF methods, multiples methods and applications
• Raising Capital: Empirical studies of IPO costs, IPO process, SEOs
• Capital structure: WACC under OPM, CAPM and MM, trade#off theory of debt, agency theory of debt,
pecking#order theory of debt
• Dividend policy: Theories of optimal dividend policy, Empirical evidence
• M&A: Explanations of wealth effects of M&A, explanations for conglomerates, Empirical results on
other forms of ownership decreases and change (divestitures, carve#outs, spin#offs, tracking stock,
split#ups, LBOs)

Intended Learning Outcomes:
The aim of the course is to introduce students to advanced concepts in corporate finance. At the end of the course students will be able to evaluate the most common concepts and techniques used in corporate finance.
Students will be able to identify real options and apply valuation theorems. They will analyse the process of raising capital and evaluate capital structure. Finally, they will be able to assess dividend policy and judge M&A processes.

Teaching and Learning Methods:
lecture and exercises are offered

Media:
Slides and videos for lecture and exercise

Reading List:
• Required: Berk / deMarzo, Corporate Finance (5th ed.)
• Further recommended readings are given in the lecture.

Responsible for Module:
Kaserer, Christoph; Prof. Dr. rer. pol. habil.

Courses (Type of course, Weekly hours per semester), Instructor:
Advanced Corporate Finance (FIM) - Exercise (WI001267) (Übung, 2 SWS)
Cehajic A, Bayer C

Advanced Corporate Finance (FIM) - Lecture (WI001267) (Vorlesung, 2 SWS)
Momtaz P, Bayer C
For further information in this module, please click campus.tum.de or here.

Module Description

WI001268: Venture Capital | Venture Capital

Version of module description: Gültig ab winterterm 2020/21

Module Level: 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:
Examination is fully based on one written exam (2 hours). The exam proofs students' knowledge and understanding of the entrepreneurial process, the various sources of financing, the business model of Venture Capital firms. Furthermore, the exam test students ability to use and critically analyze different valuation and calculation approaches. Students are allowed to use a non-programmable calculator during the exam.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
None

Content:
The module consists of a lecture as well as case studies and (excel) calculation sessions (exercises). During the lecture the contents are delivered via presentations and talks. The students are inspired to improve the acquired knowledge by studying the suggested literature. During the exercises students apply the acquired knowledge.

Intended Learning Outcomes:
After having successfully finished this module, students (1) can recall the venture capital business model. Furthermore, students (2) can evaluate the potentially attractive investment opportunities for venture capital firms. They are able (3) to analyze and (4) forecast financial key performance indicators, which prepares them for working in the equity investment industry, in particular as growth companies’ stocks equity analyst or in a venture capital or private equity firm.

Teaching and Learning Methods:
The module consists of a lecture as well as case studies and (excel) calculation sessions (exercises). During the lecture the contents are delivered via presentations and talks. The students are inspired to improve the acquired knowledge by studying the suggested literature. During the exercises students apply the acquired knowledge.

Media:

Reading List:
Feld, B. / Mendelson, J. (2016): Venture Deals. Wiley. Ramsinghani, M. (2014): The Business of Venture Capital, Wiley

Responsible for Module:
Braun, Reiner; Prof. Dr. rer. oec.

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

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

Module Description

WI001269: International Accounting | International Accounting

For students in the FIM Master

Version of module description: Gültig ab winterterm 2020/21

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 6	**Total Hours:** 180	**Self-study Hours:** 150	**Contact Hours:** 30

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

Description of Examination Method:
The examination consists of a written exam (60 min, multiple choice), in which students demonstrate that they are able to evaluate the practical application of various international accounting standards according to IFRS and that they are able to conduct financial statement analyses.
In addition, students have the option to give a short talk of 10 minutes to improve their grade by up to 0,3 grade points. They have to present a viable research idea in the area of accounting and disclosure.

Repeat Examination:
Next semester

(Recommended) Prerequisites:

Content:
The course covers the following topics:
- theoretical foundations of accounting and disclosure
- main institutions involved in accounting
- reporting formats and parts of the financial statements
- financial statement analysis
- reporting unit and consolidations
- accounting for non-current assets
- accounting for current assets
- accounting for provisions
- accounting for financial instruments
- accounting for deferred taxes

- research design for accounting research
- overview of important research areas

Intended Learning Outcomes:
After this course, participants should be able to
- critically discuss the application of IFRS accounting standards to business transactions
- to assess the impact of new or revised accounting standards on financial statments and on managerial behavior
- to analyse the financial position, the performance and the financial stability of firms using data from financial statements
- analyze state-of-the art financial accounting literature
- apply the methodological approaches to empirical archival accounting research
- create proposals for empirically testing hypotheses on new accounting phenomena using valid, powerful, and otherwise well-chosen research designs

Teaching and Learning Methods:
The course consists of a on-site and online lecture, of readings material and accompanying case studies. The lecture and readings provide an overview of IFRS accounting standards, of important ratios for financial statement analyses, of research methods, and of research findings in prior literature. In the case studies, the students work in groups afterwards discuss their findings with the goal to learn how to interpret and evaluate the application of standards, to review research papers, and to develop a research proposals.

Media:
Relevant scripts, videos, readings and exercises can be downloaded via Moodle.The on-site lectures content is conveyed by means of presentation, while the online content is presented via learning paths in Moodle.

Reading List:
Antill, N., Lee, K., & Taylor, D. (2020). Company valuation under IFRS. 3rd edition, Harriman House Limited.
Leuz, C., & Wysocki, P. D. (2016). The economics of disclosure and financial reporting regulation: Evidence and suggestions for future research. Journal of Accounting Research, 54(2), 525-622.
- Blankespoor, E., deHaan, E., & Marinovic, I. (2020). Disclosure processing costs, investors' information choice, and equity market outcomes: A review. Journal of Accounting and Economics, 70(2-3), 101-344.

Responsible for Module:
Ernstberger, Jürgen; Prof. Dr. rer. pol. habil.

Courses (Type of course, Weekly hours per semester), Instructor:
International Accounting (FIM) (WI001269) (Vorlesung, 2 SWS)
Ernstberger J, Dreiser T, Bayer C
For further information in this module, please click campus.tum.de or here.

Module Description

WI001270: Behavioral Finance | Behavioral Finance

Version of module description: Gültig ab winterterm 2020/21

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

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

Description of Examination Method:
Examination is based on a final project and its presenation. In the final project and presentation, students are required to develop and present an innovative idea for a product or service that capitalizes on behavioral finance principles. I will randomly divided students into teams. More details on the required outputs for the final project together with a checklist of expected points to be covered and samples of business ideas will be posted on the LMS. Each team will give a presentation discussing their idea and its implementation. At the end of the presentation, your classmates will be given the opportunity to ask questions.

Repeat Examination:
End of Semester

(Recommended) Prerequisites:

Content:
The course focuses around three pillars:
i) Individuals: how do we make saving and investing decisions? What biases can cloud our decisions?
ii) Managers: do managers exhibit similar biases? How do managers behave if markets are not efficient?
iii) Financial Markets: are markets fully efficient? Are stock returns predictable?
In addition to the key behavioral finance concepts, students will develop and reinforce a set of analytical tools related to corporate finance and investment decisions. We'll also consider how behavioral principles can help develop new financial services and products for consumers

Intended Learning Outcomes:
The goal of the course is to deepen students' understanding of how financial decisions are made in a vast array of settings, incorporating insights from individual and social psychology in modern financial theory.
In practice, students will learn the most common "rules of thumb" used in financial decision-making and the potential biases and mistakes that can arise.

Teaching and Learning Methods:
The module combines various learning methods:
- Basic knowledge, theoretical concepts and practical examples will be provided throughout the lecture.
- Controversial discussions and active participation in class are encouraged to deepen understanding of the concepts presented.
- In the cases, students will apply their theoretical knowledge- Guest lectures are used to strengthen practical relevance

Media:
PowerPoint, books, videos cases, newspaper articles, company information, and academic papers

Reading List:
Ackert, L. F. and Deaves, R., 2010. Behavioural Finance: Psychology, Decision- Making, and Markets. Cengage.

Kahneman, D. and Egan, P., 2011. Thinking, fast and slow. New York: Farrar, Straus and Giroux.

Thaler, R.H. and Sunstein, C.R., 2009. Nudge: Improving decisions about health, wealth, and happiness. Penguin.

Responsible for Module:
Loos, Benjamin; Prof. Dr. rer. pol.

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

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

Module Description

WI001272: Machine Learning | Machine Learning

Version of module description: Gültig ab winterterm 2020/21

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

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

Description of Examination Method:
The grading consists of a written report (30 pages) and a final presentation (30 minutes) including discussions. Students are allowed to work in groups on the project work. In the written report, students demonstrate that they are able to structure a research question, develop and implement a suitable solution approach, and to analyze results. The report must contain a digital supplement that contains all implemented models and results. At the end of the module students present their work in a final presentation and participate in a subsequent discussion.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
basic knowledge in statistics, optimization, linear algebra, multivariate calculus

Content:
The module covers different research fields in the area of Machine learning:
supervised learning (e.g., support vector machines and neural networks)
unsupervised learning (e.g., clustering, anomaly detection)
(deep) reinforcement learning
recent enhancements (e.g., explainable AI, interpretable learning)

Intended Learning Outcomes:
After participating in this module, students have a profound knowledge of the main research fields in the domain of machine learning. Moreover, they have an overview of recent developments and topics. They are able to apply a machine learning framework to a practical problem, know the advantages and disadvantages of various methods and are abel to identify and circumvent typical pitfalls in practical applications. Through the project work, students learn to connect theory and practice as well as to improve team working and presentation skills.

Teaching and Learning Methods:
Students learn the theory behind machine learning in lectures. In additional exercises and coding labs, students learn how to apply this knowledge to practical problems. The encompassing project work teaches students how to structure and conduct a full analytics project in the domain of machine learning.

Media:
slides, readings, exercises, coding labs, project work

Reading List:
Bishop, Christopher M. Pattern recognition and machine learning. springer, 2006.
Bengio, Yoshua, Ian Goodfellow, and Aaron Courville. Deep learning. Vol. 1. Massachusetts, USA:: MIT press, 2017.
Alpaydin, E. (2020). Introduction to machine learning. MIT press.
Russel, Stuart, and Peter Norvig. Artificial intelligence: a modern approach. London: Pearson Education Limited, 2013.

Responsible for Module:
Schiffer, Maximilian; Prof. Dr. rer. pol.

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

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

Module Description

WI100180: Business Plan - Advanced Course (Business Models, Sales and Finance) | Business Plan - Advanced Course (Business Models, Sales and Finance)

Business model, sales and finance

Version of module description: Gültig ab winterterm 2016/17

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

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

Description of Examination Method:
The examination consists of the elaboration of a business plan and a presentation of it. Based on the business plan, the following requirements are checked: if students can design, test and implement a business idea based on criteria like access to the market, customer desirability, prototyping, distribution, calculation and financing. In the business plan, all aspects of a new business model are partially described. Students particularly show what value proposition they can offer to defined customer groups. They estimate the market potential and analyze the competition. They study feasible marketing strategies, test them on the market and present the results.
Based on those they develop distribution strategies to reach relevant target groups. Additionally considering the results of their field tests, interviews and prototypes, the students create scenarios for business models. They identify and evaluate estimations for the financial planning based on tested and validated business hypotheses (customer, market, costs, returns …). Finally the results are delivered by the team in a business idea presentation. During the presentation students are asked critical questions by the examiners. Thereby it can be checked, if students are able to distribute tasks in a team according to competences and experiences, and therefore to test and validate dozens of hypotheses and to create a business plan in a structured way.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Business Plan Basic Course or a similar format

Content:
- Full-day "Gründer-Workshop", topics: Team, Vision, Project Plan

- Overview of the Seminar, pitch of the business ideas, hypothesis tests
- Business Plan, Business Design, Positioning Statement
- Start-up formalities, legal issues
- Presenting results of the hypothesis tests (4x)
- Marketing
- Strategy, Business model, metrics, financial estimations
- Distribution
- Sales competence
- Financing, Venture Capital, Bootstrapping

Intended Learning Outcomes:
At the end of the seminar, the participants will be able to:
- apply the benefits of an iterative approach to the development of business opportunities,
- test hypotheses by means of interviews with experts,
- develop a suitable business model and a financial plan
- develop a marketing and sales concept,
- evaluate own business idea with the use of customer feedback, observations of stakeholders and interviews,
- plan a business concept in order to apply for the, e.g. EXIST-funding or to participate in business plan competitions,
- assess whether certain business idea represents a real business opportunity.

Teaching and Learning Methods:
Seminar-style: The lecturers are experienced entrepreneurs, founders and managing directors, who have extensive experience in writing and reviewing business plans.
- Using a shared space to work together
- Intensive work on business ideas
- Feedback from lecturers and invited experts
- Action based-learning: refreshing observations, interviews and surveys made in the Business Plan Basic Course
- Teamwork: Teams develop their business ideas by prototyping
- Invitation of experts on the subjects: marketing, sales, financing
- Excursion to a Munich-based startup

Media:
- Videos
- Slides
- PowerPoint

Reading List:
Comprehensive list of books, blogs etc. will be announced at the start of the seminar
- Münchener Business Plan Wettbewerb: Handbuch Businessplan-Erstellung, München https://www.baystartup.de/bayerische-businessplan-wettbewerbe/handbuchbusinessplan/

- Osterwalder, Alexander / Pigneur, Yves (2010): Business Model Generation. A Handbook for Visionaries, Game Changers, and Challengers, John Wiley & Sons http://www.businessmodelgeneration.com/downloads/businessmodelgeneration_preview.pdf
- Blank, Steve / Dorf, Bob (2012): Startup Owner Manual, O`Reilly

Responsible for Module:
Böhler, Dominik; Dr. rer. pol.

Courses (Type of course, Weekly hours per semester), Instructor:
Business Plan - Advanced Course (Business Models, Sales and Finance) (WI100180) (Seminar, 4 SWS)
Bücken O [L], Bücken O
For further information in this module, please click campus.tum.de or here.

Elective area | Wahlbereich

Within Elective area, at least one module from three of the four areas must be selected. In addition, further elective modules from the entire elective catalog must be selected from the elective area. A total of 30 credits from the elective catalog must be successfully completed. These examination credits can be partially completed at the University of Bayreuth. These modules are accordingly assigned a module number beginning with the abbreviation WIBT. This exemplary elective module catalog is continuously updated; the applicable elective module catalog will be announced by the Faculty of Business and Economics in a suitable manner in good time before the start of lectures.

Module Description

MA3405: Insurance Mathematics 1 | Insurance Mathematics 1

Version of module description: Gültig ab summerterm 2022

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** winter semester
Credits:* 9	**Total Hours:** 270	**Self-study Hours:** 180	**Contact Hours:** 90

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

Description of Examination Method:
The module examination is based on a written exam (90 minutes). Students are able to understand the main stochastic methods in the practice of insurance mathematics and can adequately apply them.

Repeat Examination:
End of Semester

(Recommended) Prerequisites:
MA0009 Introduction to Probability and Statistics (or former modules: MA1401 Introduction to Probability Theory, MA2402 Basic Statistics)

Content:
This course introduces the principles of actuarial science with a focus on non-life insurance. We cover pricing methods, capital allocation, the individual model and the collective model. The relevant stochastic models for tariff calculation, loss reserving and reinsurance are developed and discussed. Different loss-reserving methods are introduced and compared. As non-life insurance (automotive, liability, fire, etc.) is heavily influenced by the random nature of claim arrivals (frequency) and sizes (severity), stochastic tool such as credibility theory, stochastic processes, extreme-value analysis and dependence modelling are introduced in the present context. The role of reinsurance in risk-sharing is analyzed from a mathematical perspective. The current regulation (Solvency II) is briefly discussed.

Intended Learning Outcomes:
After successful completion of the module, the students are able to understand and apply the main stochastic methods in the practice of (non-life) insurance.

Teaching and Learning Methods:
The module is offered as a series of lectures. In the lectures, the content will be presented in a talk with demonstrative examples, as well as through discussion with the students. The lectures should motivate the students to carry out their own analysis of the themes presented and to independently study the relevant literature.

Media:
Blackboard / Slides / Video-presentation

Reading List:
Albrecher, H., Beirlant, J. Teugels, J. (2017): Reinsurance: Actuarial and Statistical Aspects (Wiley Series in Probability and Statistics).
Bühlmann, H. (2008): Mathematical methods in risk theory. Springer, Berlin, Heidelberg, 2nd printing, 1st edition.
Embrechts, P., Klüppelberg, C., Mikosch, T (1997): Modelling extremal events for insurance and finance, Springer Verlag.
Goelden, H.-W., Hess K., Morlock, M. Schmidt, K. Schröter, K. (2015): Schadenversicherungsmathematik (Deutsch).
Mikosch, T. (2009): Non-life insurance mathematics, Springer, Berlin, Heidelberg.
Mack, T. (2002): Schadenversicherungsmathematik. Verlag Versicherungswirtschaft, Karlsruhe.
Van Eeghen, J. et al. (1983): Rate Making, Nationale Nederlanden, Rotterdam.
Schmidli, H. (2017): Risk Theory, Springer Actuarial.
Wüthrich, M. and Merz, M. (2008): Stochastic Claims Reserving. Wiley, New York.

Responsible for Module:
Scherer, Matthias; Prof. Dr. rer. nat.

Courses (Type of course, Weekly hours per semester), Instructor:
Exercises for Insurance Mathematics [MA3405] (Übung, 2 SWS)
Scherer M, de Witte D

Insurance Mathematics 1 [MA3405] (Vorlesung, 4 SWS)
Scherer M, de Witte D
For further information in this module, please click campus.tum.de or here.

Module Description

MA9976: Financial Econometrics (FIM) | Financial Econometrics (FIM)

Version of module description: Gültig ab winterterm 2020/21

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:** summer semester
Credits:* 4	**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 is based on a written exam (90 minutes) with theoretical and practical components. Students have to show their theoretical understanding of a generalized linear regression model by answering questions on model set-up and assumptions, the generalized least squares estimation methodology, finite and asymptotic properties as well as hypothesis testing. In the practical section, students have to demonstrate their understanding of the methodology on an economically motivated application. By analyzing and interpreting results from a variety of candidate models, students are led to reach a decision about the most plausible model for the application at hand.

Repeat Examination:

(Recommended) Prerequisites:
none

Content:
This course is an intensive introduction to various econometric concepts like sampling, estimation, hypotheses testing, and (generalized) linear regression used in applied financial research. The emphasis will be on developing and applying regression-based techniques in both cross-sectional and time-series contexts. Their usefulness will also be examined in the light of current financial studies.

Intended Learning Outcomes:
After successful completion of the module, students are able to analyze cross-sectional and time-series data with regression-based techniques. Furthermore, students can develop and calibrate econometric models that can be used to test theories or to make forecasts. They understand the properties and limitations of these models and are able to assess how they fit different applications.

Students will be able to use a programming software like Matlab or R to implement and evaluate the models.

Teaching and Learning Methods:
The module consists of the lecture supplemented by an exercise session. The lecture material is presented with slide presentations and mathematical proofs are presented on the blackboard. Students are encouraged to study course references. During the exercise sessions, students work under instructor assistance on assignments for the implementation of econometric models using programming software like Matlab or R.

Media:
Presentation slides, whiteboard, assignment sheets, programming software like Matlab or R

Reading List:
Econometric Analysis, Greene, W.H. (2008), 6th ed., New York: Prentice Hall.
Additional Reading: Market Risk Analysis: Quantitative Methods in Finance (Market Risk Analysis). Carol Alexander. Wiley; Har/Cdr edition 2008.

Responsible for Module:
Zagst, Rudi; Prof. Dr.

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

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

Module Description

WIB06771: Advanced Seminar Finance & Accounting: Cases in Finance | Advanced Seminar Finance & Accounting: Cases in Finance

Cases in Finance (WS); Theory in Finance (SS)

Version of module description: Gültig ab winterterm 2018/19

Module Level: Master	**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 certificate of achievement is accomplished by the presentation of the own case solution (verbal, 40%), the discussion of another group's case solution (verbal, 10%), and the written report (50%). In the presentation, the focus lies on the structure and content of the presented case solution. In the discussion, students must challenge the case solution of another group. In the written report, students have to apply finance theory to practical issues. Hereby, a crucial point is to address the feedback of the presentation and discussion.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
None

Content:
This module enables students to apply finance theories and valuation methods to real questions and issues. By trying to get to the bottom of the own case study and the critical discussion of other case studies which are presented by the other teams, the seminar allows students to get in-depth knowlege of the following areas:
- Company valuation with regard to different industries and different stages of the life cycle of a company
- Company valuation in the context of Initial Public Offerings and Mergers & Acquisitions
- Problems with valuing a start-up
- Mastering crises within a firm
- Importance of the capital structure, in particular in the context of leveraged buyouts
- Long-term strategic focus of a company

- Potential synergies in mergers
- Assessment of different risk factors
- Project financing

Intended Learning Outcomes:
After completion of the module students will be able to (1) identify challenges of real-word financial cases. Moreover, they will be able to (2) operate with financial databases and carry out company valuations, event studies as well as hedging strategies. Based on these skills, students will be able to (3) analyze financial cases, (4) evaluate management decisions and (5) develop own recommendations for action. The module comprises scientific work methods and provides a direct preparation for the final thesis.

Teaching and Learning Methods:
Students are encouraged to study the literature, they are shown how to find and work with data as well as to be concerned with related topics in an initial kick-off meeting. The case study seminar is conducted as team work where specific issues are solved and discussed, at the theory seminar, students question research papers and present their findings to the group.

Media:
Books, case descriptions, academic papers, presentation slides

Reading List:
• Koller et al. (2005). Valuation – Measuring and Managing the Value of Companies. John Wiley & Sons.
• Unterstanding Asset Prices: Scientific Background zum Nobelpreis 2013 (https://www.nobelprize.org/uploads/2018/06/advanced-economicsciences2013-1.pdf)

Responsible for Module:
Kaserer, Christoph; Prof. Dr. rer. pol. habil.

Courses (Type of course, Weekly hours per semester), Instructor:
Advanced Seminar Finance & Accounting (WIB06771): Cases in Finance (Limited places) (Seminar, 4 SWS)
Kaserer C, Treßel V
For further information in this module, please click campus.tum.de or here.

Module Description

WI000231: Asset Management | Asset Management

Version of module description: Gültig ab summerterm 2021

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

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

Description of Examination Method:
The grading is based on an open-book e-test with a duration of 90 minutes. The e-test consists of calculations and multiple choice questions. By answering questions in multiple choice or text form, students have to show that they are able to understand the theory behind Asset Management (e.g. concept of utility and the calculation of basic utility measures, portfolio selection under various constraints, determinants of the capital asset pricing model and other factor models).
Moreover they show their ability to explain the basic models e.g. of portfolio theory.
By performing calculations and elaborating on theoretical considerations, students demonstrate their ability to evaluate and apply the methods presented in the module. They show that they are able to consider asset pricing models.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
MA9712 "Introductory Statistics" (Recommended)
MA9711 "Introductory Mathematic" (Recommended)

Content:
The target of the module is to familiarize students with the concept of Asset Management from a theoretical perspective. The module provides the theoretical foundation that is required to understand typical problems in Asset Management and illustrates how to solve these problems effectively by means of the appropriate tools (e.g. Excel Solver).

The following contents are addressed:

- Utility Theory and decisions under uncertainty

- Theory and application of basic models of portfolio theory with a particular focus on portfolio optimization under various contraints in the Markowitz mean-variance framework
- Theory and application of asset pricing models (e.g. Capital Asset Pricing Model, Arbitrage Pricing Theory)
- Theory and application of conditional asset pricing
- Portfolios Performance Measurement

Intended Learning Outcomes:
After successful completion of the module, students (1) understand the concept of utility theory (utility functions and link to risk attitudes) and can (2) calculate basic utility measures (absolute risk aversion, relative risk aversion, expected utility, certainty equivalent, risk premium); Students can also (3) explain and apply the basic models of portfolio theory, i.e. they can calculate the optimal portfolio allocation in the Markowitz mean-variance framework for an arbitrary set of asset returns under various constraints. Moreover, students (4) understand the fundamental concept of the Capital Asset Pricing Model and are able to (5) apply the model and its variants introduced in the module and also recognize the shortcomings of this model. Students (6) learn to use other asset pricing models and when to apply them. Finally, students (7) learn the theory, process and methods to measure the portfolios' performance.

Teaching and Learning Methods:
The module combines various learning methods:
- Basic knowledge, theoretical concepts and practical examples will be provided through the lecture.
- Controversial discussions and active participation in class are encouraged to deepen understanding of the concepts presented.
- In the exercises, students will apply their theoretical knowledge to concrete
- Demonstration of how to apply portfolio optimization on real-world data by using Excel
- Students will get insights into practice via several guest lecture

Media:
Presentation slides, white board

Reading List:
Elton, E. J./ Gruber, M. J. (2006): Modern Portfolio Theory and Investment Analysis, USA, Wiley, 7th Edition.

Copeland, T. E./ Weston, J. F./ Shastri, K. (2006): Financial Theory and Corporate Policy, USA, Addison Wesley, 4th Edition.

Responsible for Module:
Kaserer, Christoph; Prof. Dr. rer. pol. habil.

Courses (Type of course, Weekly hours per semester), Instructor:
Asset Management - Übung (WI000231) (Übung, 2 SWS)
Chen M

Asset Management (WI000231) (Vorlesung, 2 SWS)
Kaserer C, Chen M
For further information in this module, please click campus.tum.de or here.

Module Description

WI001187: Private Equity | Private Equity

Version of module description: Gültig ab summerterm 2021

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

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

Description of Examination Method:
Examination is an E-Test via Moodle with a duration of 90 minutes. Students are allowed to use a non-programmable calculator and a non-electronic dictionary during the exam. Exams questions are set up in way to check whether students understand and are able to analyze the key aspects when deciding on the financing structure of corporations, the financial modeling of Private Equity transactions as well as the different types of debt instruments used in these transactions. Furthermore students have to proof that they are able to analyze the financial situation of corporations. Eventually students should proof that they can apply concepts of debt and equity financing and that they know how to apply, value and analyse the respective financing instruments.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
We recommend to attend the lecture "Entrepreneurial Finance" (WI000158) before attending this lecture.
Proficient financial and accounting skills as well as proficient excel skills are required as well.

Content:
The module deals with the opportunities and limitations of financing from the perspective of entrepreneurial companies, from start-ups to established companies, as well as Private Equity investors. For this purpose, after an overview of theoretical foundations of debt financing, the different instruments of debt financing, as well as debt-like instruments and hybrid instruments are introduced and discussed. Their functions within an optimal financial strategy in the company are outlined. After understanding the basics of financing and the systematic of financial statements as well as financial forecasting, these elements are put into practice by setting up an integrated

financial business model. Taking the perspective of a Private Equity investor, this business model is extended by a Leverage Buyout (LBO) model.

Intended Learning Outcomes:
After this module the students will be able to analyze the financial situation of the company, to prepare financial forecasts/budgets for a company, and to manage cash, receivables, payables (and inventory). Moreover, they will be able to analyze important debt financing instruments and to understand what factors influence the decision between debt and equity. Finally, students will also be to set up an integrated business model as well as a LBO model.

Teaching and Learning Methods:
The module consists of a lecture as well as excel modelling sessions (exercises). During the lecture the contents are delivered via presentations and talks. The students are inspired to improve the acquired knowledge by studying the suggested literature. During the exercises students apply the acquired knowledge.

Media:
Slides, Whiteboard

Reading List:
Berk, J./DeMarzo, P. (2007): Corporate Finance, 1st. ed., London.
Smith, J./ Smith R. (20004): Entrepreneurial Finance, 2nd. ed., Redwood.
Brigham, E./Ehrhardt, M. (2002): Financial Mangement – Theory and Practice, 10th. ed., London.

Responsible for Module:
Braun, Reiner; Prof. Dr. rer. oec.

Courses (Type of course, Weekly hours per semester), Instructor:
Private Equity (WI001187) (Vorlesung, 2 SWS)
Braun R [L], Braun R, Hysky L

Private Equity - Übung (WI001187) (Übung, 2 SWS)
Braun R [L], Hysky L
For further information in this module, please click campus.tum.de or here.

Module Description

WI001275: Applied Econometrics | Applied Econometrics

An introduction

Version of module description: Gültig ab winterterm 2020/21

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

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

Description of Examination Method:
The learning outcomes will be tested in a written essay. Students are required to show that they can apply the learned content to answering empirical research questions. The use of computer software (R, Stata, Python) is allowed as well as the use of relevant literature and course materials. Moreover, students are required to present their results in class. The final grade is composed of the presentation (30%) and the written essay (70%)

Repeat Examination:
End of Semester

(Recommended) Prerequisites:
none

Content:
1) Introduction
2) Conditional Expectations and Related Concepts in Econometrics
3) The Single-Equation Linear Model and OLS Estimation
a. Instrumental Variables Estimation of Single-Equation Linear Models
b. Simultaneous Equations Models
c. Basic Linear Unobserved Effects Panel Data Models
4) Maximum Likelihood Methods
a. Discrete Response Models
b. Corner Solution Outcomes and Censored Regression Models
c. Count Data and Related Models
d. Sample Selection, Attrition, and Stratified Sampling

Intended Learning Outcomes:
Students will learn the major fundamentals of econometrics. The course focuses on linear regression models and maximum likelihood methods for cross sectional and panel data. Moreover, the course covers methods for limited dependent variables. By studying these topics students will learn how to chose an appropriate method of analysis on the basis of the research question and the data. The ultimate goal is then to apply these methods.

Teaching and Learning Methods:
The course covers theoretical concepts as well as empirical applications. Exercise classes are supppsed to provide opportunities for practice and group work.

Media:
Lecture slides, data applications, exercise sheets

Reading List:
J.F. Wooldridge (2012): "Econometric Analysis of Cross Section and Panel Data", Cambridge University Press, MA.

Responsible for Module:
Hottenrott, Hanna; Prof. Dr.

Courses (Type of course, Weekly hours per semester), Instructor:
Applied Econometrics (WI001275) (FIM) (Vorlesung, 2 SWS)
Farbmacher H, Bayer C, Groh R, Mühlegger M

Applied Econometrics (WI001275) - Exercise (FIM) (Übung, 2 SWS)
Farbmacher H, Bayer C, Groh R, Mühlegger M
For further information in this module, please click campus.tum.de or here.

Business & Information Systems Engineering | Business & Information Systems Engineering

Module Description

WIBT0004: Business & Information Systems Engineering (Seminar) | Business & Information Systems Engineering (Seminar)

Version of module description: Gültig ab winterterm 2020/21

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

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

Description of Examination Method:
The module's examination consists of a group presentation and a term paper. Concerning the group presentation, the students have to present their findings, followed by a discussion. The presentation has to be didactically well-structured and must focus on the students' core findings. The students moderate their discussion and must answer questions by the audience (i.e., the lecturers, advisors, and other seminar groups). Students must also actively participate in the discussions moderated by other seminar groups. The assessment considers both the group-wise and the individual performance of the examinees. Thereby, the students have to demonstrate their ability to collaborate in a goal-oriented manner, create structured presentations, and present the content of these presentations in oral form. By writing the term paper, students have to show their understanding of the research problem and their ability to develop and discuss innovative solutions. They have to demonstrate their academic writing skills and their ability to present academically advanced ideas clearly and concisely.

Repeat Examination:
Next semester

(Recommended) Prerequisites:

Content:
The seminar focuses on current research topics from the field of Business and Information Systems Engineering that are relevant from both an industry and an academic perspective. As particular sub-topics of Business and Information Systems Engineering, the seminar focuses on

Business Process Management, Customer Relationship Management, Strategic IT Management, Digital Life, IT-supported Financial Management, IT-Security and Data Protection, and Innovation Management. The concrete topics of the seminar can differ each year and are published separately before the seminar using a structured topic template.

Intended Learning Outcomes:
After a successful completion of the module, students are able to develop innovative solutions to demanding research problems related to Business and Information Systems Engineering in a goal oriented, structured, and self-dependent manner. Moreover, students have advanced their skills related to academic writing, presentation of research results, and teamwork.

Teaching and Learning Methods:
The students have to work on the given topic both in their group and in close collaboration with the advisor. To do so, the students read related work, create own ideas, and prepare these ideas for the presentation with the advisor. The advisor provides the students repeated feedback and provides guidance on the directions in which the students' ideas should be further developed.

Media:
Presentations, term paper

Reading List:
The literature depends on the concrete topics of the seminar and is included in the topic template.

Responsible for Module:
Maximilian Röglinger

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

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

Module Description

WIBT0005: Digital Energy & Sustainability | Digital Energy & Sustainability

Version of module description: Gültig ab winterterm 2020/21

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

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

Description of Examination Method:
The module's examination consists of a group presentation and a term paper. Concerning the group presentation, the students have to present their findings, followed by a discussion. The presentation has to be didactically well-structured and must focus on the students' core findings. The students moderate their discussion and must answer questions by the audience (i.e., the lecturers, advisors, and other seminar groups). Students must also actively participate in the discussions moderated by other seminar groups. The assessment considers both the group-wise and the individual performance of the examinees. Thereby, the students have to demonstrate their ability to collaborate in a goal-oriented manner, create structured presentations, and present the content of these presentations in oral form. By writing the term paper, students have to show their understanding of the research problem and their ability to develop and discuss innovative solutions. They have to demonstrate their academic writing skills and their ability to present academically advanced ideas clearly and concisely.

Repeat Examination:
Next semester

(Recommended) Prerequisites:

Content:
The seminar focuses on current challenges and opportunities associated with the transition towards low-carbon energy systems. In particular, students will analyze various topics on energy market design, industrial and residential demand flexibility, design of smart districts, sustainable mobility, or lowering CO2 emissions. Against this background, we will highlight the importance and potential of digital technologies to allow for the needed changes associated with future electricity

markets. Specific topics vary each year and will be announced separately before the seminar using a structured topic template.

Intended Learning Outcomes:
Upon successful completion of this module, students will be able to develop innovative solutions to research and industry problems related to the energy markets in a goal-oriented, structured, and self-dependent manner. Moreover, students will advance their skills related to academic writing, oral presentations, and teamwork.

Teaching and Learning Methods:
The students work on the given topic in their group and in close collaboration with the advisor. To do so, students read related work, create own ideas, and prepare these ideas for the presentation. The advisor provides the students with repeated feedback and provides guidance on the directions in which the students' ideas should be further developed.

Media:
Presentations, term paper

Reading List:
The literature depends on the specific topics of the seminar and is included in the topic template.

Responsible for Module:
Jens Strüker

Courses (Type of course, Weekly hours per semester), Instructor:
Digital Energy & Sustainability (WIBT0005) (FIM) (Seminar, 2 SWS)
Strüker J, Wagon F, Bayer C
For further information in this module, please click campus.tum.de or here.

Module Description

WIBT0006: Emerging Digital Technologies @ BISE (Blockchain, AI, IoT, Process Mining) | Emerging Digital Technologies @ BISE (Blockchain, AI, IoT, Process Mining)

Version of module description: Gültig ab winterterm 2020/21

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

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

Description of Examination Method:
The module examination is based on a presentation of the own case solution and a written report by each group (2-4 students). In the presentation, the focus lies on the structure and content of the presented case solution. In the written report, students must show their understanding of emerging technologies in the field of business and information systems engineering by applying their knowledge of emerging technologies to a real-world use case.

Repeat Examination:
Next semester

(Recommended) Prerequisites:

Content:
The first part of the module teaches the students digital technologies by introducing nine related technology groups, especially IoT, AI, and Blockchain. The second part deals with technology application to real-world examples from the economy and energy sector to teach socio-technical and entrepreneurial implications of emerging technologies. The module familiarizes students with the essential concepts of digital technologies such as artificial intelligence, blockchain, the Internet of things, process mining as well as related applications in diverse domains, e.g., in the fields of energy informatics, digital innovation, business process management, and digital value networks.

Intended Learning Outcomes:
Upon successful completion of this module, students understand the socio-technical and entrepreneurial impact of emerging digital technologies on the business and energy sector. Furthermore, they are familiar with the concepts of emerging digital technologies, especially IoT,

AI, and Blockchain. Students can evaluate emerging technology's affordances in various scenarios and can critically discuss its opportunities and challenges. Using these approaches student can evaluate the potential of emerging technologies for firms.

Teaching and Learning Methods:
The module consists of two parts. The first part is lecture and a corresponding exercise. In the lecture the relevant emerging digital technologies are conveyed. Students also read literature suggested to them, which is then discussed in class. Moreover, different approaches and methods to assess various real-world problems are presented to show how scientific results can inform real-world applications. In the second part, students then apply their knowledge to real-world scenarios to solve problem sets and case studies.

Media:
Presentation slides, lecture notes, case studies, academic papers, moodle

Reading List:
Huber, R., Püschel, L., and Röglinger, M. 2019. "Capturing Smart Service Systems : Development of a Domain-specific Modeling Language," Information Systems Journal (29:6), pp. 1207-1255.
Oberländer, A., Röglinger, M., Rosemann, M., and Kees, A. 2018. "Conceptualizing Business-to-Thing Interactions : A Sociomaterial Perspective on the Internet of Things," European Journal of Information Systems (27:4), pp.486-502.
Berger, S., Denner, M-S., Kreuzer, T., Oberländer, A., and Röglinger, M. (2021) „Unfolding the Digital technology Concept – A Multi-Layer Taxonomy and Purpose-Related Groups" under review at Information Systems Journal
Mädche, A., Legner, C., Benlian, A., Berger, B., Gimpel, H., Hess, T., Hinz, O., Morana, S. and Söllner, M. 2019 „AI-Based Digital Assistants : Opportunities, Threats, and Research Perspective," Business & Information Systems Engineering (61:4), pp. 535-544.
Strüker, J., Urbach, N., Guggenberger, T., Lautenschlager, J., Ruhland, N., Schlatt, V., Sedlmeir, J., Stoetzer, J.-C. 2020 „Self-Sovereign Identity – Grundlagen, Anwendungen und Potenziale," Projektgruppe Wirtschaftsinformatik des Fraunhofer-Instituts für Angewandte Informationstechnik FIT, Bayreuth

Responsible for Module:
Maximilian Röglinger

Courses (Type of course, Weekly hours per semester), Instructor:
Emerging Digital Technologies @ BISE (Blockchain, AI, IoT, Process Mining) (WIBT0006) (FIM) (Vorlesung mit integrierten Übungen, 4 SWS)
Röglinger M, Bayer C, Egger A
For further information in this module, please click campus.tum.de or here.

Sustainability and Technology | Sustainability and Technology

Module Description

WI000813: Technology Entrepreneurship Lab | Technology Entrepreneurship Lab

Version of module description: Gültig ab summerterm 2018

Module Level: Master	**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 grading is based on a project work.
With the project work students show their understanding of the processes associated with the recognition and development of entrepreneurial opportunities. Students show that they are able to analyze the development of entrepreneurial teams. Moreover, they show their ability to apply coaching tools.
Throughout the project work each student has to hand in regular written documentation of maximum one page in which to describe the continuous development of the entrepreneurial idea as well as the team (60%). At the end of the project work each student has to hand in a summary documentation of maximum three pages (40%) covering idea development, team development and used tools.

Repeat Examination:
Next semester

(Recommended) Prerequisites:
First entrepreneurial experience (in any field)
First team development experience (in any filed)
Ideally already taken part in Tech Challenge (WI 001180) or Business Plan Basic Seminar (WI000159)

Content:
In cooperation with UnternehmerTUM GmbH.
The module Technology Entrepreneurship Lab offers a "hands-on-experience" for the development of entrepreneurial business ideas and opportunities with

teams. Students work full-time for three consecutive days on the development of their entrepreneurial, technological and coaching skills. The students document both, the opportunity development process and the parallel team development
process and present both processes. Subsequently, they will work on their teams' development of an opportunity assessment plan for the respective business ideas.

Intended Learning Outcomes:
After module participation students are able to understand the processes associated with the recognition and development of entrepreneurial opportunities. In addition, they are able to analyze the development of
entrepreneurial teams and to apply coaching tools for this purpose. Further, they are able to develop an opportunity assessment plan as well as guide others in this process.

Teaching and Learning Methods:
The module consists of a three-day introductory lecture on entrepreneurial, technological and coaching skills as well as a hands-on 3 month execution phase with teams. A coach accompanies this process. The business ideas and team development processes are supervised and presented.

Media:
PowerPoint, Flipchart, online communication tool, virtual meetings, online webinars

Reading List:
Hisrich, R. D./Peters, M. P./Shepherd, D. A.: Entrepreneurship, 8th edition, McGraw-Hill, 2010

Responsible for Module:
Patzelt, Holger; Prof. Dr. rer. pol.

Courses (Type of course, Weekly hours per semester), Instructor:
Technology Entrepreneurship Lab (WI000813) (Seminar, 4 SWS)
Heyde F [L], Heyde F
For further information in this module, please click campus.tum.de or here.

Module Description

WI001180: Tech Challenge | Tech Challenge

Version of module description: Gültig ab winterterm 2017/18

Module Level: Master	**Language:** English	**Duration:** one semester	**Frequency:**
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:
Overview of Final Deliverables

1. Functional Prototype (in hard- and/or software): 40% of grade
2. Final Demo (7 minutes incl. video): 30% of grade
3. Technical Project Description: 15% of grade
4. Read Deck (up to 10 slides max.): 15% of grade

Details of final deliverables below.

Final Deliverable 1: Functional Prototype

- Functional prototype in hard- and/or software
- Not a final product, but should showcase at least one key aspect of your product/service
- For software, use any framework, IDE, language etc. that works
- For hardware, use MakerSpace & prototype budget (up to 250€ per team, only redeemable with invoice!)

Final Deliverable 2a: Final Demo…

- You will have exactly 7 minutes, incl. your video of up to 2 minutes; and Q&A thereafter
- Your demo (incl. video) should include: Team, Customer Need, Value Proposition, Prototype, Competition, Differentiation, Future Roadmap (Note: content is same as the read deck)
- All team members must present
- Slides should not distract from the presenter (e.g. too much text, low contrast, …)

Final Deliverable 2b: …and Video

- Cannot be longer than 2 minutes max. (and should be at least 1 minute long)
- Can be real-life video, powerpoint slides, animations, cartoons or any other video format
- Should not be silent - audio can be spoken text, real world sound, music, …
- Should cover: Customer Need, Value Proposition (Prototype optional), Differentiation
- Think of it as a marketing or sales tool

Final Deliverable 3: Technical Project Description

- Description of all hardware components and software modules/frameworks used, as well as step-by-step instructions to re-create your prototype (e.g. see project descriptions at Hackster.io)
- Link to an online code repository (e.g. GitHub, GitLab, BitBucket) is mandatory

Final Deliverable 4: Read Deck

- Needs to be understandable as stand-alone with no further explanation (assume reader has not seen demo or video!)
- Use presentation format (i.e. slides); different than the presentation used in demo!
- Cannot be more than 10 slides max. (excl. appendix)
- Your read deck should include: Team, Customer Need, Value Proposition, Prototype, Competition, Differentiation, Future Roadmap (note: content is same as final pitch)

Repeat Examination:
Next semester

(Recommended) Prerequisites:
Knowledge: Willingness to participate; affinity with tech and entrepreneurship trends preferred
Abilities: Identifying opportunities; proactiveness; communication; teamwork; commitment
Skills: openness; analytical thinking; design thinking; self-motivation; networking

Content:
- Kick-off: Introduction to challenges, resources, objectives. “Challenge fair” at the end. Students are sensitized, inspired and stimulated to develop feasible, viable and holistic solutions to address current industrial topics as smart city, mobility, digital healthcare, Industry 4.0 and smart grid by utilizing cutting-edge technologies as cloud, IoT, AI, AR/VR.
- Challenge workshops: 1 day is reserved for each corporate to hold an interactive workshop with the batch of students interested to know more about the respective challenge (known needs, available technologies, boundary conditions, etc.).
- Interdisciplinary teams and ideas registration as pertaining to a specific challenge (choice made by teams): Team, Vision, Project Plan
- Ideation workshop: Design thinking, empathic exploration, needfinding, concept generation, evaluation, and selection
- Work-in-progress: Prototyping, testing, generating feedback, iterating, creating new insights and elaborating use cases. On demand office hours and consulting sessions with experts for ideation, technology development, product design, and team development.

- Customer Value Proposition, Market and Positioning with respect to competition, Unique Selling Proposition, Business Model, Value Chain, Market Entry
- Business Plan, pitch training
- Pre-Demo Day Meetup: User Acceptance Testing with respective challenge owners. Teams present, respective corporate provides feedback.
- Feedback integration to finalize project results
- Demo Day: Teams showcase their final concepts by means of their prototypes, videos, posters, and short business plans

Intended Learning Outcomes:
Upon successful completion of this module, students are able to:

- identify latest technology trends related to topics such as smart city, mobility, digital healthcare, Industry 4.0 and smart grid
- understand opportunities and challenges in applying cutting-edge technology (e.g., cloud, IoT, AI, AR/VR) to address a specific industrial challenge
- conduct project-based interdisciplinary teamwork
- carry out an individualized learning process by utilizing referenced online resources as well as on demand expert coaching regarding team development, technology development and product design
- evaluate own ideas, prototypes and project findings with experts, users, and customers, and work closely with their feedback
- recognize and utilize contemporary web platforms for digital project creation and sharing
- operate in a high-tech prototyping workshop equipped with latest technology and devices
- create functional prototypes to demonstrate own proposed solution to a specific industrial challenge
- devise a showcase of own project results to a broad audience of peers, academics and practitioners
- create short business plans to effectively communicate business value of own project results

Thus, students get familiarized with the many facets of entrepreneurship. In doing that, they are enabled to see, realize, and experience the multiplicity in the everyday life of an entrepreneur, entrepreneurial personalities, as well as entrepreneurial skills and motivations.

Teaching and Learning Methods:
Innovatively addressing complex themes as smart city and Industry 4.0 often requires the use of cutting-edge technologies within an entrepreneurial process. Based on this premise and to get the students understand and apply such a process, the module deploys hands-on project-based learning and interdisciplinary teamwork.

Each semester several industrial challenges are spotlighted as proposed by the participating corporates, who provide access to their proprietary technologies, resources, experts and coaches specific to their respective challenge. An industrial challenge is formulated to be broad, with the

potential of breeding many specific projects in return. Students are encouraged to propose which challenge to address in which way (i.e., project idea) and within which team.

Through interactive team exercises and a semester-long project, the students experience peer-learning while gaining practice in assessing and optimizing usage of their team resources. They are also provided with team coaching sessions, individual mentoring, tutorials as necessary (challenge-dependent), and hands-on courses to operate machines and devices (3D printer, laser cutter, waterjet cutter, sensors etc.) at the high-tech prototyping workshop (team- and challenge-dependent).

Media:
- Online access to slides, hand-outs, materials through dedicated e-Learning account
- Online discussion forum connecting students and involved experts
- Accounts on contemporary web platforms for digital project creation and sharing (e.g., hackster, kaggle, datacamp)

Reading List:
A maintained list of references to relevant online course materials (e.g., UnternehmerTUM MOOC videos, Coursera, Udacity, edX, Udemy) to support an individualized learning process suited to students' various levels of expertise

Responsible for Module:
Patzelt, Holger; Prof. Dr. rer. pol.

Courses (Type of course, Weekly hours per semester), Instructor:
Tech Challenge (WI001180) (Seminar, 4 SWS)
Schutz C [L], Schutz C
For further information in this module, please click campus.tum.de or here.

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