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1 Welcome to the new module handbook of your study programme

We are delighted that you have decided to study at the KIT Department of Economics and Management and wish you a good start into the new semester!

The following contact persons are at your disposal for questions and problems at any time.

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D-76133 Karlsruhe
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**Credits: 18**

**Election block: Operations Management - Datenanalyse - Informatik (at least 18 credits)**

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**Election block: Wirtschaftswissenschaftliches Seminar (at least 3 credits)**

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**Credits: 3**

**Mandatory**

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**Election block: Wahlpflichtfach (at least 12 credits)**

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3 Modules

3.1 Module: Adaptive Finite Elemente Methods [M-MATH-102900]

**Responsible:** Prof. Dr. Willy Dörfler

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

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**Prerequisites**

none
3.2 Module: Advanced Inverse Problems: Nonlinearity and Banach Spaces [M-MATH-102955]

**Responsible:** Prof. Dr. Andreas Rieder

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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**Prerequisites**

none
### 3.3 Module: Advanced Topics in Strategy and Management [M-WIWI-103119]

**Responsible:** Prof. Dr. Hagen Lindstädt  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Finance - Risk Management - Managerial Economics  
**Elective Field:**

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**Election block: Wahlpflichtangebot (9 credits)**

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**Competence Certificate**

The assessment is carried out as partial exams (according to Section 4 (2), 1-3 SPO) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

**Competence Goal**

Students

- are able to analyze business strategies and derive recommendations using appropriate frameworks
- learn to express their position through compelling reasoning in structured discussions
- are qualified to critically examine recent research topics in the field of strategic management
- can derive own conclusions from less structured information by using interdisciplinary knowledge

**Prerequisites**

None

**Content**

The module is divided into three main topics:

The students

- analyze and discuss a wide range of business strategies on the basis of collectively selected case studies.
- participate in a business wargaming workshop and analyze strategic interactions.
- write a paper about current topics in the field of strategic management theory.

**Recommendation**

None

**Annotation**

This course is admission restricted. After being admitted to one course of this module, the participation at the other courses will be guaranteed.

Every course of this module will be at least offered every second term. Thus, it will be possible to complete the module within two terms.

This module will be offered for the first time in the winter term 2017/18.
3.4 Module: Algebra [M-MATH-101315]

Responsible: Prof. Dr. Frank Herrlich
Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Algebra und Geometrie)
Elective Field

Credits: 8
Recurrence: Each winter term
Duration: 1 semester
Level: 4
Version: 1

Mandatory

| T-MATH-102253 | Algebra | 8 CR | Herrlich, Kühnlein |

Prerequisites
None
## 3.5 Module: Algebraic Geometry [M-MATH-101724]

**Responsible:** Prof. Dr. Frank Herrlich  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Algebra und Geometrie)  
**Elective Field**

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3.6 Module: Algebraic Number Theory [M-MATH-101725]

**Responsible:** Dr. Stefan Kühnlein  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Algebra und Geometrie)  
**Elective Field:**

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### 3.7 Module: Algebraic Topology [M-MATH-102948]

- **Responsible:** Prof. Dr Roman Sauer
- **Organisation:** KIT Department of Mathematics
- **Part of:** Mathematical Methods (Algebra und Geometrie)
  Elective Field

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**Prerequisites**

none
Module: Algebraic Topology II [M-MATH-102953]

**Responsible:** Prof. Dr Roman Sauer

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Algebra und Geometrie)
Elective Field

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**Prerequisites**

none
### 3.9 Module: Analytics and Statistics [M-WIWI-101637]

**Responsible:** Prof. Dr. Oliver Grothe  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Finance - Risk Management - Managerial Economics  
**Elective Field**

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#### Credits
- **T-WIWI-103123** Advanced Statistics (4.5 CR, Grothe)
- Election block: Ergänzungsangebot (between 4.5 and 5 credits)
- **T-WIWI-106341** Machine Learning 2 – Advanced Methods (4.5 CR, Zöllner)
- **T-WIWI-103124** Multivariate Statistical Methods (4.5 CR, Grothe)

### Competence Certificate
The assessment is carried out as partial written exams (according to Section 4(2), 1 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The examinations are offered every semester. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

### Competence Goal
A Student  
- Deepens the knowledge of descriptive and inferential statistics.  
- Deals with simulation methods.  
- Learns basic and advanced methods of statistical analysis of multivariate and high-dimensional data.

### Prerequisites
The course "Advanced Statistics" is compulsory.

### Content
- Deriving estimates and testing hypotheses  
- Stochastic processes  
- Multivariate statistics, copulas  
- Dependence measures  
- Dimension reduction  
- High-dimensional methods  
- Prediction

### Annotation
The planned lectures and courses for the next three years are announced online.

### Workload
The total workload for this module is approximately 270 hours.

**Responsible:** Prof. Dr. Stefan Nickel

**Organisation:** KIT Department of Economics and Management

**Part of:** Operations Management - Data Analysis - Informatics

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**Election block: Wahlpflichtangebot (between 1 and 2 items)**

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<td>Modeling and OR-Software: Introduction</td>
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**Election block: Ergänzungsangebot (at most 1 item)**

**Competence Certificate**

The assessment is carried out as partial exams (according to § 4(2), 1 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module.

The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

**Competence Goal**

The student

- is familiar with basic concepts and terms of Supply Chain Management,
- knows the different areas of Supply Chain Management and their respective optimization problems,
- is acquainted with classical location problem models (in the plane, on networks and discrete) as well as fundamental methods for distribution and transport planning, inventory planning and management,
- is able to model practical problems mathematically and estimate their complexity as well as choose and adapt appropriate solution methods.

**Prerequisites**

At least one of the courses Facility Location and Strategic Supply Chain Management and Tactical and Operational Supply Chain Management has to be taken.

**Content**

Supply Chain Management is concerned with the planning and optimization of the entire, inter-company procurement, production and distribution process for several products taking place between different business partners (suppliers, logistics service providers, dealers). The main goal is to minimize the overall costs while taking into account several constraints including the satisfaction of customer demands.

This module considers several areas of Supply Chain Management. On the one hand, the determination of optimal locations within a supply chain is addressed. Strategic decisions concerning the location of facilities like production plants, distribution centers or warehouses are of high importance for the rentability of supply chains. Thoroughly carried out, location planning tasks allow an efficient flow of materials and lead to lower costs and increased customer service. On the other hand, the planning of material transport in the context of Supply Chain Management represents another focus of this module. By linking transport connections and different facilities, the material source (production plant) is connected with the material sink (customer). For given material flows or shipments, it is considered how to choose the optimal (in terms of minimal costs) distribution and transportation chain from the set of possible logistics chains, which asserts the compliance of delivery times and further constraints.

Furthermore, this module offers the possibility to learn about different aspects of the tactical and operational planning level in Supply Chain Management, including methods of scheduling as well as different approaches in procurement and distribution logistics. Finally, issues of warehousing and inventory management will be discussed.

**Recommendation**

The courses Introduction to Operations Research I and II are helpful.
Annotation
The planned lectures and courses for the next three years are announced online.

Workload
The total workload of the module is about 240 hours. The workload is proportional to the credit points of the individual courses.
3.11 Module: Asymptotic Stochastics [M-MATH-102902]

**Responsible:** Prof. Dr. Norbert Henze  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Stochastik) Elective Field

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**Fasen-Hartmann, Henze, Klar**

**Prerequisites**
none
Module: Bifurcation Theory [M-MATH-103259]

**Responsible:** Dr. Rainer Mandel

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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**Mandatory**

| T-MATH-106487 | Bifurcation Theory | 5 CR | Mandel |

**Prerequisites**

None

**Annotation**

Course is held in English
3.13 Module: Bott Periodicity [M-MATH-104349]

Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Algebra und Geometrie)
Elective Field

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<td>Bott Periodicity</td>
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Prerequisites
None
### 3.14 Module: Boundary and Eigenvalue Problems [M-MATH-102871]

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3.15 Module: Boundary Element Methods [M-MATH-103540]

**Responsible:** PD Dr. Tilo Arens

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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**Mandatory**

| T-MATH-109851 | Boundary Element Methods | 8 CR | Arens |

**Prerequisites**

None
3.16 Module: Brownian Motion [M-MATH-102904]

**Responsible:** Prof. Dr. Nicole Bäuerle

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Stochastik)

**Elective Field**

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### Mandatory

| T-MATH-105868 | Brownian Motion | 4 CR | Bäuerle, Fasen-Hartmann, Last |

**Prerequisites**

none

**Responsible:** Prof. Dr. Michael Plum

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung) Elective Field

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Hundertmark, Lamm, Plum, Reichel, Schnaubelt, Weis
Module: Collective Decision Making [M-WIWI-101504]

**Responsible:** Prof. Dr. Clemens Puppe

**Organisation:** KIT Department of Economics and Management

**Part of:** Finance - Risk Management - Managerial Economics

**Elective Field**

**Credits**: 9

**Recurrence**: Each term

**Duration**: 2 semester

**Language**: Englisch

**Level**: 4

**Version**: 3

### Election block: Wahlpflichtangebot ()

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### Competence Certificate

The assessment is carried out as partial exams (according to Section 4(2), 1 or 2 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

### Competence Goal

Students

- are able to model practical problems of the public sector and to analyze them with respect to positive and normative questions,
- understand individual incentives and social outcomes of different institutional designs,
- are familiar with the functioning and design of democratic elections and can analyze them with respect to their individual incentives.

### Prerequisites

None

### Content

The focus of the module is on mechanisms of public decisions making, including voting and the aggregation of preferences and judgements.

### Workload

The total workload for this module is approximately 270 hours. For further information see German version.
3.19 Module: Combinatorics [M-MATH-102950]

**Responsible:** Prof. Dr. Maria Aksenovich  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Algebra und Geometrie)  
**Elective Field:**

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**Competence Certificate**

The final grade is given based on the written final exam (3h).

By successfully working on the problem sets, a bonus can be obtained. If the grade in the final written exam is between 4,0 and 1,3, then the bonus improves the grade by one step (0,3 or 0,4).

**Competence Goal**

The students understand, describe, and use fundamental notions and techniques in combinatorics. They can analyze, structure, and formally describe typical combinatorial questions. The students can use the results and methods such as inclusion-exclusion, generating functions, Young tableaux, as well as the developed proof ideas, in solving combinatorial problems. In particular, they can analyze the existence and the number of ordered and unordered arrangements of a given size. The students understand and critically use the combinatorial methods. Moreover, the students can communicate using English technical terminology.

**Prerequisites**

none

**Content**

The course is an introduction into combinatorics. Starting with counting problems and bijections, classical methods such as inclusion-exclusion principle and generating functions are discussed. Further topics include Catalan families, permutations, Young tableaux, partial orders, and combinatorial designs.

**Annotation**

- Regular cycle: every 2nd year, summer semester
- Course is held in English
3.20 Module: Commutative Algebra [M-MATH-104053]

**Responsible:** Prof. Dr. Frank Herrlich

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Algebra und Geometrie)

**Elective Field**

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**Mandatory**

| T-MATH-108398 | Commutative Algebra | 8 CR | Herrlich |

**Prerequisites**

None
3.21 Module: Comparison Geometry [M-MATH-102940]

**Responsible:** Prof. Dr. Wilderich Tuschmann

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Algebra und Geometrie)

**Elective Field**

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**Mandatory**

| T-MATH-105917 | Comparison Geometry | 5 CR | Tuschmann |

**Prerequisites**

none
### Module: Comparison of Numerical Integrators for Nonlinear Dispersive Equations [M-MATH-104426]

**Responsible:** Prof. Dr Katharina Schratz  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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**Mandatory**

| T-MATH-109040 | Comparison of Numerical Integrators for Nonlinear Dispersive Equations | 4 CR | Schratz |

**Prerequisites**

None

**Content**

We will compare numerical integrators (e.g., splitting methods, exponential integrators) for nonlinear dispersive equations such as the nonlinear Schrödinger equation and Kortweg-de Vries equation. We will analyze their convergence properties with regard to the regularity assumptions on the solution.
### 3.23 Module: Complex Analysis [M-MATH-102878]

**Responsible:** Dr. Christoph Schmoeger  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

#### Credits
- **8**

#### Recurrence
- **Irregular**

#### Duration
- **1 semester**

#### Level
- **5**

#### Version
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**Content**

- infinite products
- Mittag-Leffler theorem
- Montel's theorem
- Riemann mapping theorem
- conformal mappings
- univalent (schlicht) functions
- automorphisms of some domains
- harmonic functions
- Schwarz reflection principle
- regular and singular points of power series
### 3.24 Module: Compressive Sensing [M-MATH-102935]

**Responsible:** Prof. Dr. Andreas Rieder  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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### 3.25 Module: Computer-Assisted Analytical Methods for Boundary and Eigenvalue Problems [M-MATH-102883]

**Responsible:** Prof. Dr. Michael Plum  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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Module: Continuous Time Finance [M-MATH-102860]

**Responsible:** Prof. Dr. Nicole Bäuerle

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Stochastik) Elective Field

**Credits:** 8

**Recurrence:** Each summer term

**Duration:** 1 semester

**Level:** 4

**Version:** 1

**Mandatory**

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Economathematics M.Sc.
Module Handbook as of 22.08.2019
3.27 Module: Control Theory [M-MATH-102941]

**Mandatory**

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**Prerequisites**

none
3.28 Module: Convex Geometry [M-MATH-102864]

**Responsible:** Prof. Dr. Daniel Hug

**Organisation:** KIT Department of Mathematics

**Part of:**
- Mathematical Methods (Algebra und Geometrie)

**Elective Field**

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**Mandatory**

| T-MATH-105831 | Convex Geometry | 8 CR | Hug |

**Competence Goal**

The students

- know fundamental combinatorial, geometric and analytic properties of convex sets and convex functions and apply these to related problems,
- are familiar with fundamental geometric and analytic inequalities for functionals of convex sets and their applications to geometric extremal problems and can present central ideas and techniques of proofs,
- know selected integral formulas for convex sets and the required results on invariant measures.
- know how to work self-organized and self-reflexive.

**Content**

1. Convex Sets
   1.1. Combinatorial Properties
   1.2. Support and Separation Properties
   1.3. Extremal Representations
2. Convex Functions
   2.1. Basic Properties
   2.2. Regularity
   2.3. Support Function
3. Brunn-Minkowski Theory
   3.1. Hausdorff Metric
4. Volume and Surface Area
   3.2. Volume and Surface Area
   3.3. Mixed Volumes
   3.4. Geometric Inequalities
5. Surface Area Measures
   3.5. Surface Area Measures
   3.6. Projection Functions
4. Integralgeometric Formulas
   4.1. Invariant Measures
   4.2. Projection and Section Formulas
3.29 Module: Data Science for Finance [M-WIWI-105032]

**Responsible:** Prof. Dr Maxim Ulrich

**Organisation:** KIT Department of Economics and Management

**Part of:** Finance - Risk Management - Managerial Economics

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<td>3 CR</td>
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**Competence Certificate**

The assessment is carried out as partial exams (according to Section 4(2), 1 and 3 of the examination regulation) of the single courses of this module.

The assessment of "Computational Risk and Asset Management" is carried out in form of a written exam (90 minutes), the assessment of "Python for Computational Risk and Asset Management" is carried out in form of twelve weekly Python programming tasks and offered each winter term.

The overall grade of the module is the grade of the written exam weighted with factor 0.75 and the grade for the Python programming tasks weighted with factor 0.25. The resulting grade is truncated after the first decimal.

**Competence Goal**

Students learn how to implement solutions for advanced and real-world challenges in portfolio management. The focus of this module is on the realization of statistical concepts in Python and enable students to solve a broad range of problems along the investment process on their own.

**Content**

The module covers several topics, among them:

- Quantitative Portfolio Strategies: Extensions to Mean-Variance Portfolio Optimization
- Return Densities: Forecasting with Traditional and Machine Learning Approaches, Monte Carlo Simulation
- Financial Economics: Rationalizing Risk Premiums via Stochastic Discount Factor
- Multi-Asset Valuation: DCF Approach, No-Arbitrage and Ito Calculus

**Recommendation**

Good knowledge of statistics and first programming experience with Python is recommended.

**Workload**

Total effort for 9 credit points: approx. 270 hours. The distribution is based on the credit points of the courses of the module. The total number of hours per course results from the effort required to attend lectures and exercises, as well as the examination times and the time required to achieve the learning objectives of the module for an average student for an average performance.
Module: Decision and Game Theory [M-WIWI-102970]

Responsible: Prof. Dr. Clemens Puppe
Organisation: KIT Department of Economics and Management
Part of: Finance - Risk Management - Managerial Economics
Elective Field

Credits 9  Language Deutsch  Level 4  Version 1

Election block: Wahlpflichtangebot (9 credits)

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<td>T-WIWI-102861</td>
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Competence Certificate
The assessment is carried out as partial exams (according to Section 4(2), 1 or 2 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Competence Goal
The student learns the basics of individual and strategic decisions on an advanced and formal level.
He learns to analyze economic problems through abstract and method-based thinking and to design solution strategies. In the tutorials, the concepts and results of the lecture will be applied in case studies.

Prerequisites
None

Content
See German version.

Workload
The total workload for this module is approximately 270 hours. For further information see German version.
Module: Differential Geometry [M-MATH-101317]

**Responsible:** Prof. Dr. Wilderich Tuschmann

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Algebra und Geometrie)

**Elective Field**

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**Prerequisites**

None
### 3.32 Module: Discrete Time Finance [M-MATH-102919]

**Responsible:** Prof. Dr. Nicole Bäuerle  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Stochastik)  
**Elective Field**

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<tbody>
<tr>
<td>T-MATH-105839</td>
<td>Discrete Time Finance</td>
<td>8</td>
<td>Bäuerle, Fasen-Hartmann</td>
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</table>

**Prerequisites**

none
Module: Dispersive Equations [M-MATH-104425]

**Responsible:** Prof. Dr. Wolfgang Reichel

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung) Elective Field

<table>
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### Mandatory

| T-MATH-109001 | Dispersive Equations | 6 CR | Reichel |

**Prerequisites**
None
3.34 Module: Disruptive FinTech Innovations [M-WIWI-103261]

**Responsible:** Prof. Dr Maxim Ulrich

**Organisation:** KIT Department of Economics and Management

**Part of:** Finance - Risk Management - Managerial Economics

---

**Election block: Wahlpflichtangebot (9 credits)**

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<td>Engineering FinTech Solutions</td>
<td>9 CR</td>
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<td>T-WIWI-106496</td>
<td>Computational FinTech with Python and C++</td>
<td>1.5 CR</td>
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**Competence Certificate**
The assessment is carried out as partial exams (according to Section 4(2), 1 or 2 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately. The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

**Competence Goal**
Students with a strong technological background and/or a strong interest for software development and investments will learn how to build a prototype that automates essential steps for a fully automated investment and risk management process. Students also learn to organize themselves efficiently in teams of several developers in order to complete a prototype in a limited amount of time. Moreover, students deepen their understanding of finance and technology and learn how to combine both in an effective way. Students will hence be well prepared to become leaders and pioneers for upcoming FinTech innovations (and beyond) to help society to better invest for the future and to better protect from adverse risks.

**Prerequisites**
None.

**Content**
Within the scope of the lecture "Engineering FinTech Solutions" students get the opportunity to solve a partial problem from a larger FinTech problem independently and at the same time with close mentoring - by employees and professor of the C-RAM research group. The student is introduced to the problem to be solved on the basis of his very own level of knowledge and equipped with the necessary aids. Students are given the opportunity to combine new research approaches from the field of risk and investment management with modern information technology in order to independently master a step towards prototype development. Depending on the topic, students work alone or in teams. As part of the close mentoring approach, teams will meet weekly to discuss their progress and open questions with course students and the professor.

In the course “Computational FinTech with Python and C++” students are given individually tailored programming tasks at the beginning of the semester.

The contents of the seminar "Automated Financial Advisory" will be discussed with the students at the beginning of the semester.

**Recommendation**
None

**Annotation**
See respective lecture

**Workload**
The total workload for this module is approximately 270 hours. For further information, see respective lecture.
3.35 Module: Dynamical Systems [M-MATH-103080]

**Responsible:** Prof. Dr. Jens Rottmann-Matthes

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)
Elective Field

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**Mandatory**

| T-MATH-106114 | Dynamical Systems | 8 CR | Rottmann-Matthes |

**Prerequisites**

none
Module: Econometrics and Statistics I [M-WIWI-101638]

**Responsible:** Prof. Dr. Melanie Schienle

**Organisation:** KIT Department of Economics and Management

**Part of:** Finance - Risk Management - Managerial Economics

**Elective Field**

**Credits**

**9**

**Recurrence**

Each term

**Language**

Deutsch

**Level**

4

**Version**

3

### Mandatory

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### Election block: Ergänzungsangebot (between 4,5 and 5 credits)

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<td>Data Mining and Applications</td>
<td>4,5</td>
<td>Nakhaeizadeh</td>
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<td>T-WIWI-103064</td>
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<td>T-WIWI-103126</td>
<td>Non- and Semiparametrics</td>
<td>4,5</td>
<td>Schienle</td>
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<tr>
<td>T-WIWI-103127</td>
<td>Panel Data</td>
<td>4,5</td>
<td>Heller</td>
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<tr>
<td>T-WIWI-103065</td>
<td>Statistical Modeling of Generalized Regression Models</td>
<td>4,5</td>
<td>Heller</td>
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### Competence Certificate

The assessment is carried out as partial written exams (according to Section 4(2), 1 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The examinations are offered every semester. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

### Competence Goal

The student shows an in depth understanding of advanced Econometric techniques suitable for different types of data. He/She is able to apply his/her theoretical knowledge to real world problems with the help of statistical software and to evaluate performance of different approaches based on statistical criteria.

### Prerequisites

The course "Advanced Statistics" [2520020] is compulsory and must be examined.

The course Financial Econometrics [2520022] can only be passed if the course Time Series Analysis in the module Time Series Analysis and the course Generalized Regression Models in the module Generalized Regression Models have not be passed.

### Content

The courses of this module offer students a broad range of advanced Econometric techniques for state-of-the art data analysis.

### Workload

The total workload for this module is approximately 270 hours.
Module: Econometrics and Statistics II [M-WIWI-101639]

Responsible: Prof. Dr. Melanie Schienle
Organisation: KIT Department of Economics and Management
Part of: Finance - Risk Management - Managerial Economics
Elective Field

<table>
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Election block: Wahlplfichtangebot (between 9 and 10 credits)

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<td>Nakhaeizadeh</td>
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<td>T-WIWI-103064</td>
<td>Financial Econometrics</td>
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<td>Schienle</td>
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<tr>
<td>T-WIWI-103124</td>
<td>Multivariate Statistical Methods</td>
<td>4.5</td>
<td>Grothe</td>
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<td>T-WIWI-103126</td>
<td>Non- and Semiparametrics</td>
<td>4.5</td>
<td>Schienle</td>
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<td>T-WIWI-103127</td>
<td>Panel Data</td>
<td>4.5</td>
<td>Heller</td>
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<tr>
<td>T-WIWI-103128</td>
<td>Portfolio and Asset Liability Management</td>
<td>4.5</td>
<td>Safarian</td>
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<tr>
<td>T-WIWI-103065</td>
<td>Statistical Modeling of Generalized Regression Models</td>
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<td>T-WIWI-103129</td>
<td>Stochastic Calculus and Finance</td>
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Competence Certificate
The assessment is carried out as partial written exams (according to Section 4(2), 1 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The examinations are offered every semester. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Competence Goal
The student shows an in depth understanding of advanced Econometric techniques suitable for different types of data. He/She is able to apply his/her theoretical knowledge to real world problems with the help of statistical software and to evaluate performance of different approaches based on statistical criteria.

Prerequisites
This module can only be passed if the module “Econometrics and Statistics I” has been finished successfully before.
The course Financial Econometrics [2520022] can only be passed if the course Time Series Analysis in the module Time Series Analysis and the course Generalized Regression Models in the module Generalized Regression Models have not be passed.

Content
This modula builds on prerequisites acquired in Module “Econometrics and Statistics I”. The courses of this module offer students a broad range of advanced Econometric techniques for state-of-the art data analysis.

Workload
The total workload for this module is approximately 270 hours.
### 3.38 Module: Economic Theory and its Application in Finance [M-WIWI-101502]

**Responsible:** Prof. Dr. Kay Mitusch  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Finance - Risk Management - Managerial Economics  
**Elective Field**

<table>
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**Election block: Ergänzungsangebot (1 item)**

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<tbody>
<tr>
<td>T-WIWI-102647</td>
<td>Asset Pricing</td>
<td>4.5</td>
<td>Ruckes, Uhrig-Homburg</td>
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<tr>
<td>T-WIWI-102622</td>
<td>Corporate Financial Policy</td>
<td>4.5</td>
<td>Ruckes</td>
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<td>T-WIWI-109050</td>
<td>Corporate Risk Management</td>
<td>4.5</td>
<td>Ruckes</td>
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<td>T-WIWI-102623</td>
<td>Financial Intermediation</td>
<td>4.5</td>
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**Election block: Wahlpflichtangebot (1 item)**

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<tbody>
<tr>
<td>T-WIWI-102609</td>
<td>Advanced Topics in Economic Theory</td>
<td>4.5</td>
<td>Mitusch</td>
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<tr>
<td>T-WIWI-102861</td>
<td>Advanced Game Theory</td>
<td>4.5</td>
<td>Ehrhart, Puppe, Reiß</td>
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**Competence Certificate**  
The assessment is carried out as partial exams (according to Section 4(2), 1 or 2 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The exams are offered at the beginning of the recess period about the subject matter of the latest held lecture. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately. The overall grade for the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

**Competence Goal**  
The students:

- have learnt the methods of formal economic modeling, particularly of General Equilibrium Theory and contract theory  
- will be able to apply these methods to the topics in Finance, specifically the areas of financial markets and institutions and corporate finance  
- have gained many useful insights into the relationship between firms and investors and the functioning of financial markets

**Prerequisites**  
One of the courses T-WIWI-102861 “Advanced Game Theory” and T-WIWI-102609 “Advanced Topics in Economic Theory” is compulsory.

**Content**  
The mandatory course “Advanced Topics in Economic Theory” is devoted in equal parts to General Equilibrium Theory and to contract theory. The course “Asset Pricing” will apply techniques of General Equilibrium Theory to valuation of financial assets. The courses “Corporate Financial Policy” and “Finanzintermediation” will apply the techniques of contract theory to issues of corporate finance and financial institutions.

**Workload**  
The total workload for this module is approximately 270 hours. For further information see German version.

**Responsible:** Prof. Dr. Christof Weinhardt

**Organisation:** KIT Department of Economics and Management

**Part of:** Finance - Risk Management - Managerial Economics

**Elective Field**

**Credits:** 9

**Language:** Deutsch

**Level:** 4

**Version:** 1

Election block: Wahlpflichtangebot (at least 9 credits)

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<td>Energy Market Engineering</td>
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<td>T-WIWI-107503</td>
<td>Energy Networks and Regulation</td>
<td>4,5</td>
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<td>T-WIWI-107504</td>
<td>Smart Grid Applications</td>
<td>4,5</td>
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**Competence Certificate**
The assessment is carried out as partial exams (according to Section 4 (2), 1-3 SPO) of single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately. The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

**Competence Goal**
The student
- is aware of design options for energy and especially electricity markets and can derive implications for the market results from the market design,
- knows about current trends regarding the Smart Grid and understands affiliated modelling approaches,
- can evaluate business models of electricity grids according to the regulation regime
- is prepared for scientific contributions in the field of energy system analysis.

**Prerequisites**
None.

**Content**
The module conveys scientific and practical knowledge to analyse energy markets and according business models. To do so the scientific discussion on energy market designs is evaluated and analysed. Different energy market models are presented and their design implications are evaluated. Furthermore, the electricity system is analysed with regards to being a network industry and resulting regulation and business models are discussed. Besides these traditional areas of energy economics we will look at methods and models of digitalisation in the energy sector.

**Annotation**
The lecture Smart Grid Applications will be available starting in the winter term 2018/19.

**Workload**
The total workload for this module is approximately 270 hours. For further information see German version.

Responsible: Prof. Dr. Wolf Fichtner
Organisation: KIT Department of Economics and Management
Part of: Operations Management - Data Analysis - Informatics
Elective Field

Credits 9
Recurrence Each term
Duration 1 semester
Level 4
Version 4

Election block: Wahlpflichtangebot (at least 9 credits)

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<td>Jochem, McKenna</td>
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<td>T-WIWI-102650</td>
<td>Energy and Environment</td>
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<td>T-WIWI-107464</td>
<td>Smart Energy Infrastructure</td>
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<td>Ardone, Pustisek</td>
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<td>T-WIWI-102695</td>
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Competence Certificate
The assessment is carried out as partial written exams (according to Section 4(2), 1 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The examinations take place every semester. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Competence Goal
The student
- gains detailed knowledge about present and future energy supply technologies (focus on final energy carriers electricity and heat),
- knows the techno-economic characteristics of plants for energy provision, for energy transport as well as for energy distribution and demand,
- is able to assess the environmental impact of these technologies.

Prerequisites
To integrate the module “Energy Economics and Technology” in the degree programme “Wirtschaftsmathematik” it is compulsory to choose the course „Energy Systems Analysis“.

Content
Heat Economy: district heating, heating technologies, reduction of heat demand, statutory provisions
Energy Systems Analysis: Interdependencies in energy economics, energy systems modelling approaches in energy economics
Energy and Environment: emission factors, emission reduction measures, environmental impact
Efficient Energy Systems and Electric Mobility: concepts and current trends in energy efficiency, Overview of and economical, ecological and social impacts through electric mobility

Workload
The total workload for this module is approximately 270 hours. For further information see German version.
### 3.41 Module: Evolution Equations [M-MATH-102872]

**Responsible:** Prof. Dr. Roland Schnaubelt  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

<table>
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**Mandatory**

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<td>Evolution Equations</td>
<td>8 CR</td>
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</table>
3.42 Module: Experimental Economics [M-WIWI-101505]

**Responsible:** Prof. Dr. Johannes Philipp Reiß

**Organisation:** KIT Department of Economics and Management

**Part of:** Finance - Risk Management - Managerial Economics

**Elective Field**

- Credits: 9
- Language: Deutsch
- Level: 4
- Version: 5

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<td>4.5 CR</td>
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<td>T-WIWI-102614 Experimental Economics</td>
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**Competence Certificate**

The assessment is carried out as partial exams (according to Section 4 (2), 1-3 SPO) of the core course and further single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

**Competence Goal**

Students

- are acquainted with the methods of Experimental Economics along with its strengths and weaknesses;
- understand how theory-guided research in Experimental Economics interacts with the development of theory;
- are provided with foundations in data analysis;
- design an economic experiment and analyze its outcome.

**Prerequisites**

None.

**Content**

The module Experimental Economics offers an introduction into the methods and topics of Experimental Economics. It also fosters and extends knowledge in theory-guided experimental economics and its interaction with theory development. Throughout the module, readings of selected papers are required.

**Recommendation**

Basic knowledge in mathematics, statistics, and game theory is assumed.

**Annotation**

The course "Predictive Mechanism and Market Design" is offered every second winter semester, e.g. WS2013 / 14, WS2015 / 16, ...

**Workload**

The total workload for this module is approximately 270 hours. For further information see German version.
3.43 Module: Exponential Integrators [M-MATH-103700]

**Responsible:** Prof. Dr. Marlis Hochbruck  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

<table>
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<td>Hochbruck</td>
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</tbody>
</table>

**Competence Certificate**  
Oral exam of approximately 20 minutes

**Prerequisites**  
None

**Content**  
In this class we consider the construction, analysis, implementation and application of exponential integrators. The focus will be on two types of stiff problems.  
The first one is characterized by a Jacobian that possesses eigenvalues with large negative real parts. Parabolic partial differential equations and their spatial discretization are typical examples. The second class consists of highly oscillatory problems with purely imaginary eigenvalues of large modulus.  
Apart from motivating the construction of exponential integrators for various classes of problems, our main intention in this class is to present the mathematics behind these methods. We will derive error bounds that are independent of stiffness or highest frequencies in the system.  
Since the implementation of exponential integrators requires the evaluation of the product of a matrix function with a vector, we will briefly discuss some possible approaches as well.
Module: Extremal Graph Theory [M-MATH-102957]

**Responsible:** Prof. Dr. Maria Aksenovich

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Algebra und Geometrie)

**Elective Field**

**Credits** 8

**Recurrence** Irregular

**Language** Englisch

**Level** 4

**Version** 1

**Mandatory**

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<td>Extremal Graph Theory</td>
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**Competence Certificate**
The final grade is given based on an oral exam (approx. 30 min.).

**Competence Goal**
The students understand, describe, and use fundamental notions and techniques in extremal graph theory. They can analyze, structure, and formally describe typical combinatorial questions. The students understand and use Szemerédi’s regularity lemma and Szemerédi’s theorem, can use probabilistic techniques, such as dependent random choice and multistep random colorings, know the best bounds for the extremal numbers of complete graphs, cycles, complete bipartite graphs, and bipartite graphs with bounded maximum degree. They understand and can use the Ramsey theorem for graphs and hypergraphs, as well as stepping-up techniques for bounding Ramsey numbers. Moreover, the students know and understand the behavior of Ramsey numbers for graphs with bounded maximum degree. The students can communicate using English technical terminology.

**Content**
The course is concerned with advanced topics in graph theory. It focuses on the areas of extremal functions, regularity, and Ramsey theory for graphs and hypergraphs. Further topics include Turán’s theorem, Erdős-Stone theorem, Szemerédi’s lemma, graph colorings and probabilistic techniques.

**Recommendation**
Basic knowledge of linear algebra, analysis and graph theory is recommended.

**Annotation**
Course is held in English
Module: Extreme Value Theory [M-MATH-102939]

**Responsible:** Prof. Dr. Vicky Fasen-Hartmann

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Stochastik)
Elective Field

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**Prerequisites**

None
3.46 Module: Finance 1 [M-WIWI-101482]

Responsible: Prof. Dr. Martin Ruckes
Prof. Dr. Marliese Uhrig-Homburg

Organisation: KIT Department of Economics and Management

Part of: Finance - Risk Management - Managerial Economics
Elective Field

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Election block: Wahlpflichtangebot (9 credits)

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<td>T-WIWI-102647</td>
<td>Asset Pricing</td>
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Competence Certificate

The assessment is carried out as partial exams (according to Section 4(2), 1 or 2 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Competence Goal

The student

- has core skills in economics and methodology in the field of finance
- assesses corporate investment projects from a financial perspective
- is able to make appropriate investment decisions on financial markets

Prerequisites

None

Content

The courses of this module equip the students with core skills in economics and methodology in the field of modern finance. Securities which are traded on financial and derivative markets are presented, and frequently applied trading strategies are discussed. A further focus of this module is on the assessment of both profits and risks in security portfolios and corporate investment projects from a financial perspective.

Workload

The total workload for this module is approximately 270 hours. For further information see German version.
### 3.47 Module: Finance 2 [M-WIWI-101483]

**Responsible:** Prof. Dr. Martin Ruckes  
Prof. Dr. Marliese Uhrig-Homburg  

**Organisation:** KIT Department of Economics and Management  

**Part of:** Finance - Risk Management - Managerial Economics  
Elective Field

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<td>T-WIWI-109050</td>
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**Competence Certificate**  
The assessment is carried out as partial exams (according to Section 4(2), 1 or 2 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

**Competence Goal**  
The student is in a position to discuss, analyze and provide answers to advanced economic and methodological issues in the field of modern finance.

**Prerequisites**  
It is only possible to choose this module in combination with the module Finance 1. The module is passed only after the final partial exam of Finance 1 is additionally passed.

**Content**  
The module Finance 2 is based on the module Finance 1. The courses of this module equip the students with advanced skills in economics and methodology in the field of modern finance on a broad basis.

**Annotation**  
The courses eFinance: Information Engineering and Management for Securities Trading [2540454] and Financial Analysis [2530205] can be chosen from summer term 2015 on.

**Workload**  
The total workload for this module is approximately 270 hours. For further information see German version.
### 3.48 Module: Finance 3 [M-WIWI-101480]

**Responsible:** Prof. Dr. Martin Ruckes  
Prof. Dr. Marliese Uhrig-Homburg

**Organisation:** KIT Department of Economics and Management

**Part of:** Finance - Risk Management - Managerial Economics  
Elective Field

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**Elective block: Wahlpflichtangebot (at least 9 credits)**

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<td>Blockchains &amp; Cryptofinance</td>
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**Competence Certificate**

The assessment is carried out as partial exams (according to Section 4(2), 1 or 2 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

**Competence Goal**

The student is in a position to discuss, analyze and provide answers to advanced economic and methodological issues in the field of modern finance.

**Prerequisites**

It is only possible to choose this module in combination with the module Finance 1 and Finance 2. The module is passed only after the final partial exams of Finance 1 and Finance 2 are additionally passed.

**Content**

The courses of this module equip the students with advanced skills in economics and methodology in the field of modern finance on a broad basis.

**Workload**

The total workload for this module is approximately 270 hours. For further information see German version.
Module: Finite Element Methods [M-MATH-102891]

**Responsible:** Prof. Dr. Willy Dörfler  
Prof. Dr. Christian Wieners

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
Elective Field

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Dörfler, Hochbruck, Jahnke, Rieder, Wieners
3.50 Module: Finite Group Schemes [M-MATH-103258]

**Responsible:** Prof. Dr. Frank Herrlich  
Dr. Fabian Januszewski  

**Organisation:** KIT Department of Mathematics  

**Part of:** Mathematical Methods (Algebra und Geometrie)  
Elective Field

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### 3.51 Module: FinTech Innovations [M-WIWI-105036]

**Responsible:** Prof. Dr Maxim Ulrich  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Finance - Risk Management - Managerial Economics

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**Competence Certificate**
The assessment is carried out in form of a written thesis based on the course "Engineering FinTech Solutions".

**Competence Goal**
Students with a strong technological background and/or a strong interest for software development and investments will learn how to build a prototype that automates essential steps for a fully automated investment and risk management process. Students also learn to organize themselves efficiently in teams of several developers in order to complete a prototype in a limited amount of time. Moreover, students deepen their understanding of finance and technology and learn how to combine both in an effective way. Students will hence be well prepared to become leaders and pioneers for upcoming FinTech innovations (and beyond) to help society to better invest for the future and to better protect from adverse risks.

**Prerequisites**
see T-WIWI-106193 “Engineering FinTech Solutions”

**Content**
The module is targeted to students with strong knowledge in the field of computational risk and asset management and strong programming skills. It offers students the opportunity to develop an algorithmic solution and hence ample their programming experience and their understanding of financial economics or asset and risk management.

**Recommendation**
None

**Workload**
Total effort for 9 credit points: approx. 270 hours.
3.52 Module: Forecasting: Theory and Practice [M-MATH-102956]

**Responsible:** Prof. Dr. Tilmann Gneiting

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Stochastik)  
Elective Field

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**Mandatory**

| T-MATH-105928 | Forecasting: Theory and Practice | 8 CR | Gneiting |

**Prerequisites**

None

**Annotation**

- Regular cycle: every 2nd year, starting winter semester 16/17
- Course is held in English
### 3.53 Module: Foundations of Continuum Mechanics [M-MATH-103527]

**Responsible:** Prof. Dr. Christian Wieners  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
Elective Field

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#### Mandatory

| T-MATH-107044 | Foundations of Continuum Mechanics | 3 CR | Wieners |

**Prerequisites**

none
3.54 Module: Fourier Analysis [M-MATH-102873]

Responsible: Prof. Dr. Lutz Weis
Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)
Elective Field

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Mandatory

| T-MATH-105845 | Fourier Analysis | 8 CR | Schnaubelt, Weis |

Content

- Fourier series
- Fourier transform on $L_1$ and $L_2$
- Tempered distributions and their Fourier transform
- Explicit solutions of the Heat-, Schrödinger- and Wave equation in $\mathbb{R}^n$
- the Hilbert transform
- the interpolation theorem of Marcinkiewicz
- Singular integral operators
- the Fourier multiplier theorem of Mihlin
3.55 Module: Fourier Analysis and its Applications to PDEs [M-MATH-104827]

**Responsible:** Jun.-Prof. Dr. Xian Liao

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

Elective Field

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**Mandatory**

| T-MATH-109850 | Fourier Analysis and its Applications to PDEs | 3 CR | Liao |  |

**Prerequisites**

None
### 3.56 Module: Functional Analysis [M-MATH-101320]

**Responsible:** Prof. Dr. Roland Schnaubelt  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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**Prerequisites**

None
### 3.57 Module: Functions of Matrices [M-MATH-102937]

**Responsible:** PD Dr. Volker Grimm  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field:**  
**Credits:** 8  
**Recurrence:** Irregular  
**Duration:** 2 term  
**Level:** 4  
**Version:** 1

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**Prerequisites:** none
### 3.58 Module: Functions of Operators [M-MATH-102936]

**Responsible:** PD Dr. Volker Grimm  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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<tr>
<td>T-MATH-105905</td>
<td>Functions of Operators</td>
<td>6 CR</td>
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### 3.59 Module: Generalized Regression Models [M-MATH-102906]

**Responsible:** Dr. Bernhard Klar  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Stochastik)  
**Elective Field**

<table>
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**Mandatory**

| T-MATH-105870 | Generalized Regression Models | 4 CR | Henze, Klar |

**Prerequisites**

None
### 3.60 Module: Geometric Group Theory [M-MATH-102867]

**Responsible:** Prof. Dr Roman Sauer  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Algebra und Geometrie)  
**Elective Field**

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#### Mandatory

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<td>T-MATH-105842</td>
<td>Geometric Group Theory</td>
<td>8 CR</td>
<td>Herrlich, Leuzinger, Link, Sauer, Schwer, Tuschmann</td>
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</table>
3.61 Module: Geometric Numerical Integration [M-MATH-102921]

**Responsible:** Prof. Dr Tobias Jahnke  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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**Mandatory**

| T-MATH-105919 | Geometric Numerical Integration | 6 CR | Hochbruck, Jahnke |

**Prerequisites**

none
### Module: Geometry of Schemes [M-MATH-102866]

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**Responsible:** Prof. Dr. Frank Herrlich  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Algebra und Geometrie)  
**Elective Field:**

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<td>T-MATH-105841</td>
<td>Geometry of Schemes</td>
<td>8 CR</td>
<td>Herrlich, Kühlein</td>
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### 3.63 Module: Global Differential Geometry [M-MATH-102912]

**Responsible:** Prof. Dr. Wilderich Tuschmann

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Algebra und Geometrie)

**Elective Field**

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**Prerequisites**

none
### 3.64 Module: Graph Theory [M-MATH-101336]

**Responsible:** Prof. Dr. Maria Aksenovich  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Algebra und Geometrie)  
**Elective Field:**  
**Credits:** 8  
**Recurrence:** Irregular  
**Duration:** 1 semester  
**Language:** Englisch  
**Level:** 4  
**Version:** 1

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**Competence Certificate**  
The final grade is given based on the written final exam (3h). By successfully working on the problem sets, a bonus can be obtained. If the grade in the final written exam is between 4,0 and 1,3, then the bonus improves the grade by one step (0,3 or 0,4).

**Competence Goal**  
The students understand, describe and use fundamental notions and techniques in graph theory. They can represent the appropriate mathematical questions in terms of graphs and use the results such as Menger’s theorem, Kuratowski’s theorem, Turan’s theorem, as well as the developed proof ideas, to solve these problems. The students can analyze graphs in terms of their characteristics such as connectivity, planarity, and chromatic number. They are well positioned to understand graph theoretic methods and use them critically. Moreover, the students can communicate using English technical terminology.

**Prerequisites**  
None

**Content**  
The course Graph Theory treats the fundamental properties of graphs, starting with basic ones introduced by Euler and including the modern results obtained in the last decade. The following topics are covered: structure of trees, paths, cycles and walks in graphs, minors, unavoidable subgraphs in dense graphs, planar graphs, graph coloring, Ramsey theory, and regularity in graphs.

**Annotation**  
- Regular cycle: every 2nd year, winter semester  
- Course is held in English
### 3.65 Module: Group Actions in Riemannian Geometry [M-MATH-102954]

**Responsible:** Prof. Dr. Wilderich Tuschmann  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Algebra und Geometrie)  
**Elective Field**

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**Prerequisites**

none
Module: Growth and Agglomeration [M-WIWI-101496]

**Responsible:** Prof. Dr. Ingrid Ott

**Organisation:** KIT Department of Economics and Management

**Part of:** Finance - Risk Management - Managerial Economics

**Elective Field**

**Credits** 9

**Recurrence** Each term

**Duration** 1 semester

**Level** 4

**Version** 3

**Election block: Wahlpflichtangebot (9 credits)**

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<td>Dynamic Macroeconomics</td>
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<td>T-WIWI-102785</td>
<td>Theory of Endogenous Growth</td>
<td>4.5 CR</td>
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<tr>
<td>T-WIWI-103107</td>
<td>Spatial Economics</td>
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</table>

**Competence Certificate**
The assessment is carried out as partial written exams (see the lectures descriptions).
The overall grade for the module is the average of the grades for each course weighted by the credits.

**Competence Goal**
The student

- gains deepened knowledge of micro-based general equilibrium models
- understands how based on individual optimizing decisions aggregate phenomena like economic growth or agglomeration (cities / metropolises) result
- is able to understand and evaluate the contribution of these phenomena to the development of economic trends
- can derive policy recommendations based on theory

**Prerequisites**
None

**Content**
The module includes the contents of the lectures *Endogenous Growth Theory* [2561503], *Spatial Economics* [2561260] and *International Economic Policy* [2560254]. While the first two lectures have a more formal-analytic focus, the third lecture approaches fundamental ideas and problems from the field of international economic policy from a more verbal perspective.

The common underlying principle of all three lectures in this module is that, based on different theoretical models, economic policy recommendations are derived.

**Recommendation**
Attendance of the course *Introduction Economic Policy* [2560280] is recommended.
Successful completion of the courses *Economics I: Microeconomics* and *Economics II: Macroeconomics* is required.

**Workload**
The total workload for this module is approximately 270 hours. For further information see German version.
3.67 Module: Harmonic Analysis for Dispersive Equations [M-MATH-103545]

**Responsible:** Dr. Peer Kunstmann  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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**Prerequisites**

None

**Content**

Fourier transform, Fourier multipliers, interpolation, singular integral operators, Mihlin's Theorem, Littlewood-Paley decomposition, oscillating integrals, dispersive estimates, Strichartz estimates, nonlinear equations.
Module: Homotopy Theory [M-MATH-102959]

**Responsible:** Prof. Dr Roman Sauer

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Algebra und Geometrie)
   Elective Field

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<tr>
<td>T-MATH-105933</td>
<td>Homotopy Theory</td>
<td>8</td>
<td>Sauer</td>
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</table>
## 3.69 Module: Informatics [M-WIWI-101472]

### Responsible:
- Prof. Dr. Andreas Oberweis
- Prof. Dr. Harald Sack
- Prof. Dr. Ali Sunyaev
- Prof. Dr. York Sure-Vetter
- Prof. Dr. Melanie Volkamer
- Prof. Dr.-Ing. Johann Marius Zöllner

### Organisation:
KIT Department of Economics and Management

### Credits, Recurrence, Duration, Level

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### Version
11

### Election block: Wahlpflichtangebot ()

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<td>CR</td>
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<tr>
<td>T-WIWI-109248</td>
<td>Critical Information Infrastructures</td>
<td>4,5</td>
<td>CR</td>
<td>Sunyaev</td>
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<tr>
<td>T-WIWI-109246</td>
<td>Digital Health</td>
<td>4,5</td>
<td>CR</td>
<td>Sunyaev</td>
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<tr>
<td>T-WIWI-109270</td>
<td>Human Factors in Security and Privacy</td>
<td>4,5</td>
<td>CR</td>
<td>Volkamer</td>
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<tr>
<td>T-WIWI-102661</td>
<td>Database Systems and XML</td>
<td>4,5</td>
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<tr>
<td>T-WIWI-102668</td>
<td>Enterprise Architecture Management</td>
<td>4,5</td>
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<td>Supplement Enterprise Information Systems</td>
<td>4,5</td>
<td>CR</td>
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<td>Supplement Software- and Systemsengineering</td>
<td>4,5</td>
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<td>4,5</td>
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<td>T-WIWI-102666</td>
<td>Knowledge Discovery</td>
<td>4,5</td>
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<td>Management of IT-Projects</td>
<td>4,5</td>
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<td>Machine Learning 2 – Advanced Methods</td>
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<td>Strategic Management of Information Technology</td>
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<td>Web Science</td>
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### Election block: Seminare und Praktika (between 0 and 1 items)

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Competence Certificate
The assessment is carried out as partial exams (according to Section 4(2) of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. For passing the module exam in every singled partial exam the respective minimum requirements has to be achieved.
The examinations are offered every semester. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately.
When every singled examination is passed, the overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.
Please note the following information about the module component exams of Prof. Dr. H. Schmeck:

Competence Goal
The student
- has the ability to master methods and tools in a complex discipline and to demonstrate innovativeness regarding the methods used,
- knows the principles and methods in the context of their application in practice,
- is able to grasp and apply the rapid developments in the field of computer science, which are encountered in work life, quickly and correctly, based on a fundamental understanding of the concepts and methods of computer science,
- is capable of finding and defending arguments for solving problems.

Prerequisites
It is only allowed to choose one lab.

Content
The thematic focus will be based on the choice of courses in the areas of Effiziente Algorithmen, Betriebliche Informations- und Kommunikationssysteme, Wissensmanagement, Komplexitätsmanagement and Software- und Systems Engineering.

Annotation
Detailed information on the recognition of examinations in the field of Informatics can be found at http://www.aifb.kit.edu/web/Auslandsaufenthalt.

Workload
The total workload for this module is approximately 270 hours. For further information see German version.
3.70 Module: Information Systems in Organizations [M-WIWI-104068]

Responsible: Prof. Dr. Alexander Mädche
Organisation: KIT Department of Economics and Management
Part of: Finance - Risk Management - Managerial Economics
Elective Field

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<th>Credits</th>
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Election block: Wahlpflichtangebot (at least 9 credits)

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<tr>
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<td>Mädche</td>
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<td>T-WIWI-108461</td>
<td>Interactive Information Systems</td>
<td>4,5 CR</td>
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<td>T-WIWI-108437</td>
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<td>4,5 CR</td>
<td>Mädche</td>
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Competence Certificate
The assessment is carried out as partial exams (according to Section 4 (2), 1-3 SPO) of the core course and further single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately.
The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Competence Goal
The student

- has a comprehensive understanding of conceptual and theoretical foundations of information systems in organizations
- is aware of the most important classes of information systems used in organizations: process-centric, information-centric and people-centric information systems.
- knows the most important activities required to execute in the pre-implementation, implementation and post-implementation phase of information systems in organizations in order to create business value
- has a deep understanding of key capabilities of business intelligence systems and/or interactive information systems used in organizations

Prerequisites
None

Content
During the last decades we witnessed a growing importance of Information Technology (IT) in the business world along with faster and faster innovation cycles. IT has become core for businesses from an operational company-internal and external customer perspective. Today, companies have to rethink their way of doing business, from an internal as well as an external digitalization perspective.

This module focuses on the internal digitalization perspective. The contents of the module abstract from the technical implementation details and focus on foundational concepts, theories, practices and methods for information systems in organizations. The students get the necessary knowledge to guide the successful digitalization of organizations. Each lecture in the module is accompanied with a capstone project that is carried out in cooperation with an industry partner.

Annotation
New module starting summer term 2018.

Workload
The total workload for this module is approximately 270 hours.
Module: Innovation and Growth [M-WIWI-101478]

Responsible: Prof. Dr. Ingrid Ott
Organisation: KIT Department of Economics and Management
Part of: Finance - Risk Management - Managerial Economics
Elective Field

Credits 9
Recurrence Each term
Duration 1 semester
Level 4
Version 3

Election block: Wahlpflichtangebot (between 9 and 10 credits)

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Competence Certificate

The assessment is carried out as partial written exams (according to Section 4(2), 1 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The exams are offered at the beginning of the recess period about the subject matter of the latest held lecture. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately.

The overall grade for the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Competence Goal

Students shall be given the ability to

- know the basic techniques for analyzing static and dynamic optimization models that are applied in the context of micro- and macroeconomic theories
- understand the important role of innovation to the overall economic growth and welfare
- identify the importance of alternative incentive mechanisms for the emergence and dissemination of innovations
- explain, in which situations market interventions by the state, for example taxes and subsidies, can be legitimized, and evaluate them in the light of economic welfare

Prerequisites

None

Content

The module includes courses that deal with issues of innovation and growth in the context of micro- and macroeconomic theories. The dynamic analysis makes it possible to analyze the consequences of individual decisions over time, and sheds light on the tension between static and dynamic efficiency in particular. In this context is also analyzed, which policy is appropriate to carry out corrective interventions in the market and thus increase welfare in the presence of market failure.

Recommendation

Basic knowledge of micro- and macroeconomics is assumed, as taught in the courses Economics I [2600012], and Economics II [2600014]. In addition, an interest in quantitative-mathematical modeling is required.

Workload

Total expenditure of time for 9 credits: 270 hours

Attendance time per lecture: 3x14h
Preparation and wrap-up time per lecture: 3x14h
Rest: Exam Preparation

The exact distribution is subject to the credits of the courses of the module.
3.72 Module: Integral Equations [M-MATH-102874]

**Responsible:** PD Dr. Frank Hettlich

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung) 
Elective Field

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Module: Introduction into Particulate Flows [M-MATH-102943]

**Responsible:** Prof. Dr. Willy Dörfler

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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**Prerequisites**

none
Module: Introduction to Geometric Measure Theory [M-MATH-102949]

**Responsible:** PD Dr. Steffen Winter

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Algebra und Geometrie) 
Elective Field

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**Prerequisites**

none
3.75 Module: Introduction to Homogeneous Dynamics [M-MATH-105101]

**Responsible:** Dr. Stefan Kühnlein

**Organisation:** KIT Department of Mathematics

**Part of:**
- Mathematical Methods (Stochastik)
- Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)
- Mathematical Methods (Algebra und Geometrie)
- Elective Field

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**Prerequisites**

None
Module: Introduction to Kinetic Theory [M-MATH-103919]

Responsible: Prof. Dr. Martin Frank
Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)
Elective Field

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Frank

Competence Goal
After successfully taking part in the module’s classes and exams, students have gained knowledge and abilities as described in the "Inhalt" section. Specifically, Students know common means of mesoscopic and macroscopic description of particle systems. Furthermore, students are able to describe the basics of multiscale methods, such as the asymptotic analysis and the method of moments. Students are able to apply numerical methods to solve engineering problems related to particle systems. They can name the assumptions that are needed to be made in the process. Students can judge whether specific models are applicable to the specific problem and discuss their results with specialists and colleagues.

Prerequisites
None

Content
- From Newton's equations to Boltzmann's equation
- Rigorous derivation of the linear Boltzmann equation
- Properties of kinetic equations (existence & uniqueness, H theorem)
- The diffusion limit
- From Boltzmann to Euler & Navier-Stokes
- Method of Moments
- Closure techniques
- Selected numerical methods

Recommendation
Partial Differential Equations, Functional Analysis
Module: Introduction to Matlab and Numerical Algorithms [M-MATH-102945]

**Responsible:** Dr. Daniel Weiss

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field:**

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**Prerequisites**

none
### Module: Introduction to Scientific Computing [M-MATH-102889]

**Responsible:**
- Prof. Dr. Willy Dörfler
- Prof. Dr Tobias Jahnke

**Organisation:**
KIT Department of Mathematics

**Part of:**
Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)
Elective Field

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**Prerequisites**

None
3.79 Module: Inverse Problems [M-MATH-102890]

**Responsible:** Prof. Dr. Andreas Kirsch

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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### 3.80 Module: Key Moments in Geometry [M-MATH-104057]

**Responsible:** Prof. Dr. Wilderich Tuschmann  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Algebra und Geometrie)  
**Elective Field**

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**Prerequisites**

None
### 3.81 Module: L2-Invariants [M-MATH-102952]

**Responsible:** Dr. Holger Kammeyer

**Organisation:** KIT Department of Mathematics

**Part of:**
- Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)
- Mathematical Methods (Algebra und Geometrie)
- Elective Field

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#### Mandatory

| T-MATH-105924 | L2-Invariants | 5 CR | Kammeyer, Sauer |

#### Prerequisites
none
### 3.82 Module: Lie Groups and Lie Algebras [M-MATH-104261]

**Responsible:** Prof. Dr. Enrico Leuzinger  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Algebra und Geometrie)  
**Elective Field**

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3.83 Module: Marketing Management [M-WIWI-101490]

Responsible: Prof. Dr. Martin Klarmann
Organisation: KIT Department of Economics and Management
Part of: Operations Management - Data Analysis - Informatics

Elective Field
Credits 9
Recurrence Each summer term
Duration 1 semester
Level 4
Version 11

Election block: Wahlpflichtangebot (at least 1 item)
T-WIWI-107720 Market Research 4.5 CR Klarmann
T-WIWI-102883 Pricing 4.5 CR Feurer
T-WIWI-109864 Product and Innovation Management 3 CR Klarmann

Election block: Ergänzungsangebot (at most 1 item)
T-WIWI-106137 Country Manager Simulation 1.5 CR Feurer
T-WIWI-102835 Marketing Strategy Business Game 1.5 CR Klarmann

Competence Certificate
The assessment is carried out as partial exams (according to Section 4(2) of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. For passing the module exam in every singled partial exam the respective minimum requirements has to be achieved.

When every singled examination is passed, the overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Competence Goal
Students
- have an advanced knowledge about central marketing contents
- have a fundamental understanding of the marketing instruments
- know and understand several strategic concepts and how to implement them
- are able to implement their extensive marketing knowledge in a practical context
- know several qualitative and quantitative approaches to prepare decisions in Marketing
- have the theoretical knowledge to write a master thesis in Marketing
- have the theoretical knowledge to work in/together with the Marketing department

Prerequisites
The course "Market Research" is obligatory.

Content
The aim of this module is to deepen central marketing contents in different areas. Therefore the students can choose between the following marketing courses:

- Product and Innovation Management
- Market Research – this course has to be completed successfully by students interested in seminar or master thesis positions at the chair of marketing
- Marketing Strategy Business Game
- Country Manager Simulation

Annotation
Please note that only one of the listed 1.5-ECTS courses can be chosen in the Marketing Management module.

Workload
The total workload for this module is approximately 270 hours.
Module: Markov Decision Processes [M-MATH-102907]

**Responsible:** Prof. Dr. Nicole Bäuerle

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Stochastik)

**Elective Field**

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**Mandatory**

| T-MATH-105921 | Markov Decision Processes | 5 CR | Bäuerle |

**Prerequisites**

none
### 3.85 Module: Master Thesis [M-MATH-102917]

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Module: Mathematical Methods in Signal and Image Processing [M-MATH-102897]

| Responsible: | Prof. Dr. Andreas Rieder |
| Organisation: | KIT Department of Mathematics |
| Part of: | Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung) Elective Field |

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**Prerequisites**

none
3.87 Module: Mathematical Methods of Imaging [M-MATH-103260]

**Responsible:** Prof. Dr. Andreas Rieder

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

**Credits** 5  
**Recurrence** Irregular  
**Level** 4  
**Version** 1

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**Prerequisites**

None
### Module: Mathematical Modelling and Simulation in Practise [M-MATH-102929]

**Responsible:** PD Dr. Gudrun Thäter  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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**Prerequisites**

None
### Module: Mathematical Programming [M-WIWI-101473]

**Responsible:** Prof. Dr. Oliver Stein  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Operations Management - Data Analysis - Informatics  
**Elective Field:**

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#### Election block: Wahlpflichtangebot (at most 2 items)

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#### Election block: Ergänzungsangebot (at most 2 items)

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<td>Optimization Models and Applications</td>
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**Competence Certificate**

The assessment is carried out as partial exams (according to Section 4(2), 1 or 2 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

**Competence Goal**

The student

- names and describes basic notions for advanced optimization methods, in particular from continuous and mixed integer programming,
- knows the indispensable methods and models for quantitative analysis,
- models and classifies optimization problems and chooses the appropriate solution methods to solve also challenging optimization problems independently and, if necessary, with the aid of a computer,
- validates, illustrates and interprets the obtained solutions,
- identifies drawbacks of the solution methods and, if necessary, is able to makes suggestions to adapt them to practical problems.

**Prerequisites**

At least one of the courses "Mixed Integer Programming I", "Parametric Optimization", "Convex Analysis", "Nonlinear Optimization I" and "Global Optimization I" has to be taken.

**Content**

The modul focuses on theoretical foundations as well as solution algorithms for optimization problems with continuous and mixed integer decision variables.
Annotation
The lectures are partly offered irregularly. The curriculum of the next three years is available online (www.ior.kit.edu).
For the lectures of Prof. Stein a grade of 30 % of the exercise course has to be fulfilled. The description of the particular lectures is more detailed.

Workload
The total workload for this module is approximately 270 hours. For further information see German version.
3.90 Module: Mathematical Statistics [M-MATH-102909]

**Responsible:** Dr. Bernhard Klar

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Stochastik)
Elective Field

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| T-MATH-105872 | Mathematical Statistics | 4 CR  
|             | Henze, Klar            |         |

**Prerequisites**

none
M 3.91 Module: Mathematical Topics in Kinetic Theory [M-MATH-104059]

Responsibility: Prof. Dr. Dirk Hundertmark

Organisation: KIT Department of Mathematics

Part of: Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

Elective Field

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Mandatory

T-MATH-108403 Mathematical Topics in Kinetic Theory 4 CR Hundertmark

Competence Goal

The students are familiar with the basic questions in kinetic theory and methodical approaches to their solutions. With the acquired knowledge they are able to understand the required analytical methods and are able to apply them to the basic equations in kinetic theory.

Prerequisites

None

Content

- Boltzmann equation: Cauchy problem and properties of solutions
- entropy and H theorem
- equilibrium and convergence to equilibrium
- other models of kinetic theory
3.92 Module: Maxwell's Equations [M-MATH-102885]

**Responsible:** Prof. Dr. Andreas Kirsch

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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<th>8 CR</th>
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3.93 Module: Medical Imaging [M-MATH-102896]

**Responsible:** Prof. Dr. Andreas Rieder  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**  

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<td>T-MATH-105861</td>
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**Prerequisites**
None
3.94 Module: Methodical Foundations of OR [M-WIWI-101414]

- **Responsible:** Prof. Dr. Oliver Stein
- **Organisation:** KIT Department of Economics and Management
- **Part of:** Operations Management - Data Analysis - Informatics Elective Field

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Election block: Wahlpflichtangebot (at least 1 item as well as between 4.5 and 9 credits)

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<td>Nonlinear Optimization I</td>
<td>4.5 CR</td>
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Election block: Ergänzungsangebot ()

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<td>T-WIWI-102725</td>
<td>Nonlinear Optimization II</td>
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<td>Stein</td>
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<td>T-WIWI-102704</td>
<td>Facility Location and Strategic Supply Chain Management</td>
<td>4.5 CR</td>
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**Competence Certificate**

The assessment is carried out as partial written exams (according to Section 4(2), 1 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

**Competence Goal**

The student

- names and describes basic notions for optimization methods, in particular from nonlinear and from global optimization,
- knows the indispensable methods and models for quantitative analysis,
- models and classifies optimization problems and chooses the appropriate solution methods to solve also challenging optimization problems independently and, if necessary, with the aid of a computer,
- validates, illustrates and interprets the obtained solutions.

**Prerequisites**

At least one of the courses Nonlinear Optimization I and Global Optimization I has to be examined.

**Content**

The modul focuses on theoretical foundations as well as solution algorithms for optimization problems with continuous decision variables. The lectures on nonlinear programming deal with local solution concepts, whereas the lectures on global optimization treat approaches for global solutions.

**Recommendation**

The courses Introduction to Operations Research I and II are helpful.

**Annotation**

The planned lectures and courses for the next three years are announced online (http://www.ior.kit.edu).

**Workload**

The total workload for this module is approximately 270 hours. For further information see German version.
3.95 Module: Microeconomic Theory [M-WIWI-101500]

**Responsible:** Prof. Dr. Clemens Puppe

**Organisation:** KIT Department of Economics and Management

**Part of:** Finance - Risk Management - Managerial Economics

**Elective Field**

**Credits** 9

**Language** Deutsch/Englisch

**Level** 4

**Version** 3

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<td>Advanced Topics in Economic Theory</td>
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<td>T-WIWI-102861</td>
<td>Advanced Game Theory</td>
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<td>Ehrhart, Puppe, Reiß</td>
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<td>T-WIWI-102859</td>
<td>Social Choice Theory</td>
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<td>Auction Theory</td>
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<td>4.5 CR</td>
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**Election block: Wahlpflichtangebot (at least 9 credits)**

**Competence Certificate**

The assessment is carried out as partial exams (according to Section 4(2), 1 or 2 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately.

The overall grade of the the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

**Competence Goal**

Students

- are able to model practical microeconomic problems mathematically and to analyze them with respect to positive and normative questions,
- understand individual incentives and social outcomes of different institutional designs.

An example of a positive question is: which regulation policy results in which firm decision under imperfect competition? An example of a normative question is: which voting rule has appealing properties?

**Prerequisites**

None

**Content**

The student should gain an understanding of advanced topics in economic theory, game theory and welfare economics. Core topics are, among others, strategic interactions in markets, cooperative and non-cooperative bargaining (Advanced Game Theory), allocation under asymmetric information and general equilibrium over time (Advanced Topics in Economic Theory), voting and the aggregation of preferences and judgements (Social Choice Theory).

**Workload**

The total workload for this module is approximately 270 hours. For further information see German version.
3.96 Module: Monotonicity Methods in Analysis [M-MATH-102887]

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<tr>
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<th>PD Dr. Gerd Herzog</th>
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3.97 Module: Nonlinear Analysis [M-MATH-103539]

**Responsible:** Prof. Dr. Tobias Lamm

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

Elective Field

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**Mandatory**

| T-MATH-107065 | Nonlinear Analysis | 8 CR | Lamm |

**Prerequisites**

None
Module: Nonlinear Maxwell Equations [M-MATH-103257]

**Responsible:** Prof. Dr. Roland Schnaubelt  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field:**

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<td>T-MATH-106484</td>
<td>Nonlinear Maxwell Equations</td>
<td>3 CR</td>
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**Prerequisites**

none

**Content**

- Short introduction to nonlinear contraction semigroups in Hilbert spaces and to the spaces $H(\text{curl})$ and $H(\text{div})$.
- **Semilinear case:** Maxwell's equations with linear material laws and nonlinear conductivity. Wellposedness by means of maximal monotone operators. Long-term behavior.
- **Quasilinear case:** Maxwell's equations with nonlinear instantaneous material laws. Local wellposedness on the whole space via linearisation, apriori estimates and regularization. Blow-up examples. Outlook to results on domains.
Module: Nonlinear Maxwell Equations [M-MATH-105066]

**Responsible:** Prof. Dr. Roland Schnaubelt

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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**Mandatory**

| T-MATH-110283 | Nonlinear Maxwell Equations | 8 CR | Schnaubelt |

**Prerequisites**

none
### 3.100 Module: Nonparametric Statistics [M-MATH-102910]

**Responsible:** Prof. Dr. Norbert Henze  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Stochastik)  
**Elective Field**

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**Prerequisites**  
None
3.101 Module: Numerical Continuation Methods [M-MATH-102944]

**Responsible:** Prof. Dr. Jens Rottmann-Matthes

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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**Prerequisites**

none
Module: Numerical Linear Algebra for Scientific High Performance Computing

**3.102 Module: Numerical Linear Algebra for Scientific High Performance Computing [M-MATH-103709]**

**Responsible:** Dr. Hartwig Anzt

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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**Prerequisites**

None
Module: Numerical Linear Algebra in Image Processing [M-MATH-104058]

Responsible: PD Dr. Volker Grimm
Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)
Elective Field

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Mandatory

| T-MATH-108402 | Numerical Linear Algebra in Image Processing | 6 CR | Grimm |

Prerequisites
None
Module: Numerical Methods for Differential Equations [M-MATH-102888]

**Responsible:** Prof. Dr. Willy Dörfler
Prof. Dr Tobias Jahnke

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)
Elective Field

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Responsible: Prof. Dr. Willy Dörfler
Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)
Elective Field

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Mandatory

| T-MATH-105900 | Numerical Methods for Hyperbolic Equations | 6 CR | Dörfler |

Competence Goal

Prerequisites

none
### 3.106 Module: Numerical Methods for Integral Equations [M-MATH-102930]

**Responsible:** PD Dr. Tilo Arens  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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Module: Numerical Methods for Maxwell's Equations [M-MATH-102931]


**Responsible:** Prof. Dr. Marlis Hochbruck  
Prof. Dr Tobias Jahnke

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
Elective Field

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Economathematics M.Sc.  
Module Handbook as of 22.08.2019

**Responsible:** Prof. Dr. Marlis Hochbruck  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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**Responsible:** Prof. Dr. Willy Dörfler

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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| T-MATH-105860 | Numerical Methods in Computational Electrodynamics | 6 CR | Dörfler, Hochbruck, Jahnke, Rieder, Wieners |

**Prerequisites**

none
### 3.110 Module: Numerical Methods in Fluid Mechanics [M-MATH-102932]

**Responsible:** Prof. Dr. Willy Dörfler  
PD Dr. Gudrun Thäter

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
Elective Field

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3.111 Module: Numerical Methods in Mathematical Finance [M-MATH-102901]

Responsible: Prof. Dr Tobias Jahnke
Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)
Elective Field

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Prerequisites
none
Module: Numerical Methods in Mathematical Finance II [M-MATH-102914]

**Responsible:** Prof. Dr Tobias Jahnke

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung) 
Elective Field

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**Prerequisites**
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### M 3.113 Module: Numerical Optimisation Methods [M-MATH-102892]

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**Responsible:** Prof. Dr. Stefan Nickel

**Organisation:** KIT Department of Economics and Management

**Part of:** Operations Management - Data Analysis - Informatics

**Elective Field**

**Credits** 9

**Language** Deutsch

**Level** 4

**Version** 6

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<td>Graph Theory and Advanced Location Models</td>
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<td>T-WIWI-106200</td>
<td>Modeling and OR-Software: Advanced Topics</td>
<td>4.5 CR</td>
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<td>T-WIWI-102715</td>
<td>Operations Research in Supply Chain Management</td>
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### Election block: Ergänzungsangebot (at most 2 items)

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<td>T-WIWI-102714</td>
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### Competence Certificate

The assessment is carried out as partial exams (according to § 4(2), 1 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module.

The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

### Competence Goal

The student

- is familiar with basic concepts and terms of Supply Chain Management,
- knows the different areas of SCM and their respective optimization problems,
- is acquainted with classical location problem models (in planes, in networks and discrete) as well as fundamental methods for distribution and transport planning, inventory planning and management,
- is able to model practical problems mathematically and estimate their complexity as well as choose and adapt appropriate solution methods.

### Prerequisites

At least one of the courses "Operations Research in Supply Chain Management", "Graph Theory and Advanced Location Models", "Modeling and OR-Software: Advanced Topics" and "Special Topics of Stochastic Optimization (elective)" has to be taken.
Content

Supply Chain Management is concerned with the planning and optimization of the entire, inter-company procurement, production and distribution process for several products taking place between different business partners (suppliers, logistics service providers, dealers). The main goal is to minimize the overall costs while taking into account several constraints including the satisfaction of customer demands.

This module considers several areas of SCM. On the one hand, the determination of optimal locations within a supply chain is addressed. Strategic decisions concerning the location of facilities as production plants, distribution centers or warehouses are of high importance for the rentability of Supply Chains. Thoroughly carried out, location planning tasks allow an efficient flow of materials and lead to lower costs and increased customer service. On the other hand, the planning of material transport in the context of supply chain management represents another focus of this module. By linking transport connections and different facilities, the material source (production plant) is connected with the material sink (customer). For given material flows or shipments, it is considered how to choose the optimal (in terms of minimal costs) distribution and transportation chain from the set of possible logistics chains, which asserts the compliance of delivery times and further constraints. Furthermore, this module offers the possibility to learn about different aspects of the tactical and operational planning level in Supply Chain Management, including methods of scheduling as well as different approaches in procurement and distribution logistics. Finally, issues of warehousing and inventory management will be discussed.

Recommendation

Basic knowledge as conveyed in the module Introduction to Operations Research [M-WI1OR] is assumed.

Annotation

Some lectures and courses are offered irregularly.
The planned lectures and courses for the next three years are announced online.

Workload

Total effort for 9 credits: ca. 270 hours
- Presence time: 84 hours
- Preparation/Wrap-up: 112 hours
- Examination and examination preparation: 74 hours
Module: Optimisation and Optimal Control for Differential Equations [M-MATH-102899]

**Responsible:** Prof. Dr. Christian Wieners

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field:**

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**Prerequisites**

none
## 3.116 Module: Optimization in Banach Spaces [M-MATH-102924]

**Responsible:** Prof. Dr. Andreas Kirsch  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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**Prerequisites**  
none
### Module: Parallel Computing [M-MATH-101338]

**Responsible:** Dr. rer. nat. Mathias Krause  
Prof. Dr. Christian Wieners

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
Elective Field

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**Prerequisites**

None
3.118 Module: Percolation [M-MATH-102905]

**Responsible:** Prof. Dr. Günter Last

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Stochastik)

**Elective Field:**

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**Competence Goal**

The students

- are acquainted with basic models of discrete and continuum percolation,
- acquire the skills needed to use specific probabilistic and graph-theoretical methods for the analysis of these models,
- know how to work self-organised and self-reflexive.

**Prerequisites**

none
Module: Poisson Processes [M-MATH-102922]

**Responsible:** Prof. Dr. Günter Last

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Stochastik)

**Elective Field**

**Credits** 5

**Recurrence** Irregular

**Duration** 1 term

**Level** 4

**Version** 1

### Competence Certificate
oral exam

### Competence Goal
The students know about important properties of the Poisson process. The focus is on probabilistic methods and results which are independent of the specific phase space. The students understand the central role of the Poisson process as a specific point process and as a random measure.

### Module grade calculation
Marking: grade of exam

### Prerequisites
none

### Content
- Distributional properties of Poisson processes
- The Poisson process as a particular point process
- Stationary Poisson and point processes
- Random measures and Cox processes
- Poisson cluster processes and compound Poisson processes
- The spatial Gale-Shapley algorithm
3.120 Module: Potential Theory [M-MATH-102879]

**Responsible:** Prof. Dr. Andreas Kirsch

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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Arens, Hettlich, Kirsch, Reichel
# 3.121 Module: Probability Theory and Combinatorial Optimization [M-MATH-102947]

**Responsible:** Prof. Dr. Daniel Hug  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Stochastik)  
**Elective Field:**

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| T-MATH-105923 | Probability Theory and Combinatorial Optimization | 8 CR | Hug, Last |

**Prerequisites**
none
### Module: Project Centered Software-Lab [M-MATH-102938]

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#### Mandatory

| T-MATH-105907 | Project Centered Software-Lab | 4 CR | Thäter  |

**Prerequisites**

none
Module: Random Graphs [M-MATH-102951]

**Responsible:** Dr. Matthias Schulte

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Stochastik)

**Elective Field**

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**Prerequisites**
none
### Module: Ruin Theory [M-MATH-104055]

**Responsible:** Prof. Dr. Vicky Fasen-Hartmann  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Stochastik)  
**Elective Field:**

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**Mandatory**

| T-MATH-108400 | Ruin Theory | 4 CR | Fasen-Hartmann |

**Prerequisites**

None
3.125 Module: Scattering Theory [M-MATH-102884]

**Responsible:** PD Dr. Frank Hettlich

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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<td>1 semester</td>
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**Mandatory**

| T-MATH-105855 | Scattering Theory | 8 CR | Arens, Hettlich, Kirsch |
Module: Selected Topics in Harmonic Analysis [M-MATH-104435]

Responsible: Prof. Dr. Dirk Hundertmark
Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)
Elective Field

**Mandatory**

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Competence Goal
The students are familiar with the concepts of singular integral operators and weighted estimates in Harmonic Analysis. They know the relations between the BMO space and the Muckenhoupt weights and also how to use dyadic analysis operators to obtain estimates for Calderon-Zygmund operators.

Prerequisites
None

Content
- Calderon-Zygmund and Singular Integral operators
- BMO space and Muckenhoupt weights
- Reverse Holder Inequality and Factorisation of Ap weights
- Extrapolation Theory and weighted norm inequalities for singular integral operators
### 3.127 Module: Seminar [M-MATH-102730]

**Responsible:** Dr. Stefan Kühnlein  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Seminar

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**Election block: Wahlbereich Seminar (1 item)**

| T-MATH-105686 | Seminar Mathematics | 3 CR |
3.128 Module: Seminar [M-WIWI-102973]

**Responsible:** Prof. Dr. Hagen Lindstädt  
Prof. Dr. Oliver Stein

**Organisation:** KIT Department of Economics and Management

**Part of:** Seminar in Economics and Management  
Elective Field

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**Election block: Wahlpflichtangebot (3 credits)**

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<td>3 CR</td>
<td>Professorenschaft des Fachbereichs Informatik</td>
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<tr>
<td>3 CR</td>
<td>Nickel, Rebennack, Stein</td>
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**Competence Certificate**

The module examination consists of one seminar (according to §4 (3), 3 of the examintaion regulation). A detailed description of the assessment is given in the specific course characterisation.

The final mark for the module is the mark of the seminar.

**Competence Goal**

The students are in a position to independently handle current, research-based tasks according to scientific criteria.

- They are able to research, analyze, abstract and critically review the information.
- They can draw own conclusions using their interdisciplinary knowledge from the less structured information and selectively develop current research results.
- They can logically and systematically present the obtained results both orally and in written form in accordance with scientific guidelines (structuring, technical terminology, referencing). They can argue and defend the results professionally in the discussion.

**Prerequisites**

None.

**Content**

Competences which are gained in the seminar module especially prepare the student for composing the final thesis. Within the term paper and the presentation the student exercises himself in scientific working techniques supported by the supervisor.

Beside advancing skills in techniques of scientific working there are gained integrative key qualifications as well. A detailed description of these qualifications is given in the section "Key Qualifications" of the module handbook.

Furthermore, the module also includes additional key qualifications provided by the KQ-courses.

**Recommendation**

None.

**Annotation**

The listed seminar titles are placeholders. Currently offered seminars of each semester will be published on the websites of the institutes and in the course catalogue of the KIT. In general, the current seminar topics of each semester are already announced at the end of the previous semester. Furthermore for some seminars there is an application required. The available places are listed on the internet: https://portal.wiwi.kit.edu.
Module: Seminar [M-WIWI-102971]

**Responsible:**
Prof. Dr. Hagen Lindstädt
Prof. Dr. Oliver Stein

**Organisation:**
KIT Department of Economics and Management

**Part of:**
Seminar in Economics and Management
Elective Field

### Election block: Wahlpflichtangebot (3 credits)

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**Competence Certificate**
The modul examination consists of one seminar (according to §4 (3), 3 of the examintaion regulation). A detailed description of the assessment is given in the specific course characterization.

The final mark for the module is the mark of the seminar.

**Competence Goal**
The students are in a position to independently handle current, research-based tasks according to scientific criteria.

- They are able to research, analyze, abstract and critically review the information.
- They can draw own conclusions using their interdisciplinary knowledge from the less structured information and selectively develop current research results.
- They can logically and systematically present the obtained results both orally and in written form in accordance with scientific guidelines (structuring, technical terminology, referencing). They can argue and defend the results professionally in the discussion.

**Prerequisites**
None.

**Content**
Competences which are gained in the seminar module especially prepare the student for composing the final thesis. Within the term paper and the presentation the student exercises himself in scientific working techniques supported by the supervisor.

Beside advancing skills in techniques of scientific working there are gained integrative key qualifications as well. A detailed description of these qualifications is given in the section "Key Qualifications" of the module handbook.

Furthermore, the module also includes additional key qualifications provided by the KQ-courses.

**Recommendation**
None.

**Annotation**
The listed seminar titles are placeholders. Currently offered seminars of each semester will be published on the websites of the institutes and in the course catalogue of the KIT. In general, the current seminar topics of each semester are already announced at the end of the previous semester. Furthermore for some seminars there is an application required. The available places are listed on the internet: https://portal.wiwi.kit.edu.
### Module: Seminar [M-WIWI-102974]

**Responsible:** Prof. Dr. Hagen Lindstädt  
Prof. Dr. Oliver Stein  

**Organisation:** KIT Department of Economics and Management  
Part of: Elective Field  

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**Election block: Wahlplfichtangebot (1 item)**

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<tr>
<td>T-WIWI-103482</td>
<td>Seminar in Operations Research B (Master)</td>
<td>3 CR</td>
<td>Nickel, Rebennack, Stein</td>
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</table>

**Competence Certificate**

The modul examination consists of one seminar (according to §4 (3), 3 of the examintaion regulation). A detailed description of the assessment is given in the specific course characerization.

The final mark for the module is the mark of the seminar.

**Competence Goal**

- The students are in a position to independently handle current, research-based tasks according to scientific criteria.  
- They are able to research, analyze, abstract and critically review the information.  
- They can draw own conclusions using their interdisciplinary knowledge from the less structured information and selectively develop current research results.  
- They can logically and systematically present the obtained results both orally and in written form in accordance with scientific guidelines (structuring, technical terminology, referencing). They can argue and defend the results professionally in the discussion.

**Prerequisites**

None.

**Content**

Competences which are gained in the seminar module especially prepare the student for composing the final thesis. Within the term paper and the presentation the student exercises himself in scientific working techniques supported by the supervisor.

Beside advancing skills in techniques of scientific working there are gained integrative key qualifications as well.

**Annotation**

The listed seminar titles are placeholders. Currently offered seminars of each semester will be published on the websites of the institutes and in the course catalogue of the KIT. In general, the current seminar topics of each semester are already announced at the end of the previous semester. Furthermore for some seminars there is an application required.

The available places are listed on the internet: [https://portal.wiwi.kit.edu](https://portal.wiwi.kit.edu).

**Workload**

The total workload for this module is approximately 90 hours.
3.131 Module: Seminar [M-WIWI-102972]

Responsible: Prof. Dr. Hagen Lindstädt
Prof. Dr. Oliver Stein

Organisation: KIT Department of Economics and Management

Part of: Elective Field

<table>
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Elective Field

**Election block: Wahlpflichtangebot (1 item)**

| T-WIWI-103476 | Seminar in Business Administration B (Master) | 3 CR | Professorenschaft des Fachbereichs Betriebswirtschaftslehre |
| T-WIWI-103477 | Seminar in Economics B (Master) | 3 CR | Professorenschaft des Fachbereichs Volkswirtschaftslehre |
| T-WIWI-103484 | Seminar in Statistics B (Master) | 3 CR | Grothe, Schienle |

**Competence Certificate**
The modul examination consists of one seminar (according to §4 (3), 3 of the examintaion regulation). A detailed description of the assessment is given in the specific course characterization.
The final mark for the module is the mark of the seminar.

**Competence Goal**
- The students are in a position to independently handle current, research-based tasks according to scientific criteria.
- They are able to research, analyze, abstract and critically review the information.
- They can draw own conclusions using their interdisciplinary knowledge from the less structured information and selectively develop current research results.
- They can logically and systematically present the obtained results both orally and in written form in accordance with scientific guidelines (structuring, technical terminology, referencing). They can argue and defend the results professionally in the discussion.

**Prerequisites**
None.

**Content**
Competences which are gained in the seminar module especially prepare the student for composing the final thesis. Within the term paper and the presentation the student exercises himself in scientific working techniques supported by the supervisor.
Beside advancing skills in techniques of scientific working there are gained integrative key qualifications as well.

**Annotation**
The listed seminar titles are placeholders. Currently offered seminars of each semester will be published on the websites of the institutes and in the course catalogue of the KIT. In general, the current seminar topics of each semester are already announced at the end of the previous semester. Furthermore for some seminars there is an application required.
The available places are listed on the internet: https://portal.wiwi.kit.edu.

**Workload**
The total workload for this module is approximately 90 hours.
3.132 Module: Service Operations [M-WIWI-102805]

**Responsible:** Prof. Dr. Stefan Nickel

**Organisation:** KIT Department of Economics and Management

**Part of:** Operations Management - Data Analysis - Informatics

<table>
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**Election block: Wahlpflichtangebot (at most 2 items)**

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<td>4.5 CR</td>
<td>Nickel</td>
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<tr>
<td>T-WIWI-102884</td>
<td>Operations Research in Health Care Management</td>
<td>4.5 CR</td>
<td>Nickel</td>
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<tr>
<td>T-WIWI-102715</td>
<td>Operations Research in Supply Chain Management</td>
<td>4.5 CR</td>
<td>Nickel</td>
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<tr>
<td>T-WIWI-102716</td>
<td>Practical Seminar: Health Care Management (with Case Studies)</td>
<td>4.5 CR</td>
<td>Nickel</td>
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**Election block: Ergänzungsangebot (at most 2 items)**

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<tr>
<td>T-WIWI-102872</td>
<td>Challenges in Supply Chain Management</td>
<td>4.5 CR</td>
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</table>

**Competence Certificate**
The assessment is carried out as partial exams (according to Section 4 (2), 1-3 SPO), whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately. The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

**Competence Goal**

Students

- knows the theoretical bases and the key components of Business Intelligence systems,
- acquires the basic skills to make use of business intelligence and analytics software in the service context
- are introduced into various application scenarios of analytics in the service context
- are able to distinguish different analytics methods and apply them in context
- learn how to apply analytics software in the service context
- are trained for the structured compilation and solution of practice relevant problems with the help of commercial business intelligence software packages as well as analytics methods and tools

**Prerequisites**
At least one of the four courses Operations Research in Supply Chain Management, Operations Research in Health Care Management, Practical seminar: Health Care Management or Discrete-Event Simulation in Production and Logistics has to be assigned.

**Content**
The importance of services in modern economies is most evident – nearly 70% of gross value added are achieved in the tertiary sector and a growing number of industrial enterprises add customer specific services to their material goods or transform their business models fundamentally. The growing availability of data "Big Data" and their intelligent processing by applying analytic methods and business intelligence systems plays a key role.

It is the goal of the module to give students a comprehensive overview on the subject Business Intelligence & Analytics focusing on service issues. Various scenarios illustrate how the methods and systems introduced help to improve existing services or create innovative data-based services.

**Recommendation**
The course Practical Seminar Health Care should be combined with the course OR in Health Care Management.

**Annotation**
This module is part of the KSRI teaching profile "Digital Service Systems". Further information on a service-specific profiling is available under www.ksri.kit.edu/teaching.

**Workload**
The total workload for this module is approximately 270 hours. For further information see German version.
### 3.133 Module: Sobolev Spaces [M-MATH-102926]

**Responsible:** Prof. Dr. Andreas Kirsch  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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**Mandatory**

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<th>5 CR</th>
<th>Kirsch</th>
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</table>
Module: Spatial Stochastics [M-MATH-102903]

**Responsible:** Prof. Dr. Günter Last

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Stochastik)  
Elective Field

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<td>1 semester</td>
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**Mandatory**

| T-MATH-105867 | Spatial Stochastics | 8 CR | Hug. Last |

**Competence Goal**

The students are familiar with some basic spatial stochastic processes. They do not only understand how to deal with general properties of distributions, but also know how to describe and apply specific models (Poisson process, Gaussian random fields). They know how to work self-organised and self-reflexive.

**Prerequisites**

none

**Content**

- Point processes
- Random measures
- Poisson processes
- Gibbs point processes
- Ralm distributions
- Spatial ergodic theorem
- Spectral Theory of random fields
- Gaussian fields

**Recommendation**

It is recommended to attend the following modules previously: Probability Theory
3.135 Module: Special Functions and Applications in Potential Theory [M-MATH-101335]

**Responsible:** Prof. Dr. Andreas Kirsch

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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<td>T-MATH-102274</td>
<td>Special Functions and Applications in Potential Theory</td>
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**Prerequisites**

None
3.136 Module: Special Topics of Numerical Linear Algebra [M-MATH-102920]

**Responsible:** Prof. Dr. Marlis Hochbruck  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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<td>Special Topics of Numerical Linear Algebra</td>
<td>8 CR</td>
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**Prerequisites**

none
### 3.137 Module: Spectral Theory [M-MATH-101768]

**Responsible:** Prof. Dr. Lutz Weis

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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**Mandatory**

| T-MATH-103414 | Spectral Theory - Exam | 8 CR | Herzog, Kunstmann, Schmoeger, Schnaubelt, Weis |

**Recommendation**

It is recommended to attend the module ‘Functional Analysis’ previously.
3.138 Module: Spin Manifolds, Alpha Invariant and Positive Scalar Curvature [M-MATH-102958]

**Responsible:** Prof. Dr. Wilderich Tuschmann

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Algebra und Geometrie)

**Elective Field**

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<td>T-MATH-105932</td>
<td>Spin Manifolds, Alpha Invariant and Positive Scalar Curvature</td>
<td>5</td>
<td>Klaus, Tuschmann</td>
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## 3.139 Module: Stein's Method [M-MATH-102946]

**Responsible:** Dr. Matthias Schulte  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Stochastik)  
**Elective Field**

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### Mandatory

| T-MATH-105914 | Stein's Method | 5 CR | Schulte |

### Prerequisites

none
3.140 Module: Stochastic Control [M-MATH-102908]

**Responsible:** Prof. Dr. Nicole Bäuerle

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Stochastik)

**Elective Field**

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<td>Stochastic Control</td>
<td>4 CR</td>
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**Prerequisites**

none
3.141 Module: Stochastic Differential Equations [M-MATH-102881]

**Responsible:** Prof. Dr. Lutz Weis

**Organisation:** KIT Department of Mathematics

**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)

**Elective Field**

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**Mandatory**

| T-MATH-105852 | Stochastic Differential Equations | 8 CR | Schnaubelt, Weis |

**Content**

- Brownian motion
- Martingales and Martingal inequalities
- Stochastic integrals and Ito's formula
- Existence and uniqueness of solutions for systems of stochastic differential equations
- Perturbation and stability results
- Application to equations in financial mathematics, physics and engineering
- Connection with diffusion equations and potential theory
### 3.142 Module: Stochastic Evolution Equations [M-MATH-102942]

**Responsible:** Prof. Dr. Lutz Weis  
**Organisation:** KIT Department of Mathematics  
**Part of:**  
- Mathematical Methods (Stochastik)  
- Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
- Elective Field

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**Mandatory**

| T-MATH-105910 | Stochastic Evolution Equations | 8 CR | Weis |

**Prerequisites**

none
### 3.143 Module: Stochastic Geometry [M-MATH-102865]

**Responsible:** Prof. Dr. Daniel Hug  
**Organisation:** KIT Department of Mathematics  
**Part of:**  
- Mathematical Methods (Stochastik)  
- Mathematical Methods (Algebra und Geometrie)  
**Elective Field**

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**Mandatory**

| T-MATH-105840 | Stochastic Geometry | 8 CR | Hug, Last |

**Competence Goal**

The students

- know the fundamental geometric models and characteristics in stochastic geometry,
- are familiar with properties of Poisson processes of geometric objects,
- know examples of applications of models of stochastic geometry,
- know how to work self-organized and self-reflexive.

**Content**

- Random Sets
- Geometric Point Processes
- Stationarity and Isotropy
- Germ Grain Models
- Boolean Models
- Foundations of Integral Geometry
- Geometric densities and characteristics
- Random Tessellations

**Recommendation**

It is recommended to attend the module ‘Spatial Stochastics’ previously.
Module: Stochastic Optimization [M-WIWI-103289]

Responsibility: Prof. Dr. Steffen Rebennack

Organisation: KIT Department of Economics and Management

Part of: Operations Management - Data Analysis - Informatics

Elective Field

Credits: 9
Recurrence: Each term
Duration: 1 semester
Level: 4
Version: 8

Election block: Wahlpflichtangebot (between 1 and 2 items)

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<td>Introduction to Stochastic Optimization</td>
<td>4.5</td>
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<td>T-WIWI-106548</td>
<td>Advanced Stochastic Optimization</td>
<td>4.5</td>
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<td>T-WIWI-106549</td>
<td>Large-scale Optimization</td>
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Election block: Ergänzungsangebot (at most 1 item)

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<td>Graph Theory and Advanced Location Models</td>
<td>4.5</td>
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<td>T-WIWI-102719</td>
<td>Mixed Integer Programming I</td>
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<td>T-WIWI-102720</td>
<td>Mixed Integer Programming II</td>
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<td>Optimization under Uncertainty</td>
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<td>Optimization Models and Applications</td>
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<td>T-WIWI-106552</td>
<td>Simulation of Stochastic Systems</td>
<td>4.5</td>
<td>Grothe, Rebennack</td>
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Competence Certificate
The assessment is carried out as partial exams (according to § 4(2), 1 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module.

The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Competence Goal
The student

- names and describes basic notions for advanced stochastic optimization methods, in particular, ways to algorithmically exploit the special model structures,
- knows the indispensable methods and models for quantitative analysis of stochastic optimization problems,
- models and classifies stochastic optimization problems and chooses the appropriate solution methods to solve also challenging stochastic optimization problems independently and, if necessary, with the aid of a computer,
- validates, illustrates and interprets the obtained solutions,
- identifies drawbacks of the solution methods and, if necessary, is able to makes suggestions to adapt them to practical problems.

Prerequisites
At least one of the courses "Advanced Stochastic Optimization" and "Large-scale Optimization" has to be taken.

Content
The module focuses on the modeling as well as the imparting of theoretical principles and solution methods for optimization problems with special structure, which occur for example in the stochastic optimization.

Recommendation
It is recommended to listen to the lecture "Introduction to Stochastic Optimization" before the lecture "Advanced Stochastic Optimization" is visited.
Annotation
The course "Introduction to Stochastic Optimization" will be offered until the summer semester 2019 as an additional option in the elective offer of the module. Thereafter, the course can only be selected in the supplementary offer.
The courses are sometimes offered irregularly. The curriculum, planned for three years in advance, can be found on the Internet at http://sop.ior.kit.edu/28.php.

Workload
The total workload for this module is approximately 270 hours (9 credits). The allocation is made according to the credit points of the courses of the module. The total number of hours per course is determined by the amount of time spent attending the lectures and exercises, as well as the exam times and the time required to achieve the module's learning objectives for an average student for an average performance.
### Module: The Riemann Zeta Function [M-MATH-102960]

**Responsible:** Dr. Fabian Januszewski  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Algebra und Geometrie)  
**Elective Field**

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<tr>
<td>T-MATH-105934</td>
<td>The Riemann Zeta Function</td>
<td>4 CR</td>
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<td>Januszewski</td>
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### 3.146 Module: Time Series Analysis [M-MATH-102911]

**Responsible:** Dr. Bernhard Klar  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Stochastik) Elective Field

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**Mandatory**

| T-MATH-105874 | Time Series Analysis | 4 CR | Henze, Klar |

**Prerequisites**

None
### 3.147 Module: Traveling Waves [M-MATH-102927]

**Responsible:** Prof. Dr. Jens Rottmann-Matthes  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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<tr>
<td>T-MATH-105897</td>
<td><strong>Traveling Waves</strong></td>
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3.148 Module: Uncertainty Quantification [M-MATH-104054]

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**Competence Goal**

After successfully taking part in the module's classes and exams, students have gained knowledge and abilities as described in the "Inhalt" section.

Specifically, students know several parametrization methods for uncertainties. Furthermore, students are able to describe the basics of several solution methods (stochastic collocation, stochastic Galerkin, Monte-Carlo). Students can explain the so-called curse of dimensionality.

Students are able to apply numerical methods to solve engineering problems formulated as algebraic or differential equations with uncertainties. They can name the advantages and disadvantages of each method. Students can judge whether specific methods are applicable to the specific problem and discuss their results with specialists and colleagues. Finally, students are able to implement the above methods in computer codes.

**Prerequisites**

None

**Content**

In this class, we learn to propagate uncertain input parameters through differential equation models, a field called Uncertainty Quantification (UQ). Given uncertain input (parameter values, initial or boundary conditions), how uncertain is the output? The first part of the course ("how to do it") gives an overview on techniques that are used. Among these are:

- Sensitivity analysis
- Monte-Carlo methods
- Spectral expansions
- Stochastic Galerkin method
- Collocation methods, sparse grids

The second part of the course ("why to do it like this") deals with the theoretical foundations of these methods. The so-called "curse of dimensionality" leads us to questions from approximation theory. We look back at the very standard numerical algorithms of interpolation and quadrature, and ask how they perform in many dimensions.

**Recommendation**

Numerical methods for differential equations
### 3.149 Module: Variational Methods [M-MATH-105093]

**Responsible:** Prof. Dr. Wolfgang Reichel  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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</table>
# Module: Wavelets [M-MATH-102895]

**Responsible:** Prof. Dr. Andreas Rieder  
**Organisation:** KIT Department of Mathematics  
**Part of:** Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)  
**Elective Field**

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**Prerequisites**  
none
4 Courses

4.1 Course: Adaptive Finite Element Methods [T-MATH-105898]

 Responsible: Prof. Dr. Willy Dörfler
 Organisation: KIT Department of Mathematics
 Part of: M-MATH-102900 - Adaptive Finite Elemente Methods

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Prerequisites
none
4.2 Course: Advanced Empirical Asset Pricing [T-WIWI-110513]

**Responsible:** Jun.-Prof. Dr. Julian Thimme

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101480 - Finance 3
- M-WIWI-101483 - Finance 2

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<th>Version</th>
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<td>Each winter term</td>
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<tr>
<td>WS 19/20 2530570</td>
<td>Übung zu Advanced Empirical Asset Pricing</td>
<td>1 SWS</td>
<td>Practice (Ü)</td>
<td>Thimme</td>
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**Competence Certificate**

The success control takes place in form of a written examination (60 min) during the semester break (according to §4(2), 1 SPO). If the number of participants is low, an oral examination (according to §4 (2), 2 SPO) may also be offered. The examination is offered every semester and can be repeated at any regular examination date.

A bonus can be acquired through successful participation in the practice. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by up to one grade level (0.3 or 0.4). Details will be announced in the lecture.

**Recommendation**

We strongly recommend knowledge of the basic topics in investments (bachelor course), which will be necessary to be able to follow the course. In addition, prior participation in the Asset Pricing Master course is strongly recommended.

**Annotation**

New course from winter semester 2019/2020.

*Below you will find excerpts from events related to this course:*

**Advanced Empirical Asset Pricing**

2530569, WS 19/20, 2 SWS, Language: Englisch, Open in study portal

**Notes**

In this course we will discuss the fundamentals of Asset Pricing and how to test them. Although this is an Empirical Asset Pricing course, we deal with some concepts from Asset Pricing Theory that we can test afterwards (CAPM, ICAPM, CCAPM, recursive utility). Besides, the course will cover the most important empirical methods to do so. For that purpose, we will discuss the overarching tool Generalized Method of Moments, and the special cases of OLS and FMB regressions. Every second week, we will meet for a programing session, in which we will look at the data to draw our own conclusions. An introduction to the software MATLAB will be given at the beginning of the course. Students should bring a laptop to these sessions. Programing skills are not required but helpful.

We start with a review of the Stochastic Discount Factor, which is already known from the course „Asset Pricing”. We then derive the CAPM and the Consumption-CAPM as special cases from the general consumption-savings optimization problem of the rational investor. In the first part of the course we discuss the CAPM and, as natural extensions, models with multiple factors. Prominent phenomena such as the value premium and momentum are discussed. In the second part of the lecture we will study extensions of Consumption-CAPM and study the implications of exotic preferences.
4.3 Course: Advanced Game Theory [T-WIWI-102861]

Responsible: Prof. Dr. Karl-Martin Ehrhart
Prof. Dr. Clemens Puppe
Prof. Dr. Johannes Philipp Reiβ

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-101500 - Microeconomic Theory
M-WIWI-101502 - Economic Theory and its Application in Finance
M-WIWI-102970 - Decision and Game Theory

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Events

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<tr>
<td>WS 19/20</td>
<td>2521533</td>
<td>Advanced Game Theory</td>
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<td>Lecture (V)</td>
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<tr>
<td>WS 19/20</td>
<td>2521534</td>
<td>Übung zu Advanced Game Theory</td>
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<td>Practice (Ü)</td>
<td>Reiβ</td>
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</table>

Competence Certificate
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Prerequisites
None

Recommendation
Basic knowledge of mathematics and statistics is assumed.

Below you will find excerpts from events related to this course:

Advanced Game Theory
2521533, WS 19/20, 2 SWS, Language: Englisch, Open in study portal

Learning Content
This course offers an advanced and rigorous treatment of game theory.

Workload
The total workload for this course is approximately 135.0 hours. For further information see German version.
4.4 Course: Advanced Inverse Problems: Nonlinearity and Banach Spaces [T-MATH-105927]

**Responsible:** Prof. Dr. Andreas Rieder  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-102955 - Advanced Inverse Problems: Nonlinearity and Banach Spaces

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**Prerequisites**  
none
4.5 Course: Advanced Lab Informatics [T-WIWI-103523]

Responsible: Prof. Dr. Andreas Oberweis  
Prof. Dr. Harald Sack  
Prof. Dr. Ali Sunyaev  
Prof. Dr. York Sure-Vetter  
Prof. Dr. Melanie Volkamer  
Prof. Dr.-Ing. Johann Marius Zöllner

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-101472 - Informatics

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<td>3 SWS</td>
<td>Practical course (P)</td>
<td>Oberweis, Toussaint, Ullrich</td>
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<tr>
<td>SS 2019 2512300 Knowledge Discovery and Data Mining</td>
<td>3 SWS</td>
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<td>Sure-Vetter, Färber, Nguyen, Weller</td>
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<tr>
<td>SS 2019 2513306 Data Science &amp; Real-time Big Data Analytics</td>
<td>2 SWS</td>
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<td>Sure-Vetter, Riemer, Zehnder</td>
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<td>WS 19/20 2512100 Security</td>
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<td>WS 19/20 2512101 Business Information Systems: Realisation of innovative services</td>
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<td>WS 19/20 2512301 Linked Data and the Semantic Web</td>
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<td>WS 19/20 2512311 Real-World Challenges in Data Science and Analytics</td>
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<td>Sure-Vetter, Nickel, Weinhardt, Zehnder, Brandt</td>
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<td>WS 19/20 2512400 Sociotechnical Information Systems Development</td>
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<td>WS 19/20 2512501 Projektpрактикum Kognitive Automobile und Roboter</td>
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<td>WS 19/20 2512551 Praktikum Security, Usability and Society</td>
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<td>WS 19/20 2512600 Projektpрактиkum Information Service Engineering</td>
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<td>Practical course (P)</td>
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Competence Certificate Advanced Lab “Privacy Friendly Apps”:
The non exam assessment (§4(2), 3 SPO 2007) or alternative exam assessment (§ 4(2), 3 SPO 2015) consists of a practical work in which a software functionality must be implemented and three interim submissions of the software to be developed. The weighting of the individual components will be announced during the first meeting.

All other courses of the Institute AIFB:
The non exam assessment (§4(2), 3 SPO 2007) or alternative exam assessment (§ 4(2), 3 SPO 2015) consists of:

- a practical work
- a presentation and
- a written seminar thesis

Practical work, presentation and written thesis are weighted according to the course.

Prerequisites None
Annotation
The title of this course is a generic one. Specific titles and the topics of offered seminars will be announced before the start of a semester in the internet at https://portal.wiwi.kit.edu.

Below you will find excerpts from events related to this course:

Knowledge Discovery and Data Mining
2512300, SS 2019, 3 SWS, Language: Englisch, Open in study portal

Description
The seminar includes different methods of machine learning and data mining. Participants of the seminar should have basic knowledge of machine learning and programming skills.

Notes
The exact dates and information for registration will be announced at the event page.

Learning Content
Domains of interest include, but are not limited to:

- Medicine
- Social Media
- Finance Market

Literature
Detailed references are indicated together with the respective subjects. For general background information look up the following textbooks:

- Mitchell, T.; Machine Learning

Data Science & Real-time Big Data Analytics
2513306, SS 2019, 2 SWS, Language: Deutsch/Englisch, Open in study portal

Description
Event processing and real-time data are everywhere: financial market data, sensors, business intelligence, social media analytics, logistics. Many applications collect large volumes of data in real time and are increasingly faced with the challenge of being able to process them quickly and react promptly. The challenges of this real-time processing are currently also receiving a great deal of attention under the term "Big Data". The complex processing of real-time data requires both knowledge of methods for data analysis (data science) and their processing (real-time analytics). Seminar papers are offered on both of these areas as well as on interface topics, the input of own ideas is explicitly desired.

Security
2512100, WS 19/20, 4 SWS, Language: Deutsch, Open in study portal

Notes
More information on https://ilias.studium.kit.edu/goto_produktiv_crs_998421.html

Linked Data and the Semantic Web
2512301, WS 19/20, 3 SWS, Language: Deutsch/Englisch, Open in study portal
Description
The Linked Data principles are a set of practices for data publishing on the web. Linked Data builds on the web architecture and uses HTTP for data access, and RDF for describing data, thus aiming towards web-scale data integration. There is a vast amount of data available published according to those principles: recently, 4.5 billion facts have been counted with information about various domains, including music, movies, geography, natural sciences. Linked Data is also used to make web-pages machine-understandable, corresponding annotations are considered by the big search engine providers. On a smaller scale, devices on the Internet of Things can also be accessed using Linked Data which makes the unified processing of device data and data from the web easy.

In this practical seminar, students will build prototypical applications and devise algorithms that consume, provide, or analyse Linked Data. Those applications and algorithms can also extend existing applications ranging from databases to mobile apps.

For the seminar, programming skills or knowledge about web development tools/technologies are highly recommended. Basic knowledge of RDF and SPARQL are also recommended, but may be acquired during the seminar. Students will work in groups. Seminar meetings will take place as 'Block-Seminar'.

Notes
The exact dates and information for registration will be announced at the event page.

Learning Content
Topics of interest include, but are not limited to:

- Travel Security
- Geo data
- Linked News
- Social Media

Real-World Challenges in Data Science and Analytics
2512311, WS 19/20, 3 SWS, Language: Deutsch/Englisch, Open in study portal

Notes
The exact dates and information for registration will be announced at the event page.

Sociotechnical Information Systems Development
2512400, WS 19/20, 3 SWS, Language: Deutsch/Englisch, Open in study portal

Description
The aim of this course is to provide a practical introduction into developing socio-technical information systems, such as web platforms, mobile apps, or desktop applications. Course participants will create (individually or in groups) software solutions for specific problems from various practical domains. The course tasks comprise requirements assessment, system design, and software implementation. Furthermore, course participants will gain insights into software quality assurance methods and software documentation.

Workload
4 ECTS = approx. 120 h

Praktikum Security, Usability and Society
2512551, WS 19/20, 3 SWS, , Open in study portal

Notes
Kick-off Meeting (compulsory attendance) on 18.10.2019 at 11:00 in room 3A-11.2

Projektpraktikum Information Service Engineering
2512600, WS 19/20, 2 SWS, Language: Englisch, Open in study portal
**Description**

The ISE project course is based on the summer semester lecture "Information Service Engineering". Goal of the course is to work on a research problem in small groups (3-4 students) related to the ISE lecture topics, i.e. Natural Language Processing, Knowledge Graphs, and Machine Learning. The solution of the given research problem requires the development of a software implementation.

The project will be worked on in teams of 3-4 students each, guided by a tutor from the teaching staff.

Required coursework includes:

- Mid term presentation (5-10 min)
- Final presentation (10-15 min)
- Course report (c. 20 pages)
- Participation and contribution of the students during the course
- Software development and delivery

**Notes**

The ISE project course can also be credited as a seminar.

The project will be worked on in teams of 3-4 students each, guided by a tutor from the teaching staff.
4.6 Course: Advanced Lab Security [T-WIWI-109786]

Responsible: Prof. Dr. Melanie Volkamer
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

Type: Examination of another type
Credits: 4,5
Recurrence: Each winter term
Version: 2

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</table>

Competence Certificate
The non exam assessment (§4(2), 3 SPO 2007) or alternative exam assessment (§4(2), 3 SPO 2015) consists of:

- a practical work
- a presentation and possibly
- a written seminar thesis

Practical work, presentation and written thesis are weighted according to the course.

Prerequisites
None

Recommendation
Knowledge from the lecture "Information Security" is recommended.

Below you will find excerpts from events related to this course:

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Notes
More information on https://ilias.studium.kit.edu/goto-produktiv_crs_998421.html

Responsible: Prof. Dr. Melanie Volkamer
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

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<td>Praktikum User Studies in Security and Privacy</td>
<td>3</td>
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Competence Certificate

The non exam assessment (§4(2), 3 SPO 2007) or alternative exam assessment (§ 4(2), 3 SPO 2015) consists of:

- a practical work
- a presentation and possibly
- a written seminar thesis

Practical work, presentation and written thesis are weighted according to the course.

Prerequisites
None
4.8 Course: Advanced Statistics [T-WIWI-103123]

**Responsible:** Prof. Dr. Oliver Grothe

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-101637 - Analytics and Statistics

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**Competence Certificate**

The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation. A bonus program can improve the grade by one grade level (i.e. by 0.3 or 0.4). The exam is offered every semester. Re-examinations are offered only for repeaters.

**Prerequisites**

None

**Annotation**

New course starting winter term 2015/2016

Below you will find excerpts from events related to this course:

**Statistik für Fortgeschrittene**

2550552, WS 19/20, 2 SWS, Open in study portal

**Learning Content**

Basic principles
Types of convergence and limit theorems
Multivariate Distributions
Copulas
Simulation techniques, Bootstrap
Statistical Estimation
Statistical Testing
Simulation studies

**Literature**

Comprehensive lecture notes
### 4.9 Course: Advanced Stochastic Optimization [T-WIWI-106548]

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**Responsible:** Prof. Dr. Steffen Rebennack  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101473 - Mathematical Programming  
- M-WIWI-103289 - Stochastic Optimization

**Competence Certificate**  
The assessment consists of a written exam (60 minutes) according to Section 4(2), 1 of the examination regulation. The exam takes place in every semester.

**Prerequisites**  
None.
4.10 Course: Advanced Topics in Economic Theory [T-WIWI-102609]

**Responsible:** Prof. Dr. Kay Mitusch

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101500 - Microeconomic Theory
- M-WIWI-101502 - Economic Theory and its Application in Finance

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<td>Übung zu Advanced Topics in Economic Theory</td>
<td>Practice (Ü)</td>
<td>1 SWS</td>
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</table>

**Competence Certificate**
The course T-WIWI-102609 "Advanced Topics in Economic Theory" restarts in summer term 2019.
The assessment consists of a written exam (60min) (following §4(2), 1 of the examination regulation) at the end of the lecture period or at the beginning of the following semester.

**Prerequisites**
None

**Recommendation**
This course is designed for advanced Master students with a strong interest in economic theory and mathematical models. Bachelor students who would like to participate are free to do so, but should be aware that the level is much more advanced than in other courses of their curriculum.

*Below you will find excerpts from events related to this course:*

**Advanced Topics in Economic Theory**
2520527, SS 2019, 2 SWS, Language: Englisch, Open in study portal

**Learning Content**
The course deals with basic elements of modern economic theory. It is divided into two parts. The first part introduces the microeconomic foundations of general equilibrium à la Debreu ("The Theory of Value", 1959) and Hildenbrand/Kirman ("Equilibrium Analysis", 1988). The second part deals with asymmetric information and introduces the basic techniques of contract theory.
The course is largely based on the textbook "Microeconomic Theory" (Chapters 1-5, 10, 13-20) by A.Mas-Colell, M.D.Whinston, and J.R.Green.

**Workload**
The total workload for this course is approximately 135.0 hours. For further information see German version.

**Literature**
The course is based on the excellent textbook "Microeconomic Theory" (Chapters 1-5, 10, 13-20) by A.Mas-Colell, M.D.Whinston, and J.R.Green.
## T 4.11 Course: Algebra [T-MATH-102253]

**Responsible:** Prof. Dr. Frank Herrlich  
Dr. Stefan Kühnlein  

**Organisation:** KIT Department of Mathematics  

**Part of:** M-MATH-101315 - Algebra

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<td>Herrlich</td>
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</table>
4.12 Course: Algebraic Geometry [T-MATH-103340]

**Responsible:** Prof. Dr. Frank Herrlich  
Dr. Stefan Kühnlein

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-101724 - Algebraic Geometry

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<td>0152100</td>
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<td>2 SWS</td>
<td>Practice (Ü)</td>
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4.13 Course: Algebraic Number Theory [T-MATH-103346]

**Responsible:** Dr. Stefan Kühnlein

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-101725 - Algebraic Number Theory

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</table>
4.14 Course: Algebraic Topology [T-MATH-105915]

**Responsible:** Dr. Holger Kammeyer
               Prof. Dr Roman Sauer

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102948 - Algebraic Topology

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**Prerequisites**

none
4.15 Course: Algebraic Topology II [T-MATH-105926]

Responsible: Prof. Dr Roman Sauer
Organisation: KIT Department of Mathematics
Part of: M-MATH-102953 - Algebraic Topology II

Type: Written examination
Credits: 8
Recurrence: Irregular
Version: 1

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Prerequisites
none
4.16 Course: Applied Econometrics [T-WIWI-103125]

**Responsible:** Prof. Dr. Melanie Schienle

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-101638 - Econometrics and Statistics I

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**Competence Certificate**
The assessment of this course is a written examination (90 min) according to §4(2), 1 of the examination regulation.

**Prerequisites**
None

**Annotation**
The course is not offered regularly.

**Responsible:** Prof. Dr. Ali Sunyaev

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-101472 - Informatics

**Type**

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**Competence Certificate**

The assessment consists of a written exam (120 min) according to Section 4(2), 1 of the examination regulation. The successful completion of the exercises is recommended for the written exam, which is offered at the end of the winter semester and at the end of the summer semester.

By successful processing the exercises a bonus can be obtained. If the grade of the written exam is at least 4.0 and at most 1.3, the bonus will improve it by one grade level (i.e. by 0.3 or 0.4).

**Prerequisites**

None

**Annotation**

Replaces from winter semester 2019/2020 T-WIWI-109445 "Applied Informatics - Internet Computing".

Below you will find excerpts from events related to this course:

**Learning Content**

The lecture Applied Computer Science II provides insights into fundamental concepts and future technologies of distributed systems and Internet computing. Students should be able to select, design and apply the presented concepts and technologies. The course first introduces basic concepts of distributed systems (e.g. design of architectures for distributed systems, internet architectures, web services, middleware).

In the second part of the course, emerging technologies of Internet computing will be examined in depth. These include, among others:

- Cloud Computing
- Edge & Fog Computing
- Internet of Things
- Blockchain
- Artificial Intelligence

**Workload**

The total workload for this course is approximately 150 hours. For further information see German version.

**Literature**

Tba in the lecture.
4.18 Course: Asset Pricing [T-WIWI-102647]

**Responsible:** Prof. Dr. Martin Ruckes  
Prof. Dr. Marliese Uhrig-Homburg

**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101480 - Finance 3  
- M-WIWI-101482 - Finance 1  
- M-WIWI-101483 - Finance 2  
- M-WIWI-101502 - Economic Theory and its Application in Finance

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**Competence Certificate**  
The success control takes place in form of a written examination (75 min) during the semester break (according to §4(2), 1 SPO). The examination is offered every semester and can be repeated at any regular examination date. A bonus can be acquired through successful participation in the practice. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by up to one grade level (0.3 or 0.4). Details will be announced in the lecture.

**Prerequisites**  
None

**Recommendation**  
We strongly recommend knowledge of the basic topics in investments (bachelor course), which will be necessary to be able to follow the course.

*Below you will find excerpts from events related to this course:*

**Asset Pricing**  
2530555, SS 2019, 2 SWS, Language: Deutsch, [Open in study portal](#)

**Description**  
The lecture deals with the diverse issues arising in the context of measuring and controlling credit risk. At first, the theoretical and empirical relations between ratings, probabilities of default, and credit spreads are analysed. After that, the focus is on the valuation of credit risk. Finally, the management of credit risk, e.g. using credit derivatives and credit portfolio analysis, is examined, and the legal framework and its implications are discussed.

**Learning Content**  
This lecture deals with the valuation of risky cash flows. A stochastic discount model and a central equation will be introduced, which form the basis of nearly every valuation model in finance. That includes the valuation of stocks, bonds and derivatives. The first part of the lecture will present the theory, the second part covers empirical questions related to this approach.

**Workload**  
The total workload for this course is approximately 135.0 hours. For further information see German version.
Literature

Basic literature


Elective literature

4.19 Course: Asymptotic Stochastics [T-MATH-105866]

Responsible: Prof. Dr. Vicky Fasen-Hartmann
            Prof. Dr. Norbert Henze
            Dr. Bernhard Klar

Organisation: KIT Department of Mathematics
Part of: M-MATH-102902 - Asymptotic Stochastics

Type: Oral examination
Credits: 8
Version: 1

Events

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<td>WS 19/20</td>
<td>0118000</td>
<td>Asymptotische Stochastik</td>
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<td>Lecture (V)</td>
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<td>WS 19/20</td>
<td>0118100</td>
<td>Tutorial for 0118000 (asymptotic Stochastics)</td>
<td>2</td>
<td>Practice (Ü)</td>
<td>N.N.</td>
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Prerequisites:
none
4.20 Course: Auction Theory [T-WIWI-102613]

Responsible: Prof. Dr. Karl-Martin Ehrhart
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101500 - Microeconomic Theory
M-WIWI-102970 - Decision and Game Theory

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Events

| WS 19/20 | 2520408 | Auktionstheorie | 2 SWS | Lecture (V) | Ehrhart |
| WS 19/20 | 2520409 | Übungen zu Auktionstheorie | 1 SWS | Practice (Ü) | Ehrhart |

Competence Certificate

The assessment of this course is a written examination (following §4(2), 1 SPO) of 60 mins. The exam is offered each semester.

Prerequisites

None

Below you will find excerpts from events related to this course:

Learning Content

This course deals with the analysis and modeling of auction which are based on game theory. This also includes aspects of applying and designing auctions as well as experiences with auctions. Main topics are:

- Single- and multi-unit auctions
- Selling and procurement auctions
- Electronic auctions (e.g. eBay, C2C, B2B)
- Multi-attributive auctions.

Annotation

We suggest to attend either Game Theory I or Decision Theory beforehand.

Workload

The total workload for this course is approximately 135.0 hours. For further information see German version.

Literature

- Ehrhart , K.-M. und S. Seifert: Auktionstheorie, Skript zur Vorlesung, KIT, 2011
- Ausubel, L.M. und P. Cramton: Demand Reduction and Inefficiency in Multi-Unit Auctions, University of Maryland, 1999
### 4.21 Course: Automated Financial Advisory [T-WIWI-106495]

**Responsible:** Prof. Dr Maxim Ulrich  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-103261 - Disruptive FinTech Innovations

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**Events**

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<tr>
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<td>2530372</td>
<td>Automated Financial Advisory</td>
<td>2 SWS</td>
<td>Seminar (S)</td>
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</table>

**Competence Certificate**

The grade consists of a written thesis and an oral presentation.

**Prerequisites**

There are two conditions for taking this course:

1. This course is only open for registered students of the module “Disruptive FinTech Innovations”.
2. Registered students do also attend in the same semester the lecture “Engineering FinTech Solutions” and the programming internship "Computational FinTech with Python and C++”.

*Below you will find excerpts from events related to this course:*

**Automated Financial Advisory**  
2530372, SS 2019, 2 SWS, Language: Englisch, Open in study portal

**Learning Content**

At the beginning of the semester, a selection of seminar topics will be discussed with each student of the seminar.

**Workload**

The total workload for this course is approximately 90 hours.

**Literature**

Literature will be distributed during the first lecture.
### 4.22 Course: Bifurcation Theory [T-MATH-106487]

**Responsible:** Dr. Rainer Mandel  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-103259 - Bifurcation Theory

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**Prerequisites**  
None
4.23 Course: Blockchains & Cryptofinance [T-WIWI-108880]

**Responsible:**
- Dr. Philipp Schuster
- Prof. Dr. Marliese Uhrig-Homburg

**Organisation:**
KIT Department of Economics and Management

**Part of:**
- M-WIWI-101480 - Finance 3
- M-WIWI-101483 - Finance 2

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<td>WS 19/20</td>
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<td>Übung zu Blockchains &amp; Cryptofinance</td>
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<td>Müller</td>
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**Competence Certificate**
The assessment consists of a written exam (75 min) (§4(2), 1 of the examination regulations). A bonus can be acquired through successful participation in the practice. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by up to one grade level (0.3 or 0.4). Details will be announced in the lecture.

**Prerequisites**
None

**Recommendation**
None

**Annotation**

Below you will find excerpts from events related to this course:

**Blockchains & Cryptofinance**
2530567, WS 19/20, 2 SWS, Language: Deutsch, [Open in study portal](#)

**Workload**
Gesamtaufwand bei 4,5 Leistungspunkten: ca. 135.0 Stunden
Präsenzzeit: 30 Stunden
Vor – und Nachbereitung der LV: 45.0 Stunden
Prüfung und Prüfungsvorbereitung: 60.0 Stunden
4.24 Course: Bott Periodicity [T-MATH-108905]

**Responsible:** Prof. Dr. Wilderich Tuschmann

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-104349 - Bott Periodicity

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**Prerequisites**

none
4.25 Course: Boundary and Eigenvalue Problems [T-MATH-105833]

**Responsible:**
- Prof. Dr. Dirk Hundertmark
- Prof. Dr. Tobias Lamm
- Prof. Dr. Michael Plum
- Prof. Dr. Wolfgang Reichel
- Prof. Dr. Jens Rottmann-Matthes
- Prof. Dr. Roland Schnaubelt
- Prof. Dr. Lutz Weis

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102871 - Boundary and Eigenvalue Problems

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<td>0157500</td>
<td>4 SWS Lecture (V)</td>
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<td>SS 2019 Übungen zu 0157500</td>
<td>0157510</td>
<td>2 SWS Practice (Ü)</td>
<td>Reichel</td>
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4.26 Course: Boundary Element Methods [T-MATH-109851]

**Responsible:** PD Dr. Tilo Arens

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-103540 - Boundary Element Methods

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**Prerequisites**

none
4.27 Course: Brownian Motion [T-MATH-105868]

**Responsible:**  Prof. Dr. Nicole Bäuerle  
Prof. Dr. Vicky Fasen-Hartmann  
Prof. Dr. Günter Last

**Organisation:**  KIT Department of Mathematics

**Part of:**  M-MATH-102904 - Brownian Motion

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<td>Lecture (V)</td>
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<td>0155710</td>
<td>Übungen zu 0155700 (Brownsche Bewegung)</td>
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<td>Practice (Ü)</td>
<td>Bäuerle</td>
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**Prerequisites**

none
4.28 Course: Business Intelligence Systems [T-WIWI-105777]

**Responsible:** Prof. Dr. Alexander Mädche
Mario Nadj
Peyman Toreini

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-104068 - Information Systems in Organizations

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**Events**

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**Competence Certificate**

Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation. Students receive one aggregated grade consisting of a written exam (60%) and the Business Intelligence System challenge (40%). The exam and the Business Intelligence System challenge need to be both passed. A fail in one element results in a fail of the entire lecture. There will be one retake possibility for the exam, no retake possibilities will be provided for the Business Intelligence System challenge.

**Prerequisites**

None

**Recommendation**

Basic knowledge on database systems is helpful.

*Below you will find excerpts from events related to this course:*

**Description**

In most modern enterprises, Business Intelligence Systems represent a core enabler of managerial decision making in that they are supplying up-to-date and accurate information about all relevant aspects of a company’s planning and operations: from stock levels to sales volumes, from process cycle times to key indicators of corporate performance.

The aim of this course is to introduce theoretical foundations, concepts, tools, and current practice of Business Intelligence Systems from a managerial and technical perspective. The lecture is complemented with a Business Intelligence System challenge, where students work with real-world data and enable system-based decision making using commercial Business Intelligence software packages.

**Learning Content**

- Conceptual Foundations
- Provisioning: ETL Process, Metadata, Data Warehouse & Data Marts and Big Data Technologies
- Consumption: Reporting, Dashboards and its relation to (Big Data) Analytics
- BI Strategy & Governance
- BI Implementation & Post-Implementation Management
- Business Intelligence System Challenge (in cooperation with industry partner)
Literature
Economist Intelligence Unit. 2015 “Big data evolution: Forging new corporate capabilities for the long term”
4.29 Course: Business Process Modelling [T-WIWI-102697]

**Responsible:** Prof. Dr. Andreas Oberweis

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-101472 - Informatics

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<td>Practice (Ü)</td>
<td>Oberweis, Schüler, Schreiber</td>
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**Competence Certificate**

The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation in the first week after lecture period.

**Prerequisites**

None

Below you will find excerpts from events related to this course:

**Business Process Modelling**

2511210, WS 19/20, 2 SWS, Language: Deutsch, [Open in study portal]

**Lecture (V)**

**Learning Content**

The proper modeling of relevant aspects of business processes is essential for an efficient and effective design and implementation of processes. This lecture presents different classes of modeling languages and discusses the respective advantages and disadvantages of using actual application scenarios. For that simulative and analytical methods for process analysis are introduced. In the accompanying exercise the use of process modeling tools is practiced.

**Workload**

- Lecture 30h
- Exercise 15h
- Preparation of lecture 30h
- Preparation of exercises 30h
- Exam preparation 44h
- Exam 1h

Total: 150h

**Literature**


Further Literature will be given in the lecture.
4.30 Course: Business Strategies of Banks [T-WIWI-102626]

**Type**
- Written examination

**Credits**
- 3

**Recurrence**
- Each winter term

**Version**
- 1

**Responsible:** Prof. Dr. Wolfgang Müller

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101480 · Finance 3
- M-WIWI-101483 · Finance 2

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<td>Written examination</td>
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<td>Each winter term</td>
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**Competence Certificate**
See German version.

**Prerequisites**
None

**Recommendation**
None

Below you will find excerpts from events related to this course:

Business Strategies of Banks

Lecture (V)

WS 19/20 2530299 Business Strategies of Banks 2 SWS Lecture (V) Müller

**Description**
The management of a bank is in charge of the determination and implementation of business policy - taking into account all relevant endogenous and exogenous factors - that assures the bank's success in the long run. In this context, there exists a large body of banking models and theories which are helpful in describing the success and risk of a bank. This course is meant to be the bridging of banking theory and practical implementation. In the course of the lectures students will learn to take on the bank management's perspective.

The first chapter deals with the development of the banking sector. Making use of appropriate assumptions, a banking policy is developed in the second chapter. The design of bank services (ch. 3) and the adequate marketing plan (ch. 4) are then built on this framework. The operational business of banks must be guided by appropriate risk and earnings management (ch. 5 and 6), which are part of the overall (global) bank management (ch. 7). Chapter eight, at last, deals with the requirements and demands of bank supervision as they have significant impact on a bank's corporate policy.

**Learning Content**
The management of a bank is in charge of the determination and implementation of business policy - taking into account all relevant endogenous and exogenous factors - that assures the bank's success in the long run. In this context, there exists a large body of banking models and theories which are helpful in describing the success and risk of a bank. This course is meant to be the bridging of banking theory and practical implementation. In the course of the lectures students will learn to take on the bank management's perspective.

The first chapter deals with the development of the banking sector. Making use of appropriate assumptions, a banking policy is developed in the second chapter. The design of bank services (ch. 3) and the adequate marketing plan (ch. 4) are then built on this framework. The operational business of banks must be guided by appropriate risk and earnings management (ch. 5 and 6), which are part of the overall (global) bank management (ch. 7). Chapter eight, at last, deals with the requirements and demands of bank supervision as they have significant impact on a bank’s corporate policy.

**Workload**
The total workload for this course is approximately 90 hours. For further information see German version.

**Literature**

Elective literature:
- A script is disseminated chapter by chapter during the course of the lecture.
- Hartmann-Wendels, Thomas; Pfingsten, Andreas; Weber, Martin; 2000, Bankbetriebslehre, 6th edition, Springer
4.31 Course: Challenges in Supply Chain Management [T-WIWI-102872]

**Responsible:** Esther Mohr

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-102805 - Service Operations

---

### Competence Certificate

The assessment consists of a written paper and an oral exam of ca. 30-40 min (non exam assessment ($\S4$ (2), 3 SPO 2007) respectively alternative exam assessments ($\S4$(2), 3 SPO 2015)).

### Prerequisites

None

### Recommendation

Basic knowledge as conveyed in the module "Introduction to Operations Research" is assumed.

### Annotation

The number of course participants is limited to 12 participants due to joint work in BASF project teams. Due to these capacity restrictions, registration before course start is required. For further information see the webpage of the course.

The course is offered irregularly. The planned lectures and courses for the next three years are announced online.

---

Below you will find excerpts from events related to this course:

---

### Challenges in Supply Chain Management

**Type:** Written examination

**Credits:** 4.5

**Recurrence:** Each summer term

**Version:** 1

**Events**

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<th>2550494</th>
<th>Challenges in Supply Chain Management</th>
<th>3 SWS</th>
<th>Lecture (V)</th>
<th>Mohr</th>
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</table>

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### Learning Content

The course consists of case studies of BASF which cover future challenges of supply chain management. Thus, the course aims at a case-study based presentation, critical evaluation and exemplary discussion of recent questions in supply chain management. The focus lies on future challenges and trends, also with regard to their applicability in practical cases (especially in the chemical industry).

The main part of the course is working on a project together with BASF in Ludwigshafen. The students get in touch with scientific working: The in-depth work with a special scientific topic makes the students familiar with scientific literature research and argumentation methods. As a further aspect of scientific work, especially for Master students the emphasis is put on a critical discussion of the project topic.

This course will include working on cutting edge supply chain topics like Industry 4.0 / “Internet of Everything in production”, supply chain analytics, risk management, procurement and production in SCM. The team essays / project reports will be linked to industry-related challenges as well as to upcoming theoretical concepts. The topics of the seminar will be announced at the beginning of the term in a preliminary meeting.

### Annotation

The number of course participants is limited to 12 participants due to joint work in BASF project teams. Due to these capacity restrictions, registration before course start is required. For further information see the webpage of the course.

The course is offered irregularly. The planned lectures and courses for the next three years are announced online.

### Workload

The total workload for this course is approximately 135.0 hours. For further information see German version.

### Literature

To be defined depending on the topic.
4.32 Course: Classical Methods for Partial Differential Equations [T-MATH-105832]

**Responsible:**
Prof. Dr. Dirk Hundertmark  
Prof. Dr. Tobias Lamm  
Prof. Dr. Michael Plum  
Prof. Dr. Wolfgang Reichel  
Prof. Dr. Roland Schnaubelt  
Prof. Dr. Lutz Weis

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102870 - Classical Methods for Partial Differential Equations

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<td>Classical Methods for Partial Differential Equations</td>
<td>4 SWS</td>
<td>Lecture (V)</td>
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<td>WS 19/20 0105310</td>
<td>Written examination</td>
<td>2 SWS</td>
<td>1</td>
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<td>Tutorial for 0105300 (Classical Methods for Partial Differential Equations)</td>
<td>Practice (Ü)</td>
<td>Plum</td>
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4.33 Course: Combinatorics [T-MATH-105916]

Responsible: Prof. Dr. Maria Aksenovich
Organisation: KIT Department of Mathematics
Part of: M-MATH-102950 - Combinatorics

Type
Written examination

Credits
8

Recurrence
Irregular

Version
1

Prerequisites
none
4 COURSES

4.34 Course: Commutative Algebra [T-MATH-108398]

Responsible: Prof. Dr. Frank Herrlich
Organisation: KIT Department of Mathematics
Part of: M-MATH-104053 - Commutative Algebra

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Prerequisites
none
**4.35 Course: Comparison Geometry [T-MATH-105917]**

**Responsible:** Prof. Dr. Wilderich Tuschmann  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-102940 - Comparison Geometry

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**Prerequisites**  
Keine
### 4.36 Course: Comparison of Numerical Integrators for Nonlinear Dispersive Equations [T-MATH-109040]

**Responsible:** Prof. Dr Katharina Schratz  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-104426 - Comparison of Numerical Integrators for Nonlinear Dispersive Equations

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**Prerequisites**  
none
4.37 Course: Complex Analysis [T-MATH-105849]

**Responsible:**  
PD Dr. Gerd Herzog  
Prof. Dr. Michael Plum  
Prof. Dr. Wolfgang Reichel  
Dr. Christoph Schmoeger  
Prof. Dr. Roland Schnaubelt  
Prof. Dr. Lutz Weis

**Organisation:**  
KIT Department of Mathematics

**Part of:**  
M-MATH-102878 - Complex Analysis

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Economathematics M.Sc.  
Module Handbook as of 22.08.2019
4.38 Course: Compressive Sensing [T-MATH-105894]

** Responsible:** Prof. Dr. Andreas Rieder
** Organisation:** KIT Department of Mathematics
** Part of:** M-MATH-102935 - Compressive Sensing

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Economathematics M.Sc.
Module Handbook as of 22.08.2019
4.39 Course: Computational Economics [T-WIWI-102680]

**Responsible:** Dr. rer. nat. Pradyumn Kumar Shukla

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-101472 - Informatics

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<td>Shukla</td>
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</table>

**Competence Certificate**

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation). By successful completion of the exercises (§4 (2), 3 SPO 2007 respectively §4 (3) SPO 2015) a bonus can be obtained. If the grade of the written exam is at least 4.0 and at most 1.3, the bonus will improve it by one grade level (i.e. by 0.3 or 0.4). The bonus only applies to the first and second exam of the semester in which it was obtained.

**Prerequisites**

None

**Annotation**

The credits have been changed to 5 starting summer term 2016.

*Below you will find excerpts from events related to this course:*

### Computational Economics

2590458, WS 19/20, 2 SWS, Language: Englisch, [Open in study portal](#)

**Lecture (V)**

**Learning Content**

Examining complex economic problems with classic analytical methods usually requires making numerous simplifying assumptions, for example that agents behave rationally or homogeneously. Recently, widespread availability of computing power gave rise to a new field in economic research that allows the modeling of heterogeneity and forms of bounded rationality: Computational Economics. Within this new discipline, computer based simulation models are used for analyzing complex economic systems. In short, an artificial world is created which captures all relevant aspects of the problem under consideration. Given all exogenous and endogenous factors, the modelled economy evolves over time and different scenarios can be analyzed. Thus, the model can serve as a virtual testbed for hypothesis verification and falsification.

**Literature**


**Elective literature:**

4.40 Course: Computational FinTech with Python and C++ [T-WIWI-106496]

Responsible: Prof. Dr Maxim Ulrich
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-103261 - Disruptive FinTech Innovations

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Events

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<td></td>
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</table>

Competence Certificate
The grade is based on a larger or several smaller programming exercises.

Prerequisites
There are two conditions for taking this course:

1. This course is only open for registered students of the module “Disruptive FinTech Innovations”.
2. Registered students do also attend in the same semester the lecture “Engineering FinTech Solutions” and the seminar “Automated Financial Advisory”.

Below you will find excerpts from events related to this course:

Learning Content
At the beginning of the semester, each student receives a personalized set of programming tasks.

Workload
Roughly 45 hours.
4.41 Course: Computational Risk and Asset Management [T-WIWI-102878]

**Responsible:** Prof. Dr Maxim Ulrich  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-105032 - Data Science for Finance

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<td>4 SWS</td>
<td>Lecture (V)</td>
<td>Ulrich</td>
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</table>

**Competence Certificate**

The assessment consists of a written exam (90 minutes) according to §4(2) of the examination regulation.

**Recommendation**

Good knowledge of statistics and first programming experience with Python is recommended.

Below you will find excerpts from events related to this course:

**Description**

The aim of this course is to master real-world challenges of computational risk and asset management and provide students with a skill set to incorporate different portfolio objectives into the investment process. It enables students to solve such challenges independently in Python.

**Learning Content**

The course covers several topics, among them:

- Quantitative Portfolio Strategies: Extensions to Mean-Variance Portfolio Optimization
- Return Densities: Forecasting with Traditional and Machine Learning Approaches, Monte Carlo Simulation
- Financial Economics: Rationalizing Risk Premiums via Stochastic Discount Factor
- Multi-Asset Valuation: DCF Approach, No-Arbitrage and Ito Calculus

**Workload**

The total workload for this course is approximately 180 hours.

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<thead>
<tr>
<th>Responsible</th>
<th>Prof. Dr. Michael Plum</th>
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4.43 Course: Continuous Time Finance [T-MATH-105930]

**Responsible:** Prof. Dr. Nicole Bäuerle  
Prof. Dr. Vicky Fasen-Hartmann

**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-102860 - Continuous Time Finance

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<td>2 SWS</td>
<td>Practice (Ü)</td>
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</table>
**4.44 Course: Control Theory [T-MATH-105909]**

**Responsible:** Prof. Dr. Roland Schnaubelt  
Prof. Dr. Lutz Weis

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102941 - Control Theory

- **Type:** Oral examination
- **Credits:** 6
- **Version:** 1

**Prerequisites**
none
4.45 Course: Convex Analysis [T-WIWI-102856]

**Responsible:** Prof. Dr. Oliver Stein  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101473 - Mathematical Programming

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| Events |  
|---|---|
| SS 2019 | 2550120 |
| Konvexe Analysis | SWS | Lecture (V) | Stein |

**Competence Certificate**  
The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation. The examination is held in the semester of the lecture and in the following semester. Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

**Prerequisites**  
None

**Recommendation**  
It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

**Annotation**  
The lecture is offered irregularly. The curriculum of the next three years is available online (www.ior.kit.edu).

Below you will find excerpts from events related to this course:

**Konvexe Analysis**  
2550120, SS 2019, SWS, , Open in study portal  
Lecture (V)

**Learning Content**  
Convex Analysis deals with properties of convex functions and convex sets, in particular with respect to the minimization of convex functions over convex sets. That the involved functions are not necessarily assumed to be differentiable allows a number a applications which are not covered by techniques from smooth optimization, e.g. approximation problems with respect to the Manhattan or maximum norms, classification problems or the theory of statistical estimates. The lecture develops along another, geometrically simple example, where a nonsmooth obstacle set is to be described by a single smooth convex constraint such that minimal and maximal distances to the obstacle can be computed. The lecture is structured as follows:

- Introductory examples and terminology
- Convex subdifferential, Lipschitz continuity and the safety margin
- Normal cones, error bounds and the maximal distance

**Literature**  
**Elective literature:**

4.46 Course: Convex Geometry [T-MATH-105831]

**Responsible:** Prof. Dr. Daniel Hug  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-102864 - Convex Geometry  

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<tbody>
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</table>
4.47 Course: Corporate Financial Policy [T-WIWI-102622]

**Responsible:** Prof. Dr. Martin Ruckes

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101480 · Finance 3
- M-WIWI-101483 · Finance 2
- M-WIWI-101502 · Economic Theory and its Application in Finance

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<td>see Annotations</td>
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**Competence Certificate**
The assessment of this course is a written examination (following §4(2), 1 SPO) of 60 mins.
The exam is offered each semester.

**Prerequisites**
None

**Annotation**
The course will exceptionally be held in the winter semester 2019/2020. Usually, however, the event takes place in the summer semester.
4.48 Course: Corporate Risk Management [T-WIWI-109050]

Responsibilities: Prof. Dr. Martin Ruckes
Organisation: KIT Department of Economics and Management
Part of:
- M-WIWI-101480 - Finance 3
- M-WIWI-101483 - Finance 2
- M-WIWI-101502 - Economic Theory and its Application in Finance

Type: Written examination
Credits: 4.5
Recurrence: Each summer term
Version: 2

Events
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Competence Certificate
The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation. The exam is offered each semester. If there are only a small number of participants registered for the exam, we reserve the right to hold an oral examination instead of a written one.

Prerequisites
None

Recommendation
None

Annotation
The course is offered as a block course in the summer term.

Below you will find excerpts from events related to this course:

Corporate Risk Management
2530218, SS 2019, SWS, Language: Englisch, Open in study portal

Learning Content
- Stochastic basics
- Firm decisions under risk - expected utility theory
- The value motive for corporate risk management
- Common risk measures from practice (e.g. Cash-flow at Risk)
- Operational and financial risk management instruments
- The risk management organization (central vs. decentral)
- External risk reporting (e.g. obligations and incentives)

Workload
The total workload of this course is approximately 135.0 hours. For further information, see German version.

Literature
Übung zu Corporate Risk Management

2530219, SS 2019, SWS, Language: Englisch, Open in study portal

Learning Content

- Stochastic basics
- Firm decisions under risk - expected utility theory
- The value motive for corporate risk management
- Common risk measures from practice (e.g. Cash-flow at Risk)
- Operational and financial risk management instruments
- The risk management organization (central vs. decentral)
- External risk reporting (e.g. obligations and incentives)

Workload
The total workload of this course is approximately 135.0 hours. For further information, see German version.

Literature


V 2530220, WS 19/20, SWS, Language: Englisch, Open in study portal

Learning Content

- Stochastic basics
- Firm decisions under risk - expected utility theory
- The value motive for corporate risk management
- Common risk measures from practice (e.g. Cash-flow at Risk)
- Operational and financial risk management instruments
- The risk management organization (central vs. decentral)
- External risk reporting (e.g. obligations and incentives)

Workload
The total workload of this course is approximately 135.0 hours. For further information, see German version.

Literature

4.49 Course: Country Manager Simulation [T-WIWI-106137]

**Responsible:** Dr. Sven Feurer

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-101490 - Marketing Management

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<td>Each winter term</td>
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</table>

**Competence Certificate**

Alternative exam assessment (30 minutes presentation) according to § 4 paragraph 2 Nr. 3 of the examination regulation SPO 2015.

**Annotation**

The course language is English. In order to participate in this course, you need to apply. Applications are usually accepted at the start of the lecture period in winter term. Detailed information on the application process is usually provided on the website of the Marketing and Sales Research Group (marketing.iism.kit.edu) shortly before the lecture period in winter term starts. Please note that only one of the 1.5-ECTS courses can be chosen in this Module.

Please note: The number of participants for this course is limited. The Marketing and Sales Research Group typically provides the possibility to attend a course with 1.5 ECTS in the respective module to all students. Participation in a specific course cannot be guaranteed.

**Below you will find excerpts from events related to this course:**

**Country Manager**

2572172, WS 19/20, 1 SWS, Language: Englisch, Open in study portal

**Learning Content**

Understanding Culture
Understanding International Buyer Behavior
Market Entry Decisions
International Marketing and Sales Management (adaptation vs. differentiation)

**Annotation**

- The course language is English.
- In order to participate in this course, you need to apply. Applications are usually accepted at the start of the lecture period in winter term. Detailed information on the application process is usually provided on the website of the Marketing and Sales Research Group (marketing.iism.kit.edu) shortly before the lecture period in winter term starts.
- Please note that only one of the 1.5 ECTS courses can be chosen in the module.
- Please note: The number of participants for this course is limited. The Marketing and Sales Research Group typically provides the possibility to attend a course with 1.5 ECTS in the respective module to all students. Participation in a specific course cannot be guaranteed.

**Workload**

Total workload for 1.5 ECTS: ca. 45 hours

**Literature**

4.50 Course: Credit Risk [T-WIWI-102645]

Responsible: Prof. Dr. Marliese Uhrig-Homburg
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101480 - Finance 3
M-WIWI-101483 - Finance 2

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Events

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Competence Certificate
The assessment consists of a written exam (75 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation and may be supplemented by a non exam assessment according to § 4 paragraph 2 Nr. 3. The examination is offered every semester and can be repeated at every regular examination date.
A bonus can be acquired through successful participation in the practice. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by up to one grade level (0.3 or 0.4). Details will be announced in the lecture.

Prerequisites
None

Recommendation
Knowledge from the course "Derivatives" is very helpful.

Annotation
See German version.

Below you will find excerpts from events related to this course:

Description
The lecture deals with the diverse issues arising in the context of measuring and controlling credit risk. At first, the theoretical and empirical relations between ratings, probabilities of default, and credit spreads are analysed. After that, the focus is on the valuation of credit risk. Finally, the management of credit risk, e.g. using credit derivatives and credit portfolio analysis, is examined, and the legal framework and its implications are discussed.

Learning Content
The lecture deals with the diverse issues arising in the context of measuring and controlling credit risk. At first, the theoretical and empirical relations between ratings, probabilities of default, and credit spreads are analysed. After that, the focus is on the valuation of credit risk. Finally, the management of credit risk, e.g. using credit derivatives and credit portfolio analysis, is examined, and the legal framework and its implications are discussed.

Workload
The total workload for this course is approximately 135.0 hours. For further information see German version.
Literature


Elective literature:

4.51 Course: Critical Information Infrastructures [T-WIWI-109248]

Responsible: Prof. Dr. Ali Sunyaev
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

Type: Examination of another type
Credits: 4,5
Recurrence: Each winter term
Version: 4

Events

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<td>Lecture (V)</td>
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Competence Certificate
The alternative exam assessment (§ 4(2), 3 SPO 2015) consists of

- the preparation of a written elaboration as well as
- an oral examination as part of a presentation of the work.

Details of the grades will be announced at the beginning of the course.

Prerequisites
None.

Annotation

Below you will find excerpts from events related to this course:

Critical Information Infrastructures
2511400, WS 19/20, 2 SWS, Language: Deutsch/Englisch, Open in study portal

Description
The lecture critical information infrastructures introduces students to the world of these complex sociotechnical systems that permeate societies on a global scale. Students will learn to handle the complexities involved in the design, development, operation and evaluation of critical information infrastructures. In the beginning of the lecture, critical information infrastructures will be introduced on a general level. The following sessions will focus on an in-depth exploration of selected cases that represent current challenges in research and practice. For example, students will learn how to continuously monitor and audit critical information infrastructures to ensure reliability and security. Likewise, students will get to know how to deal with cascading failures in interconnected infrastructures.
4.52 Course: Data Mining and Applications [T-WIWI-103066]

**Responsible:** Rheza Nakhaeizadeh  
**Organisation:** KIT Department of Economics and Management

**Part of:**  
M-WIWI-101638 - Econometrics and Statistics I  
M-WIWI-101639 - Econometrics and Statistics II

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<th>Lecture (V)</th>
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</table>

**Competence Certificate**

- Conduction of a larger empirical study in groups
- Reporting of milestones
- Final presentation (app. 45 minutes)

**Prerequisites**

None

*Below you will find excerpts from events related to this course:*

**Data Mining and Applications**

2520375, SS 2019, 2/4 SWS, Language: Deutsch, [Open in study portal](#)

**Lecture (V)**

**Learning Content**

**Part one: Data Mining**

Why Data Mining?

- What is Data Mining?  
- History of Data Mining  
- Conferences and Journals on Data Mining  
- Potential Applications  
- Data Mining Process:  
- Business Understanding  
- Data Understanding  
- Data Preparation  
- Modeling  
- Evaluation  
- Deployment  
- Interdisciplinary aspects of Data Mining  
- Data Mining tasks  
- Data Mining Algorithms (Decision Trees, Association Rules, Regression, Clustering, Neural Networks)  
- Fuzzy Mining  
- OLAP and Data Warehouse  
- Data Mining Tools  
- Trends in Data Mining

**Part two: Examples of application of Data Mining**

- Success parameters of Data Mining Projects  
- Application in industry  
- Application in Commerce

**Workload**

The total workload for this course is approximately 135 hours. For further information see German version.
Literature

- Jiawei Han, Micheline Kamber, Data Mining: Concepts and Techniques, 2nd edition, Morgan Kaufmann, ISBN 1558609016, 2006.
4.53 Course: Database Systems and XML [T-WIWI-102661]

Responsible: Prof. Dr. Andreas Oberweis
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

Type: Written examination
Credits: 4.5
Recurrence: Each winter term
Version: 2

Events

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Competence Certificate
The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation in the first week after lecture period.

Prerequisites
None

Below you will find excerpts from events related to this course:

Database Systems and XML
2511202, WS 19/20, 2 SWS, Language: Deutsch, Open in study portal

Learning Content
Databases are a proven technology for managing large amounts of data. The oldest database model, the hierarchical model, was replaced by different models such as the relational or the object-oriented data model. The hierarchical model became particularly more important with the emergence of the extensible Markup Language XML. XML is a data format for structured, semi-structured, and unstructured data. In order to store XML documents consistently and reliably, databases or extensions of existing data base systems are required. Among other things, this lecture covers the data model of XML, concepts of XML query languages, aspects of storage of XML documents, and XML-oriented database systems.

Workload
Lecture 30h
Exercise 15h
Preparation of lecture 30h
Preparation of exercises 30h
Exam preparation 44h
Exam 1h
Total: 150h

Literature
- W. Kazakos, A. Schmidt, P. Tomchyk: Datenbanken und XML. Springer-Verlag 2002
- G. Vossen: Datenbankmodelle, Datenbanksprachen und Datenbankmanagementsysteme. Oldenbourg 2008

Further literature will be given individually.
### Course: Derivatives [T-WIWI-102643]

**Responsible:** Prof. Dr. Marliese Uhrig-Homburg

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101480 - Finance 3
- M-WIWI-101482 - Finance 1
- M-WIWI-101483 - Finance 2

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</table>

**Competence Certificate**

The success control takes place in form of a written examination (75min.) (according to §4(2), 1 SPOs). Details on the structure of the success control may be announced during the lecture. The examination is offered every semester and can be repeated at any regular examination date.

A bonus can be acquired through successful participation in the practice. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by up to one grade level (0.3 or 0.4). Details will be announced in the lecture.

**Prerequisites**

None

**Recommendation**

None

Below you will find excerpts from events related to this course:

#### Derivatives

**Description**

The lecture deals with the application areas and valuation of financial derivatives. After an overview of the most important derivatives and their relevance, forwards and futures are analysed. Then, an introduction to the Option Pricing Theory follows. The main emphasis is on option valuation in discrete and continuous time models. Finally, construction and usage of derivatives are discussed, e.g. in the context of risk management.

**Learning Content**

The lecture deals with the application areas and valuation of financial derivatives. After an overview of the most important derivatives and their relevance, forwards and futures are analysed. Then, an introduction to the Option Pricing Theory follows. The main emphasis is on option valuation in discrete and continuous time models. Finally, construction and usage of derivatives are discussed, e.g. in the context of risk management.

**Workload**

The total workload for this course is approximately 135.0 hours. For further information see German version.

**Literature**


**Elective literature:**

### Course: Differential Geometry [T-MATH-102275]

**Responsible:** Dr. Sebastian Grensing  
Prof. Dr. Enrico Leuzinger  
Prof. Dr. Wilderich Tuschmann  

**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-101317 - Differential Geometry

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4.56 Course: Digital Health [T-WIWI-109246]

**Responsible:** Prof. Dr. Ali Sunyaev

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-101472 - Informatics

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**Competence Certificate**

Alternative exam assessment (written elaboration, presentation, peer review, oral participation) according to §4(2),3 of the examination regulation. Details of the grading will be announced at the beginning of the course.

**Prerequisites**

None.

Below you will find excerpts from events related to this course:

**Digital Health**

2511402, WS 19/20, 2 SWS, Language: Deutsch/Englisch, Open in study portal

**Description**

The lecture “Digital Health” has a twofold purpose: first, to introduce theoretical foundations of various topics in digital health (they include, for instance, eHealth, health information systems, ambient assisted living, and smart homes in health care); and second, to introduce current topics in research on digital health (this includes for example genomics, gamification in health care, mobile health, and information privacy) by presenting papers and research projects the research group is working on. In addition, students are given the opportunity to combine the theoretical knowledge with real problems through a practical lecture.

**Workload**

4 ECTS = approx. 120 h.
**4.57 Course: Digital Transformation of Organizations [T-WIWI-106201]**

**Responsible:** Prof. Dr. Alexander Mädche  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-104068 - Information Systems in Organizations

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**Competence Certificate**  
Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation. Students receive one aggregated grade consisting of a written exam (60%) and case study deliverable (40%). The exam and the case study need to be both passed. A fail in one element results in a fail of the entire lecture. There will be one retake possibility for the exam, no retake possibilities will be provided for the case study.

**Prerequisites**  
None

**Annotation**  
The course will be held in English.

*Below you will find excerpts from events related to this course:*

**Digital Transformation of Organizations**  
2540556, SS 2019, 3 SWS, Language: Englisch, [Open in study portal](#)

**Description**  
During the last decades we witnessed a growing importance of Information Technology (IT) in the business world along with faster and faster innovation cycles. IT has become core for businesses from an operational company-internal and external customer perspective. Today, IT is considered as key enabler of operational excellence ranging from the enrichment of routine working tasks (e.g., enterprise resource planning systems) to e-enabled integration of entire business eco-systems (e.g., e-supply chains). Complementing this primarily company-internal perspective on IT, we have recently seen a massive growth of digital extensions of existing products and services across all industries. The disruptive potential of IT has already transformed selected key industries, e.g., media or retail, and its impact is continuously growing in all areas of business and society.

Large-scale information systems (IS) in organizations strongly interplay with work practices of individual employees as well as organizational structures shaping and being shaped by individuals’ behavior. Thus, successful implementation of IS requires dealing with transformation beyond technology. The ability to implement and use IS in a way supporting its overall value proposition has become a central success determinant. Accordingly, the course “Management of Information Systems” course is designed to provide a comprehensive insight into theoretical foundations, concepts, tools, and current practice of IS. The lecture is complemented with a case study. Students get the opportunity to analyze and propose solutions for a selected real-world IS implementation.

**Learning Content**

- Definition and key concepts of Information Systems
- Introduction of different types of application systems (organizational process & information-centric systems, customer-centric systems, supplier-centric systems and people-centric systems) and their characteristics
- The digital transformation process: The pre-implementation, implementation and post-implementation phase covering facets such as business/IT alignment, packaged software selection, IS implementation projects, as well as adoption & use of IS
- Practice-oriented case study focusing on real-world IS scenarios
Literature
4.58 Course: Discrete Time Finance [T-MATH-105839]

Responsible: Prof. Dr. Nicole Bäuerle
Prof. Dr. Vicky Fasen-Hartmann

Organisation: KIT Department of Mathematics
Part of: M-MATH-102919 - Discrete Time Finance

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Prerequisites
none
4.59 Course: Discrete-Event Simulation in Production and Logistics [T-WIWI-102718]

Responsible: Prof. Dr. Stefan Nickel
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-102805 - Service Operations
M-WIWI-102832 - Operations Research in Supply Chain Management

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<th>Ereignisdiskrete Simulation in Produktion und Logistik</th>
<th>3 SWS</th>
<th>Lecture (V)</th>
<th>Spieckermann</th>
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Competence Certificate
The assessment consists of a written paper and an oral exam of about 30-40 min (non exam assessment (§4 (2), 3 SPO 2007) respectively alternative exam assessments (§4(2), 3 SPO 2015)).

Prerequisites
None

Recommendation
Basic knowledge as conveyed in the module "Introduction to Operations Research" is assumed.

Annotation
Due to capacity restrictions, registration before course start is required. For further information see the webpage of the course. The course is planned to be held every summer term. The planned lectures and courses for the next three years are announced online.

Below you will find excerpts from events related to this course:

V Ereignisdiskrete Simulation in Produktion und Logistik
2550488, SS 2019, 3 SWS, Language: Deutsch, Open in study portal

Learning Content
Simulation of production and logistics systems is an interdisciplinary subject connecting expert knowledge from production management and operations research with mathematics/statistics as well as computer science and software engineering. With completion of this course, students know statistical foundations of discrete simulation, are able to classify and apply related software applications, and know the relation between simulation and optimization as well as a number of application examples. Furthermore, students are enabled to structure simulation studies and are aware of specific project scheduling issues.

Annotation
Basic knowledge as conveyed in the module "Introduction to Operations Research" is assumed.
Besides knowledge of Operations Research students are assumed to be familiar with the following topics:

- Introduction in Statistics
- Programming basics (algorithms and data structures)
- Basic knowledge in production and logistics

Workload
The total workload for this course is approximately 135.0 hours. For further information see German version.
Literature

4 COURSES

Course: Dispersive Equations [T-MATH-109001]

Prerequisites
none

Responsible:  Prof. Dr. Wolfgang Reichel
Organisation:  KIT Department of Mathematics
Part of:  M-MATH-104425 - Dispersive Equations

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4.61 Course: Dynamic Macroeconomics [T-WIWI-109194]

**Responsible:** Prof. Dr. Johannes Brumm

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101478 - Innovation and Growth
- M-WIWI-101496 - Growth and Agglomeration

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**Competence Certificate**
The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

**Prerequisites**
None.

*Below you will find excerpts from events related to this course:*

**Dynamic Macroeconomics**
2560402, WS 19/20, 2 SWS, Language: Englisch, [Open in study portal](#)

**Description**
The course Dynamic Macroeconomics addresses macroeconomic questions on an advanced level. The main focus of this course is on dynamic programming and its fundamental role in modern macroeconomics. After starting with the necessary mathematical tools, several applications in labor economics, economic growth, and asset pricing are introduced. The course pursues a hands-on approach so that students not only gain theoretical insights but also learn numerical tools to solve dynamic economic models using the modern programming language Python.

**Workload**
The total workload for this course is approximately 135 hours. For further information see German version.

**Literature**
Literature and lecture notes are provided during the course.
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<th>Prof. Dr. Jens Rottmann-Matthes</th>
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**Prerequisites**

none


Below you will find excerpts from events related to this course:

**Learning Content**

This lecture series combines two of the most central topics in the field of energy economics at present, namely energy efficiency and electric mobility. The objective of the lecture is to provide an introduction and overview to these two subject areas, including theoretical as well as practical aspects, such as the technologies, political framework conditions and broader implications of these for national and international energy systems.

The energy efficiency part of the lecture provides an introduction to the concept of energy efficiency, the means of affecting it and the relevant framework conditions. Further insights into economy-wide measurements of energy efficiency, and associated difficulties, are given with recourse to several practical examples. The problems associated with market failures in this area are also highlighted, including the Rebound Effect. Finally, and by way of an outlook, perspectives for energy efficiency in diverse economic sectors are examined.

The electric mobility part of the lecture examines all relevant issues associated with an increased penetration of electric vehicles including their technology, their impact on the electricity system (power plants and grid), their environmental impact as well as their optimal integration in the future private electricity demand (i.e. smart grids and V2G). Besides technical aspects the user acceptance and behavioral aspects are also discussed.

**Workload**

The total workload for this course is approximately 105.0 hours. For further information see German version.

**Literature**

Will be announced in the lecture.
Below you will find excerpts from events related to this course:

### eFinance: Information Systems for Securities Trading
**2540454, WS 19/20, 2 SWS, Language: Englisch, Open in study portal**

**Lecture (V)**

**Description**

The theoretical part of the course examines the New Institutions Economics which provides a theoretically found explanation for the existence of markets and intermediaries. Building upon the foundations of the market micro structure, several key parameters and factors of electronic trading are examined. These insights gained along a structured securities trading process are complemented and verified by the analysis of prototypical trading systems developed at the institute as well as selected trading systems used by leading exchanges in the world. In the more practical-oriented second part of the lecture, speakers from practice will give talks about financial trading systems and link the theoretical findings to real-world systems and applications.

**Learning Content**

The theoretical part of the course examines the New Institutions Economics which provides a theoretically found explanation for the existence of markets and intermediaries. Building upon the foundations of the market micro structure, several key parameters and factors of electronic trading are examined. These insights gained along a structured securities trading process are complemented and verified by the analysis of prototypical trading systems developed at the institute as well as selected trading systems used by leading exchanges in the world. In the more practical-oriented second part of the lecture, speakers from practice will give talks about financial trading systems and link the theoretical findings to real-world systems and applications.

**Workload**

The total workload for this course is approximately 135.0 hours. For further information see German version.
Literature


Elective literature:

4.65 Course: Emerging Trends in Digital Health [T-WIWI-110144]

**Responsible:** Prof. Dr. Ali Sunyaev

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-101472 - Informatics

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**Competence Certificate**


**Prerequisites**

None.

**Annotation**

The course is usually held as a block course.
Competence Certificate

Prerequisites
None.

Annotation
The course is usually held as a block course.
4.67 Course: Energy and Environment [T-WIWI-102650]

Responsible: Ute Karl
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101452 - Energy Economics and Technology

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Events

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<td>1 SWS</td>
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Competence Certificate

The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

Prerequisites

None.

Below you will find excerpts from events related to this course:

Energy and Environment

2581003, SS 2019, 2 SWS, Language: Deutsch, Open in study portal

Learning Content

The focus of the lecture is put on environmental impacts of fossil fuel conversion and related assessment methods. The list of topics is given below.

- Fundamentals of energy conversion
- Air pollutant formation from fossil fuel combustion
- Control of air pollutant emissions from fossil-fuelled power plants.
- Measures to improve conversion efficiency of fossil fuelled power plants.
- External effects of energy supply (Life Cycle Assessment of selected energy systems)
- Integrated Assessment models supporting the European Thematic Strategy on Air
- Cost-effectiveness analyses and cost-benefit analyses of air pollution control measures
- Monetary evaluation of external effects of energy supply (external costs)

Workload

The total workload for this course is approximately 135.0 hours. For further information see German version.

Literature

Thr references for further reading are included in the lecture documents (see ILIAS)
4.68 Course: Energy Market Engineering [T-WIWI-107501]

**Responsible:** Prof. Dr. Christof Weinhardt

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-103720 - eEnergy: Markets, Services and Systems

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**Competence Certificate**

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulations). By successful completion of the exercises (§4 (2), 3 SPO 2007 respectively §4 (3) SPO 2015) a bonus can be obtained. If the grade of the written exam is at least 4.0 and at most 1.3, the bonus will improve it by one grade level (i.e. by 0.3 or 0.4).

**Prerequisites**

None

**Recommendation**

None

**Annotation**

Former course title until summer term 2017: T-WIWI-102794 "eEnergy: Markets, Services, Systems".
The lecture has also been added in the IIP Module Basics of Liberalised Energy Markets.

Below you will find excerpts from events related to this course:

**Energy Market Engineering**

2540464, SS 2019, 2 SWS, Language: Deutsch, Open in study portal

**Lecture (V)**

**Learning Content**

This lecture discusses different design options for electricity markets. We will focus on different approaches of nodal and zonal pricing as well as single price mechanisms and capacity markets. After a short recap of German and European market designs, the different design options will be discussed scientifically and with the help of examples. Furthermore, we will evaluate alternative market design options like microgrids. Besides the fundamental functioning of those markets, we will introduce and discuss methodological knowledge to evaluate market design options.

**Annotation**

The lecture has also been added in the IIP Module Basics of Liberalised Energy Markets.

**Workload**

The total workload for this course is approximately 135.0 hours. For further information see German version.

**Literature**

4.69 Course: Energy Networks and Regulation [T-WIWI-107503]

**Responsible:** Prof. Dr. Christof Weinhardt

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-103720 - eEnergy: Markets, Services and Systems

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<td>2 SWS</td>
<td>Lecture (V)</td>
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**Competence Certificate**
The assessment consists of a written exam according to Section 4 (2), 1 of the examination regulation. The exam is offered every semester. Re-examinations are offered on every ordinary examination date.

**Prerequisites**
None

**Recommendation**
None

**Annotation**
Former course title until summer term 2017: T-WIWI-103131 "Regulatory Management and Grid Management - Economic Efficiency of Network Operation"

**Below you will find excerpts from events related to this course:**

**Energy Networks and Regulation**
2540494, WS 19/20, 2 SWS, Open in study portal

**Lecture (V)**

**Learning Content**
The lecture “Energy Networks and Regulation” provides insights into the regulatory framework of electricity and gas. It touches upon the way the grids are operated and how regulation affects almost all grid activities. The lecture also addresses approaches of grid companies to cope with regulation on a managerial level. We analyze how the system influences managerial decisions and strategies such as investment or maintenance. Furthermore, we discuss how the system affects the operator’s abilities to deal with the massive challenges lying ahead ("Energiewende", redispatch, European grid integration, electric vehicles etc.). Finally, we look at current developments and major upcoming challenges, e.g., the smart meter rollout. Covered topics include:

- Grid operation as a heterogeneous landscape: big vs. small, urban vs. rural, TSO vs. DSO.
- Objectives of regulation: Fair price calculation and high standard access conditions.
- The functioning of incentive regulation
- Amendment to the incentive regulation: its merits, its flaws
- The revenue cap and how it is adjusted according to certain exogenous factors
- Grid tariffs: How are they calculated, what is the underlying rationale, do we need a reform (and which)?
- Exogenous costs shifted (arbitrarily) into the grid, e.g. feed-in tariffs for renewable energy or decentralized supply.

**Workload**
The total workload for this course is approximately 135.0 hours. For further information see German version.
Literature


**4.70 Course: Energy Systems Analysis [T-WIWI-102830]**

**Responsible:** Dr. Armin Ardone  
Prof. Dr. Wolf Fichtner

**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101452 - Energy Economics and Technology

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**Competence Certificate**
The assessment consists of a written exam according to Section 4(2), 1 of the examination regulation.

**Prerequisites**
None

**Recommendation**
None

**Annotation**
Since 2011 the lecture is offered in winter term. Exams can still be taken in summer term.

*Below you will find excerpts from events related to this course:*

**Energy Systems Analysis**

2581002, WS 19/20, 2 SWS, Language: Englisch, [Open in study portal](#)

**Learning Content**
1. Overview and classification of energy systems modelling approaches  
2. Usage of scenario techniques for energy systems analysis  
3. Unit commitment of power plants  
4. Interdependencies in energy economics  
5. Scenario-based decision making in the energy sector  
6. Visualisation and GIS techniques for decision support in the energy sector

**Annotation**
Since 2011 the lecture is offered in winter term. Exams can still be taken in summer term.

**Workload**
The total workload for this course is approximately 90 hours. For further information see German version.
4.71 Course: Engineering FinTech Solutions [T-WIWI-106193]

**Responsible:** Prof. Dr Maxim Ulrich  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-103247 - Intelligent Risk and Investment Advisory  
M-WIWI-103261 - Disruptive FinTech Innovations  
M-WIWI-105036 - FinTech Innovations

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**Competence Certificate**  
The assessment is carried out in form of a written thesis based on the course “Engineering FinTech Solutions”.

**Prerequisites**  
In order to take the course “Engineering FinTech Solutions”, students must have completed the module “Data Science for Finance” with a grade of 1.3 or better.

*Below you will find excerpts from events related to this course:

**Description**  
This project invites students to either pursue their own FinTech innovation project or to contribute to the Chair’s ongoing innovation projects.

**Learning Content**  
The course is targeted to students with strong knowledge in the field of computational risk and asset management and strong programming skills. It offers students the opportunity to develop an algorithmic solution and hence ample their programming experience and their understanding of financial economics or asset and risk management.

**Workload**  
The total workload for this course is approximately 270 hours. This consists of regular meetings with members of the research group and time for independent work on the software project.
4.72 Course: Enterprise Architecture Management [T-WIWI-102668]

**Responsible:** Thomas Wolf  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101472 - Informatics

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**Competence Certificate**

Please note that the exam for first writers will be offered for the last time in winter semester 2019/2020. A last examination possibility exists in the summer semester 2020 (only for repeaters).

The assessment of this course is a written (60 min.) or (if necessary) oral examination (30 min.) according to §4(2) of the examination regulation.

**Prerequisites**

None

*Below you will find excerpts from events related to this course:*

**Enterprise Architecture Management**

2511600, WS 19/20, 2 SWS, Language: Deutsch, [Open in study portal](#)

**Learning Content**

The following topics will be covered: components of enterprise architecture, enterprise strategy including methods to develop strategies, business process (re)engineering, methods to implement changes within enterprises (management of change)

**Literature**

- Doppler, K., Lauterburg, Ch.: Change Management. Campus Verlag 1997
4.73 Course: Evolution Equations [T-MATH-105844]

**Responsible:** Prof. Dr. Roland Schnaubelt  
Prof. Dr. Lutz Weis

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102872 - Evolution Equations

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Economathematics M.Sc.  
Module Handbook as of 22.08.2019
4.74 Course: Experimental Economics [T-WIWI-102614]

**Responsible:** Prof. Dr. Christof Weinhardt

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101505 - Experimental Economics
- M-WIWI-102970 - Decision and Game Theory

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**Competence Certificate**

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulations). By successful completion of the exercises (§4 (2), 3 SPO 2007 respectively §4 (3) SPO 2015) a bonus can be obtained. If the grade of the written exam is at least 4.0 and at most 1.3, the bonus will improve it by one grade level (i.e. by 0.3 or 0.4).

**Prerequisites**

None

Below you will find excerpts from events related to this course:

**Experimental Economics**

2540489, WS 19/20, 2 SWS, Language: Deutsch, [Open in study portal](#)

**Learning Content**

Experimental Economics have become a separate field in Economics. Nearly all fields of the economic discipline use economic experiments to verify theoretical results. Besides being used for empirical validation, this method is applied in political and strategic consulting. The lecture gives an introduction to experimental methods in economics and shows differences to experiments in natural sciences. Scientific studies are used to show exemplary applications.

**Workload**

The total workload for this course is approximately 135.0 hours. For further information see German version.

**Literature**

- Strategische Spiele; S. Berninghaus, K.-M. Ehrhart, W. Güth; Springer Verlag, 2nd ed., 2006.
- Experimental Methods: A Primer for Economists; D. Friedman, S. Sunder; Cambridge University Press, 1994.
4.75 Course: Exponential Integrators [T-MATH-107475]

**Responsible:** Prof. Dr. Marlis Hochbruck  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-103700 - Exponential Integrators

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**Prerequisites**  
none
4.76 Course: Extremal Graph Theory [T-MATH-105931]

**Responsible:** Prof. Dr. Maria Aksenovich

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102957 - Extremal Graph Theory

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Economathematics M.Sc.
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4.77 Course: Extreme Value Theory [T-MATH-105908]

**Responsible:** Prof. Dr. Vicky Fasen-Hartmann
Prof. Dr. Norbert Henze

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102939 - Extreme Value Theory

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### 4.78 Course: Facility Location and Strategic Supply Chain Management [T-WIWI-102704]

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**Responsible:** Prof. Dr. Stefan Nickel  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101413 - Applications of Operations Research  
- M-WIWI-101414 - Methodical Foundations of OR  
- M-WIWI-102832 - Operations Research in Supply Chain Management

**Competence Certificate**  
Due to a research semester of Professor Nickel in WS 19/20, the course "Facility Location and Strategic Supply Chain Management" does NOT take place in WS 19/20. In particular, neither WS 19/20 nor SS 20 will offer an exam for the lecture. The follow-up exam to the lecture in WS 18/19 takes place in SS 19 and is exclusively for students in the second examination.  
The assessment consists of a written exam (60 min) according to Section 4 (2), 1 of the examination regulation.  
The exam takes place in every semester.  
Prerequisite for admission to examination is the successful completion of the online assessments.

**Prerequisites**  
Prerequisite for admission to examination is the successful completion of the online assessments.

**Recommendation**  
None

**Annotation**  
The lecture is held in every winter term. The planned lectures and courses for the next three years are announced online.
4.79 Course: Financial Analysis [T-WIWI-102900]

Responsible: Dr. Torsten Luedecke
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101480 - Finance 3
M-WIWI-101483 - Finance 2

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Events

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Competence Certificate
See German version.

Prerequisites
None

Recommendation
Basic knowledge in corporate finance, accounting, and valuation is required.

Below you will find excerpts from events related to this course:

V Financial Analysis
2530205, SS 2019, 2 SWS, Language: Englisch, Open in study portal

Description
This lecture reviews the key financial statements according to international financial reporting standards and provides analytical tools to evaluate the income statement, the balance sheet, and the cash flow statement in order to measure a firm’s liquidity, operational efficiency, and profitability.

Learning Content
Topics:
- Introduction to Financial Analysis
- Financial Reporting Standards
- Major Financial Statements and Other Information
- Recognition and Measurement Issues
- Analysis of Financial Statements
- Financial Reporting Quality

Literature
4.80 Course: Financial Econometrics [T-WIWI-103064]

**Responsible:** Prof. Dr. Melanie Schienle

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101638 - Econometrics and Statistics I
- M-WIWI-101639 - Econometrics and Statistics II

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**Competence Certificate**
The assessment consists of a written exam (90 minutes) (following §4(2), 1 of the examination regulation).

**Prerequisites**
None

**Recommendation**
Knowledge of the contents covered by the course "Economics III: Introduction in Econometrics"[2520016]

**Annotation**
The course takes place each second summer term: 2018/2020....
Course: Financial Intermediation [T-WIWI-102623]

Responsible: Prof. Dr. Martin Ruckes
Organisation: KIT Department of Economics and Management

Part of:
- M-WIWI-101480 - Finance 3
- M-WIWI-101483 - Finance 2
- M-WIWI-101502 - Economic Theory and its Application in Finance

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Competence Certificate
The assessment of this course is a written examination (following §4(2), 1 SPO) of 60 mins. The exam is offered each semester.

Prerequisites
None

Recommendation
None

Below you will find excerpts from events related to this course:

Financial Intermediation
2530232, WS 19/20, 2 SWS, Language: Deutsch, Open in study portal

Description
- Arguments for the existence of financial intermediaries
- Bank loan analysis, relationship lending
- Competition in the banking sector
- Stability of the financial system
- The macroeconomic role of financial intermediation

Learning Content
- Arguments for the existence of financial intermediaries
- Bank loan analysis, relationship lending
- Stability of the financial system
- The macroeconomic role of financial intermediation
- Principles of the prudential regulation of banks

Workload
The total workload for this course is approximately 135.0 hours. For further information see German version.

Literature
Elective literature:
### 4.82 Course: Finite Element Methods [T-MATH-105857]

**Responsible:** Prof. Dr. Willy Dörfler  
Prof. Dr. Marlis Hochbruck  
Prof. Dr Tobias Jahnke  
Prof. Dr. Andreas Rieder  
Prof. Dr. Christian Wieners

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102891 - Finite Element Methods

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4.83 Course: Finite Group Schemes [T-MATH-106486]

Responsible:  Dr. Fabian Januszewski
Organisation: KIT Department of Mathematics
Part of:  M-MATH-103258 - Finite Group Schemes

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### 4.84 Course: Fixed Income Securities [T-WIWI-102644]

**Responsible:** Prof. Dr. Marliese Uhrig-Homburg  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101480 - Finance 3  
M-WIWI-101483 - Finance 2

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**Competence Certificate**  
The assessment consists of a written exam (75 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation SPO2015 and may be supplemented by a non exam assessment according to § 4 paragraph 2 Nr. 3. The examination is offered every semester and can be repeated at every regular examination date. A bonus can be acquired through successful participation in the practice. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by up to one grade level (0.3 or 0.4). Details will be announced in the lecture.

**Prerequisites**  
None

**Recommendation**  
Knowledge from the course "Derivatives" is very helpful.

**Annotation**  
The course is offered as a block course.

*Below you will find excerpts from events related to this course:*

#### Fixed Income Securities

**2530260, WS 19/20, 2 SWS, Language: Deutsch, Open in study portal**

**Description**  
The lecture deals with both German and international bond markets, which are an important source of funding for both the corporate and the public sector. After an overview of the most important bond markets, various definitions of return are discussed. Based on that, the concept of the yield curve is presented. The modelling of the dynamics of the term structure of interest rates provides the theoretical foundation for the valuation of interest rate derivatives, which is discussed in the last part of the lecture.

**Learning Content**  
The lecture deals with both German and international bond markets, which are an important source of funding for both the corporate and the public sector. After an overview of the most important bond markets, various definitions of return are discussed. Based on that, the concept of the yield curve is presented. The modelling of the dynamics of the term structure of interest rates provides the theoretical foundation for the valuation of interest rate derivatives, which is discussed in the last part of the lecture.

**Workload**  
The total workload for this course is approximately 135.0 hours. For further information see German version.

**Literature**

**Elective literature:**
# 4.85 Course: Forecasting: Theory and Practice [T-MATH-105928]

**Responsible:** Prof. Dr. Tilmann Gneiting  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-102956 - Forecasting: Theory and Practice

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<td>1 SWS</td>
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Economathematics M.Sc.  
Module Handbook as of 22.08.2019
4.86 Course: Foundations of Continuum Mechanics [T-MATH-107044]

**Responsible:** Prof. Dr. Christian Wieners

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-103527 - Foundations of Continuum Mechanics

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**Prerequisites**
none
### 4.87 Course: Fourier Analysis [T-MATH-105845]

**Responsible:** Prof. Dr. Roland Schnaubelt  
Prof. Dr. Lutz Weis  

**Organisation:** KIT Department of Mathematics  

**Part of:** M-MATH-102873 - Fourier Analysis

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<td>Tutorial for 0157600 (Fourier analysis and its applications to PDEs)</td>
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4.88 Course: Fourier Analysis and its Applications to PDEs [T-MATH-109850]

**Responsible:** Jun.-Prof. Dr. Xian Liao

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-104827 - Fourier Analysis and its Applications to PDEs

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**Prerequisites**
none
### 4.89 Course: Functional Analysis [T-MATH-102255]

**Responsible:**
- PD Dr. Gerd Herzog
- Prof. Dr. Dirk Hundertmark
- Prof. Dr. Tobias Lamm
- Prof. Dr. Michael Plum
- Prof. Dr. Wolfgang Reichel
- Dr. Christoph Schmoeger
- Prof. Dr. Roland Schnaubelt
- Prof. Dr. Lutz Weis

**Organisation:**
KIT Department of Mathematics

**Part of:**
M-MATH-101320 - Functional Analysis

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4.90 Course: Functions of Matrices [T-MATH-105906]

**Responsible:** PD Dr. Volker Grimm

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102937 - Functions of Matrices

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**Prerequisites**

none
4.91 Course: Functions of Operators [T-MATH-105905]

Organisation: KIT Department of Mathematics
Part of: M-MATH-102936 - Functions of Operators

Type
Oral examination

Credits 6

Version 1
**4.92 Course: Generalized Regression Models [T-MATH-105870]**

- **Responsible:** Prof. Dr. Norbert Henze  
  Dr. Bernhard Klar  
- **Organisation:** KIT Department of Mathematics  
  **Part of:** M-MATH-102906 - Generalized Regression Models

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Economathematics M.Sc.  
Module Handbook as of 22.08.2019
4.93 Course: Geometric Group Theory [T-MATH-105842]

**Responsible:**
- Prof. Dr. Frank Herrlich
- Prof. Dr. Enrico Leuzinger
- Dr. Gabriele Link
- Prof. Dr. Roman Sauer
- Prof. Dr. Petra Schwer
- Prof. Dr. Wilderich Tuschmann

**Organisation:**
KIT Department of Mathematics

**Part of:**
M-MATH-102867 - Geometric Group Theory

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4.94 Course: Geometric Numerical Integration [T-MATH-105919]

**Responsible:** Prof. Dr. Marlis Hochbruck  
Prof. Dr. Tobias Jahnke

**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-102921 - Geometric Numerical Integration

**Type**  
Oral examination

**Credits**  
6

**Version**  
1

**Prerequisites**  
none
### 4.95 Course: Geometry of Schemes [T-MATH-105841]

| Responsible:       | Prof. Dr. Frank Herrlich  
                      | Dr. Stefan Kühnlein      |
|--------------------|----------------------------|
| Organisation:      | KIT Department of Mathematics |
| Part of:           | M-MATH-102866 - Geometry of Schemes |

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4.96 Course: Global Differential Geometry [T-MATH-105885]

**Responsible:** Dr. Sebastian Grensing  
Prof. Dr. Wilderich Tuschmann

**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-102912 - Global Differential Geometry

**Type**  
Oral examination

**Credits**  
8

**Version**  
1

**Prerequisites**  
none
4.97 Course: Global Optimization I [T-WIWI-102726]

**Responsible:** Prof. Dr. Oliver Stein

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101413 - Applications of Operations Research
- M-WIWI-101414 - Methodical Foundations of OR
- M-WIWI-101473 - Mathematical Programming

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**Competence Certificate**

Success is in the form of a written examination (60 min.) (according to § 4(2), 1 SPO) and possibly of a compulsory prerequisite. The exam is offered in the lecture of semester and the following semester.

The success check can be done also with the success control for "Global optimization II". In this case, the duration of the written exam is 120 min.

**Prerequisites**

None

**Recommendation**

None

**Annotation**

Part I and II of the lecture are held consecutively in the same semester.

Below you will find excerpts from events related to this course:

**Globale Optimierung I**

2550134, SS 2019, 2 SWS. Open in study portal

**Lecture (V)**

**Learning Content**

In many optimization problems from economics, engineering and natural sciences, numerical solution methods are only able to efficiently identify local optimizers, while it is much harder to find globally optimal points. This corresponds to the fact that by local search it is easy to find the summit of the closest mountain, but that the search for the summit of Mount Everest is rather elaborate.

Part I of the lecture treats methods for global optimization of convex functions under convex constraints. It is structured as follows:

- Introduction, examples, and terminology
- Existence results
- Optimality in convex optimization
- Duality, bounds, and constraint qualifications
- Numerical methods

Nonconvex optimization problems are treated in part II of the lecture.

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.
Literature

- W. Alt *Numerische Verfahren der konvexen, nichtglatten Optimierung* Teubner 2004
- C.A. Floudas *Deterministic Global Optimization* Kluwer 2000
- R. Horst, H. Tuy *Global Optimization* Springer 1996
4.98 Course: Global Optimization I and II [T-WIWI-103638]

**Responsible:** Prof. Dr. Oliver Stein  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101414 - Methodical Foundations of OR  
M-WIWI-101473 - Mathematical Programming

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**Competence Certificate**

The assessment of the lecture is a written examination (120 minutes) according to §4(2), 1 of the examination regulation and possibly of a compulsory prerequisite. The examination is held in the semester of the lecture and in the following semester.

**Prerequisites**

None

**Recommendation**

None

**Annotation**

Part I and II of the lecture are held consecutively in the same semester.

*Below you will find excerpts from events related to this course:*

**Globale Optimierung I**  
2550134, SS 2019, 2 SWS, [Open in study portal]

**Learning Content**

In many optimization problems from economics, engineering and natural sciences, numerical solution methods are only able to efficiently identify local optimizers, while it is much harder to find globally optimal points. This corresponds to the fact that by local search it is easy to find the summit of the closest mountain, but that the search for the summit of Mount Everest is rather elaborate.

Part I of the lecture treats methods for global optimization of convex functions under convex constraints. It is structured as follows:

- Introduction, examples, and terminology
- Existence results
- Optimality in convex optimization
- Duality, bounds, and constraint qualifications
- Numerical methods

Nonconvex optimization problems are treated in part II of the lecture.

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

**Literature**

Learning Content
In many optimization problems from economics, engineering and natural sciences, numerical solution methods are only able to efficiently identify local optimizers, while it is much harder to find globally optimal points. This corresponds to the fact that by local search it is easy to find the summit of the closest mountain, but that the search for the summit of Mount Everest is rather elaborate.

The global solution of convex optimization problems is subject of part I of the lecture.

Part II of the lecture treats methods for global optimization of nonconvex functions under nonconvex constraints. It is structured as follows:

- Introduction and examples
- Convex relaxation
- Interval arithmetic
- Convex relaxation via aBB method
- Branch and bound methods
- Lipschitz optimization

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Literature

- W. Alt *Numerische Verfahren der konvexen, nichtglatten Optimierung* Teubner 2004
- C.A. Floudas *Deterministic Global Optimization* Kluwer 2000
- R. Horst, H. Tuy *Global Optimization* Springer 1996
4 COURSES

Course: Global Optimization II [T-WIWI-102727]

Responsible: Prof. Dr. Oliver Stein
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101414 - Methodical Foundations of OR
M-WIWI-101473 - Mathematical Programming

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Competence Certificate
The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation and possibly of a compulsory prerequisite.

The examination is held in the semester of the lecture and in the following semester.

The examination can also be combined with the examination of “Global optimization I”. In this case, the duration of the written examination takes 120 minutes.

Prerequisites
None

Annotation
Part I and II of the lecture are held consecutively in the same semester.

Below you will find excerpts from events related to this course:

Globale Optimierung II
2550136, SS 2019, 2 SWS, Open in study portal

Learning Content
In many optimization problems from economics, engineering and natural sciences, numerical solution methods are only able to efficiently identify local optimizers, while it is much harder to find globally optimal points. This corresponds to the fact that by local search it is easy to find the summit of the closest mountain, but that the search for the summit of Mount Everest is rather elaborate.

The global solution of convex optimization problems is subject of part I of the lecture.

Part II of the lecture treats methods for global optimization of nonconvex functions under nonconvex constraints. It is structured as follows:

- Introduction and examples
- Convex relaxation
- Interval arithmetic
- Convex relaxation via aBB method
- Branch and bound methods
- Lipschitz optimization

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Literature
- W. Alt Numerische Verfahren der konvexen, nichtglatten Optimierung Teubner 2004
- C.A. Floudas Deterministic Global Optimization Kluwer 2000
- R. Horst, H. Tuy Global Optimization Springer 1996
4.100 Course: Graph Theory [T-MATH-102273]

Responsibility: Prof. Dr. Maria Aksenovich
Organisation: KIT Department of Mathematics
Part of: M-MATH-101336 - Graph Theory

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Prerequisites

None
4.101 Course: Graph Theory and Advanced Location Models [T-WIWI-102723]

Responsible: Prof. Dr. Stefan Nickel
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101473 - Mathematical Programming
M-WIWI-102832 - Operations Research in Supply Chain Management
M-WIWI-103289 - Stochastic Optimization

Type: Written examination
Credits: 4.5
Recurrence: Irregular
Version: 2

Competence Certificate
The assessment is a 60 minutes written examination (according to §4(2), 1 of the examination regulation).
The examination is held in the term of the lecture and the following lecture.

Prerequisites
None

Recommendation
Basic knowledge as conveyed in the module "Introduction to Operations Research" is assumed.

Annotation
The course is offered irregularly. Planned lectures for the next three years can be found in the internet at http://dol.ior.kit.edu/english/Courses.php.
4.102 Course: Group Actions in Riemannian Geometry [T-MATH-105925]

**Responsible:** Prof. Dr. Wilderich Tuschmann

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102954 - Group Actions in Riemannian Geometry

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**Prerequisites**

none
**4.103 Course: Harmonic Analysis for Dispersive Equations [T-MATH-107071]**

**Responsible:** Dr. Peer Kunstmann

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-103545 - Harmonic Analysis for Dispersive Equations

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**Prerequisites**

none
Competence Certificate
The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

Prerequisites
None.

Recommendation
None

Annotation
See German version.
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4.106 Course: Human Factors in Security and Privacy [T-WIWI-109270]

**Responsible:** Prof. Dr. Melanie Volkamer  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101472 - Informatics

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**Competence Certificate**  
The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation or an oral exam (30 min) following §4, Abs. 2, 2 of the examination regulation. The exam takes place every semester and can be repeated at every regular examination date.

**Prerequisites**  
Successful participation in the exercises.

Below you will find excerpts from events related to this course:

**Human Factors in Security and Privacy**  
2511554, WS 19/20, 2 SWS, Language: Deutsch, Open in study portal

**Description**  
The history of information security and privacy has taught us that it takes more than technological innovation to develop effective security and privacy mechanisms: Many aspects of information security and privacy actually depend on both technical and human factors. As a result of focusing on the technical factors, we are seeing a persistent gap between theoretical security and actual security in real world which becomes an increasing problem in the age of digitalization. The gap is mainly caused by strong and actually unrealistic assumptions regarding the users’ knowledge and behavior.

Human factors in security and privacy research addresses several types of security and privacy mechanisms, e.g., authentication mechanisms including text and graphical passwords, security and privacy indicators (such as the icons in the address bar of nowadays web browsers) and security and privacy interventions like warning messages, permission dialogs and security and privacy policies as well as corresponding configuration interfaces. Besides security and privacy mechanisms, human factors in security and privacy researchers deal with security and privacy awareness, education, and training approaches.

‘Human factors in security & privacy’ research areas are:

- identifying users’ mental models using techniques such as (semi-)structured interviews or focus groups,
- evaluating existing approaches regarding their effectiveness in supporting their users in making secure decisions / informed decisions in the context of privacy using techniques such as cognitive walkthroughs, lab user studies or even field studies,
- proposing improved / new approaches and evaluating their effectiveness using the so called human-centered security / privacy by design approach.

This lecture and the corresponding exercises discuss the various problems of existing security and privacy mechanisms and security and privacy awareness/education/training approaches. The lecture addresses relevant psychological and sociological aspects which are important to know and to consider when developing more usable security/privacy mechanisms and more effective awareness/education/training approaches. The human centered security and privacy by design approach is introduced. Furthermore, some of the methodologies used in this area are explained and a subset of them is applied. Finally, positive examples, such as graphical passwords, are introduced and discussed. Note, the main part of the exercise is replicating an interview based study.
Learning Content
This lecture and the corresponding exercises discuss the various problems of existing security and privacy mechanisms and security and privacy awareness/education/training approaches. The lecture addresses relevant psychological and sociological aspects which are important to know and to consider when developing more usable security/privacy mechanisms and more effective awareness/education/training approaches. This includes the importance of mental models. The human centered security and privacy by design approach is introduced. Furthermore, some of the methodologies used in this area are explained and a subset of them is also applied. Finally, positive examples, such as graphical passwords, are introduced and discussed. Note, the main part of the exercise is replicating an interview based study.

Literature

- Security and Usability: Designing Secure Systems that People Can Use von Lorrie Faith Cranor und Simson Garfinkel. 2005
4.107 Course: Incentives in Organizations [T-WIWI-105781]

**Responsible:** Prof. Dr. Petra Nieken

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101500 - Microeconomic Theory
- M-WIWI-101505 - Experimental Economics

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**Competence Certificate**

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

In case of a small number of registrations, we might offer an oral exam instead of a written exam.

**Prerequisites**

None

**Recommendation**

Knowledge of microeconomics, game theory, and statistics is assumed.

**Annotation**

The course is carried out routinely in summer.

*Below you will find excerpts from events related to this course:*

**V** Incentives in Organizations

2573003, SS 2019, 2 SWS, Language: Englisch, [Open in study portal](#)

**Notes**

See Module Handbook
### 4.108 Course: Information Service Engineering [T-WIWI-106423]

**Responsible:** Prof. Dr. Harald Sack  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101472 - Informatics

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**Competence Certificate**

The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation or an oral exam (20 min) following §4, Abs. 2, 2 of the examination regulation.

The exam takes place every semester and can be repeated at every regular examination date.

**Prerequisites**

None

**Annotation**

New course starting summer term 2017.

Below you will find excerpts from events related to this course:

**Information Service Engineering**

2511606, SS 2019, 2 SWS, Language: Englisch, [Open in study portal](#)  

Lecture (V)
Learning Content

- Information, Natural Language and the Web
- Natural Language Processing
  - NLP and Basic Linguistic Knowledge
  - NLP Applications, Techniques & Challenges
  - Evaluation, Precision and Recall
  - Regular Expressions and Automata
  - Tokenization
  - Language Model and N-Grams
  - Part-of-Speech Tagging

- Linked Data Engineering
  - Knowledge Representations and Ontologies
  - What’s in an URI?
  - Resource Description Framework (RDF)
  - Creating new Models with RDFS
  - Querying RDF(S) with SPARQL
  - More Expressivity with Web Ontology Language (OWL)
  - The Web of Data
  - Vocabularies and Ontologies in the Web of Data
  - Wikipedia, DBpedia, and Wikidata

- Information Retrieval
  - Information Retrieval Models
  - Retrieval Evaluation
  - Web Information Retrieval
  - Document Crawling, Text Processing, and Indexing
  - Query Processing and Result Representation
  - Question Answering

- Knowledge Mining
  - From Data to Knowledge
  - Data Mining
  - Machine Learning Basics for Knowledge Mining
  - Mining Knowledge from Wikipedia
  - Named Entity Resolution

- Exploratory Search and Recommender Systems
  - Semantic Search and Entity Centric Search
  - Collaborative Filtering and Content Based Recommendations
  - From Search to Intelligent Browsing
  - Linked Data Based Exploratory Search
  - Fact Ranking

Annotation
New lecture, since summer semester 2017

Literature

4.109 Course: Innovationtheory and -Policy [T-WIWI-102840]

Responsible: Prof. Dr. Ingrid Ott
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101478 - Innovation and Growth

Competence Certificate
The assessment consists of a written exam (60 min) according to Section 4(2), 1 of the examination regulation. The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.
Students will be given the opportunity of writing and presenting a short paper during the lecture time to achieve a bonus on the exam grade. If the mandatory credit point exam is passed, the awarded bonus points will be added to the regular exam points. A deterioration is not possible by definition, and a grade does not necessarily improve, but is very likely to (not every additional point improves the total number of points, since a grade can not become better than 1). The voluntary elaboration of such a paper can not countervail a fail in the exam.

Prerequisites
None

Recommendation
Basic knowledge of micro- and macroeconomics is assumed, as taught in the courses Economics I [2600012], and Economics II [2600014]. In addition, an interest in quantitative-mathematical modeling is required.

Below you will find excerpts from events related to this course:

Innovationtheory and -policy
2560236, SS 2019, SWS, Language: Deutsch, Open in study portal

Learning Content
- Incentives for the emergence of innovations
- Patents
- Diffusion
- Impact of technological progress
- Innovation Policy

Workload
The total workload for this course is approximately 135.0 hours. For further information see German version.

Literature
Excerpt:
4.110 Course: Integral Equations [T-MATH-105834]

**Responsible:**  
PD Dr. Tilo Arens  
PD Dr. Frank Hettlich  
Prof. Dr. Andreas Kirsch

**Organisation:**  
KIT Department of Mathematics

**Part of:**  
M-MATH-102874 - Integral Equations

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Economathematics M.Sc.  
Module Handbook as of 22.08.2019
Course: Interactive Information Systems [T-WIWI-108461]

**Responsible:** Prof. Dr. Alexander Mädche
Dr. Stefan Morana

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-104068 - Information Systems in Organizations

**Type:** Examination of another type
**Credits:** 4.5
**Recurrence:** Each summer term
**Version:** 3

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<td>Interactive Systems</td>
<td>3 SWS</td>
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**Competence Certificate**
Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation. Students receive one aggregated grade consisting of a written exam (70%) and research paper (30%). The exam and the research paper need to be both passed. A fail in one element results in a fail of the entire lecture. There will be one retake possibility for the exam, no retake possibilities will be provided for the research paper.

**Prerequisites**
None

**Annotation**
This course replaces T-WIWI-106342 “Interactive Systems” starting summer term 2018. The course is held in English.

*Below you will find excerpts from events related to this course:*

**Interactive Systems**
2540558, SS 2019, 3 SWS, Language: Englisch, [Open in study portal](#)

**Description**
Advanced information and communication technologies make interactive systems ever-present in the users' private and business life. They are an integral part of smartphones, devices in the smart home, mobility vehicles as well as at the working place in production and administration (e.g. in the form of dashboards).

With the continuous growing capabilities of computers, the design of the interaction between human and computer becomes even more important. The aim of this course is to introduce the foundations, theoretical grounding, key concepts and principles as well as current practice of interactive systems. The contents of the course abstract from the technical implementation details. The students get the necessary knowledge to guide the successful implementation of interactive systems in business and private life.

**Notes**
The lecture is complemented with a capstone project assignment, where students analyze and review existing interactive systems and suggest areas of improvement / extensions.

**Learning Content**
- Basics
- Theoretical foundations
- Key concepts and design principles for specific interactive systems classes
- Capstone project

**Literature**
The lecture bases to a large extend on

Additional literature will be provided in the lecture.
4.112 Course: International Finance [T-WIWI-102646]

**Responsible:** Prof. Dr. Marliese Uhrig-Homburg  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101480 - Finance 3  
M-WIWI-101483 - Finance 2

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**Events**

| SS 2019 | 2530570 | International Finance | 2 SWS | Lecture (V) | Walter, Uhrig-Homburg |

**Competence Certificate**
See German version.

**Prerequisites**
None

**Recommendation**
None

**Annotation**
See German version.

Below you will find excerpts from events related to this course:

**International Finance**  
2530570, SS 2019, 2 SWS, Language: Deutsch, [Open in study portal]

**Description**
The main aspects of this course are the chances and the risks which are associated with international transactions. We carry out our analysis from two distinct perspectives: First the point of view of an international investor second that, of an international corporation. Several alternatives to the management of foreign exchange risks are shown. Due to the importance of foreign exchange risks, the first part of the course deals with currency markets. Furthermore, current exchange rate theories are discussed.

**Learning Content**
The main aspects of this course are the chances and the risks which are associated with international transactions. We carry out our analysis from two distinct perspectives: First the point of view of an international investor second that, of an international corporation. Several alternatives to the management of foreign exchange risks are shown. Due to the importance of foreign exchange risks, the first part of the course deals with currency markets. Furthermore, current exchange rate theories are discussed.

**Workload**
The total workload for this course is approximately 90 hours. For further information see German version.

**Literature**

Elective literature:
4.113 Course: Introduction into Particulate Flows [T-MATH-105911]

**Responsible:** Prof. Dr. Willy Dörfler

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102943 - Introduction into Particulate Flows

**Type:** Oral examination

**Credits:** 3

**Version:** 1

**Prerequisites**

none
4.114 Course: Introduction to Geometric Measure Theory [T-MATH-105918]

**Responsible:** PD Dr. Steffen Winter

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102949 - Introduction to Geometric Measure Theory

**Type:** Oral examination

**Credits:** 6

**Version:** 1

**Prerequisites**

none
4.115 Course: Introduction to Homogeneous Dynamics [T-MATH-110323]

Responsibility: Dr. Stefan Kühnlein
Organisation: KIT Department of Mathematics
Part of: M-MATH-105101 - Introduction to Homogeneous Dynamics

Type: Oral examination
Credits: 6
Recurrence: Irregular
Version: 1

Prerequisites
none
### 4.116 Course: Introduction to Kinetic Theory [T-MATH-108013]

**Responsible:** Prof. Dr. Martin Frank  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-103919 - Introduction to Kinetic Theory

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**Prerequisites**  
none

Below you will find excerpts from events related to this course:

**Introduction to Kinetic Theory**  
0155450, WS 19/20, 2 SWS, Language: Englisch, [Open in study portal](#)  
**Lecture (V)**

**Learning Content**  
- From Newton's equations to Boltzmann's equation  
- Rigorous derivation of the linear Boltzmann equation  
- Properties of kinetic equations (existence & uniqueness, H theorem)  
- The diffusion limit  
- From Boltzmann to Euler & Navier-Stokes  
- Method of Moments  
- Closure techniques  
- Selected numerical methods
4.117 Course: Introduction to Matlab and Numerical Algorithms [T-MATH-105913]

**Responsible:**  Dr. Daniel Weiß  
Prof. Dr. Christian Wieners

**Organisation:**  KIT Department of Mathematics

**Part of:**  M-MATH-102945 - Introduction to Matlab and Numerical Algorithms

**Type**  
Written examination  

**Credits**  
5  

**Version**  
1

**Prerequisites**  
none
**Course: Introduction to Scientific Computing [T-MATH-105837]**

**Responsible:** Prof. Dr. Willy Dörfler  
Prof. Dr. Marlis Hochbruck  
Prof. Dr. Tobias Jahnke  
Prof. Dr. Andreas Rieder  
Prof. Dr. Christian Wieners

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102889 - Introduction to Scientific Computing

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### Course: Introduction to Stochastic Optimization [T-WIWI-106546]

**Responsible:** Prof. Dr. Steffen Rebennack  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101414 - Methodical Foundations of OR  
- M-WIWI-102832 - Operations Research in Supply Chain Management  
- M-WIWI-103289 - Stochastic Optimization

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**Competence Certificate**

The assessment consists of a written exam (60 minutes) according to Section 4(2), 1 of the examination regulation. The exam takes place in every the semester.

**Prerequisites**

None.
## 4.120 Course: Inverse Problems [T-MATH-105835]

**Responsible:** PD Dr. Tilo Arens  
PD Dr. Frank Hettlich  
Prof. Dr. Andreas Kirsch  
Prof. Dr. Andreas Rieder

**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-102890 - Inverse Problems

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4.121 Course: Key Moments in Geometry [T-MATH-108401]

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<th>Prof. Dr. Wilderich Tuschmann</th>
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Prerequisites
none
4.122 Course: Knowledge Discovery [T-WIWI-102666]

Responsible: Prof. Dr. York Sure-Vetter
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

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Competence Certificate
The assessment consists of an 1h written exam following §4, Abs. 2, 1 of the examination regulation.
Students can be awarded a bonus on their final grade if they successfully complete special assignments.

Prerequisites
None

Below you will find excerpts from events related to this course:

Knowledge Discovery
2511302, WS 19/20, 2 SWS, Language: Englisch, Open in study portal

Description
Knowledge discovery is a well-established field with a large community investigating methods for the discovery of patterns and regularities in large data sets, including relational databases and unstructured text.
A variety of methods are available to assist in extracting patterns that, if interpreted, provide valuable, possibly previously unknown, insights. This information can be predictive or descriptive in nature.
This lecture provides an overview of this field. The lecture imparts specific techniques and methods, challenges and current and future research work in this field.

Learning Content
Topics of the lectures comprise the whole Machine Learning and Data Mining process like CRISP, data warehousing, OLAP-techniques, learning algorithms, visualization and empirical evaluation. Covered learning techniques range from traditional approaches like decision trees, neural networks and support vector machines to selected approaches resulting from current research. Discussed learning problems are amongst others featurevector-based learning, text mining and social network analysis.

Workload
- The total workload for this course is approximately 150 hours
- Time of presentness: 45 hours
- Time of preparation and postprocessing: 67.5 hours
- Exam and exam preparation: 37.5 hours

Literature
- M. Berhold, D. Hand (eds). Intelligent Data Analysis - An Introduction. 2003
- P. Tan, M. Steinbach, V. Kumar: Introduction to Data Mining, 2005, Addison Wesley
Exercises to Knowledge Discovery
2511303, WS 19/20, 1 SWS, Language: Englisch, Open in study portal

Description
Multiple exercises are held that capture the topics, held in the lecture Knowledge Discovery, and discuss them in detail. Thereby, practical examples are given to the students in order to transfer theoretical aspects into practical implementation.

Learning Content
Topics of the lectures comprise the whole Machine Learning and Data Mining process like CRISP, data warehousing, OLAP-techniques, learning algorithms, visualization and empirical evaluation. Covered learning techniques range from traditional approaches like decision trees, neural networks and support vector machines to selected approaches resulting from current research. Discussed learning problems are amongst others featurevector-based learning, text mining and social network analysis.

Workload
The total workload for the lecture Knowledge Discovery is given out on the description of the lecture.

Literature
- M. Berhold, D. Hand (eds). Intelligent Data Analysis - An Introduction. 2003
- P. Tan, M. Steinbach, V. Kumar: Introduction to Data Mining, 2005, Addison Wesley
4.123 Course: L2-Invariants [T-MATH-105924]

**Responsible:** Dr. Holger Kammeyer  
Prof. Dr Roman Sauer

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102952 - L2-Invariants

### Prerequisites

none

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4.124 Course: Large-scale Optimization [T-WIWI-106549]

**Responsible:** Prof. Dr. Steffen Rebennack  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101473 - Mathematical Programming  
- M-WIWI-102832 - Operations Research in Supply Chain Management  
- M-WIWI-103289 - Stochastic Optimization

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**Events**

| SS 2019 | 2550475 | Large-Scale Optimization | 2 SWS | Lecture (V) | Rebennack |
| SS 2019 | 2550476 | Übung zu Large-Scale Optimization | 1 SWS | Practice (Ü) | Rebennack, Assistenten |

**Competence Certificate**

The assessment consists of a written exam (60 minutes) according to Section 4(2), 1 of the examination regulation. The exam takes place in every the semester.

**Prerequisites**

None.
4.125 Course: Lie Groups and Lie Algebras [T-MATH-108799]

**Responsible:** Prof. Dr. Enrico Leuzinger  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-104261 - Lie Groups and Lie Algebras

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</table>
Below you will find excerpts from events related to this course:

**Machine Learning 1 - Fundamental Methods**

**2511500, WS 19/20, 2 SWS, Language: Deutsch, Open in study portal**  
**Lecture (V)**

**Description**

The field of knowledge acquisition and machine learning is a rapidly expanding field of knowledge and the subject of numerous research and development projects. The acquisition of knowledge can take place in different ways. Thus a system can benefit from experiences already made, it can be trained, or it draws conclusions from extensive background knowledge.

The lecture covers symbolic learning methods such as inductive learning (learning from examples, learning by observation), deductive learning (explanation-based learning) and learning from analogies, as well as sub-symbolic techniques such as neural networks, support vector machines and genetic algorithms. The lecture introduces the basic principles and structures of learning systems and examines the algorithms developed so far. The structure and operation of learning systems is presented and explained with some examples, especially from the fields of robotics and image processing.

**Learning Content**

The field of knowledge acquisition and machine learning is a rapidly expanding field of knowledge and the subject of numerous research and development projects. The acquisition of knowledge can take place in different ways. Thus a system can benefit from experiences already made, it can be trained, or it draws conclusions from extensive background knowledge.

The lecture covers symbolic learning methods such as inductive learning (learning from examples, learning by observation), deductive learning (explanation-based learning) and learning from analogies, as well as sub-symbolic techniques such as neural networks, support vector machines and genetic algorithms. The lecture introduces the basic principles and structures of learning systems and examines the algorithms developed so far. The structure and operation of learning systems is presented and explained with some examples, especially from the fields of robotics and image processing.
Literature
The slides are available as a PDF

Related Literature

- Artificial Intelligence: A Modern Approach - Peter Norvig and Stuart J. Russell
- Machine Learning - Tom Mitchell
- Pattern Recognition and Machine Learning - Christopher M. Bishop
- Reinforcement Learning: An Introduction - Richard S. Sutton and Andrew G. Barto
- Deep Learning - Ian Goodfellow, Yoshua Bengio, Aaron Courville

Further (specific) literature on individual topics will be given in the lecture.
Below you will find excerpts from events related to this course:

**Machine Learning 2 - Advanced methods**

2511502, SS 2019, 2 SWS, Language: Deutsch, [Open in study portal](#)

**Description**

The field of machine decision-making and inference procedures, taking into account uncertainties and incomplete knowledge, is a rapidly expanding field of knowledge and the subject of numerous research and development projects.

The focus of this lecture is on the embedding and application of machine-learning methods in decision and inference systems starting with methods of dimension reduction, feature selection/evaluation via semi-supervised learning to methods of probabilistic inference (e.g. Dempster Shafer information fusion, dynamic and object-oriented Bayesian networks, POMDP, etc).

The lecture introduces the basic principles and structures and explains algorithms developed so far. The structure and operation of the procedures and methods are presented and explained using a number of application scenarios, in particular from the field of technical (semi-)autonomous systems.

**Notes**

The first exercise will take place on 08.05.2019.

**Learning Content**

The subject area of machine intelligence and, in particular, machine learning, taking into account real challenges of complex application domains, is a rapidly expanding field of knowledge and the subject of numerous research and development projects.

The lecture "Machine Learning 2" deals with advanced methods of machine learning such as semi-supervised and active learning, deep neural networks (deep learning), pulsed networks, hierarchical approaches, e.g. As well as dynamic, probabilistic relational methods. Another focus is the embedding and application of machine learning methods in real systems.

The lecture introduces the latest basic principles as well as extended basic structures and elucidates previously developed algorithms. The structure and the mode of operation of the methods and methods are presented and explained by means of some application scenarios, especially in the field of technical (sub) autonomous systems (robotics, neurorobotics, image processing, etc.).
Literature
The slides are available as a PDF

Related Literature
- Artificial Intelligence: A Modern Approach - Peter Norvig and Stuart J. Russell
- Machine Learning - Tom Mitchell
- Pattern Recognition and Machine Learning - Christopher M. Bishop
- Reinforcement Learning: An Introduction - Richard S. Sutton and Andrew G. Barto
- Deep Learning - Ian Goodfellow, Yoshua Bengio, Aaron Courville

Further (specific) literature on individual topics will be given in the lecture.

Exercises for Machine Learning 2 - Advanced Methods
2511503, SS 2019, 1 SWS, , Open in study portal

Notes
The first exercise will take place on 08.05.2019.
4.128 Course: Management of IT-Projects [T-WIWI-102667]

Responsible: Dr. Roland Schätzle
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

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Events

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<th>Management of IT-Projects</th>
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<td>2511215</td>
<td>Übungen zu Management von Informatik-Projekten</td>
<td>1 SWS</td>
<td>Practice (Ü)</td>
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Competence Certificate
The assessment of this course is a written examination (60 min) in the first week after lecture period according to Section 4(2), 1 of the examination regulation.

Prerequisites
None.

Below you will find excerpts from events related to this course:

Management of IT-Projects
2511214, SS 2019, 2 SWS, Language: Deutsch, [Open in study portal](#)

Learning Content
The lecture deals with the general framework, impact factors and methods for planning, handling, and controlling of IT projects. Especially following topics are addressed:

- project environment
- project organisation
- project planning including the following items:
  - plan of the project structure
  - flow chart
  - project schedule
  - plan of resources
- effort estimation
- project infrastructur
- project controlling
- risk management
- feasibility studies
- decision processes, conduct of negotiations, time management.

Workload
Lecture 30h
Exercise 15h
Preparation of lecture 30h
Preparation of exercises 30h
Exam preparation 44h
Exam &1h

Total: 150h
Literature

- B. Hindel, K. Hörmann, M. Müller, J. Schmied. Basiswissen Software-Projektmanagement. dpunkt.verlag 2004

Further literature is given in each lecture individually.
4.129 Course: Market Research [T-WIWI-107720]

**Responsible:** Prof. Dr. Martin Klarmann

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-101490 - Marketing Management

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**Events**

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<td>Practice (Ü)</td>
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**Competence Certificate**
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

**Prerequisites**
None

**Recommendation**
None

**Annotation**
Please note that this course has to be completed successfully by students interested in master thesis positions at the Marketing & Sales Research Group.

**Below you will find excerpts from events related to this course:**

**Market Research**

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<td>Practice (Ü)</td>
<td>1 SWS</td>
<td>Market Research Tutorial</td>
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</table>

**Learning Content**
Within the lecture, essential statistical methods for measuring customer attitudes (e.g. satisfaction measurement), understanding customer behavior and making strategic decisions will be discussed. The practical use as well as the correct handling of different survey methods will be taught, such as experiments and surveys. To analyze the collected data, various analysis methods are presented, including hypothesis tests, factor analyses, cluster analyses, variance and regression analyses. Building on this, the interpretation of the results will be discussed.

Topics addressed in this course are for example:

- Theoretical foundations of market research
- Statistical foundations of market research
- Measuring customer attitudes
- Understanding customer reactions
- Strategical decision making

**Annotation**
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

**Workload**
The total workload for this course is approximately 135.0 hours.

- Presence time: 30 hours
- Preparation and wrap-up of the course: 45.0 hours
- Exam and exam preparation: 60.0 hours

**Literature**
Course: Marketing Strategy Business Game [T-WIWI-102835]

Responsible: Prof. Dr. Martin Klarmann
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101490 - Marketing Management

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Events
SS 2019 2571183 Marketing Strategy Business Game 1 SWS Block (B) Klarmann, Assistenz

Competence Certificate

Prerequisites
None

Recommendation
None

Annotation
Please note that only one of the courses from the election block can be chosen in the module.
Please note: The number of participants for this course is limited. The Marketing and Sales Research Group typically provides the possibility to attend a course with 1.5 ECTS points in the respective module to all students. Participation in a specific course cannot be guaranteed.
In order to participate in this course, you need to apply. Applications are usually accepted at the start of the lecture period in summer term. Detailed information on the application process is usually provided on the website of the Marketing and Sales Research Group (marketing.iism.kit.edu) shortly before the lecture period in summer term starts.

Below you will find excerpts from events related to this course:

Marketing Strategy Business Game
2571183, SS 2019, 1 SWS, Language: Deutsch, Open in study portal

Learning Content
Using Markstrat, a marketing strategy business game, students work in groups representing a company that competes on a simulated market against the other groups' companies.

Annotation
- Please note that only one of the courses from the election block can be chosen in the module.
- Please note: The number of participants for this course is limited. The Marketing and Sales Research Group typically provides the possibility to attend a course with 1.5 ECTS in the respective module to all students. Participation in a specific course cannot be guaranteed.
- In order to participate in this course, you need to apply. Applications are usually accepted at the start of the lecture period in summer term. Detailed information on the application process is usually provided on the website of the Marketing and Sales Research Group (marketing.iism.kit.edu) shortly before the lecture period in summer term starts.

Workload
The total workload for this course is approximately 45.0 hours. For further information see German version.

Literature
4.131 Course: Markov Decision Processes [T-MATH-105921]

Responsible: Prof. Dr. Nicole Bäuerle
Organisation: KIT Department of Mathematics
Part of: M-MATH-102907 - Markov Decision Processes

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Prerequisites
none
4.132 Course: Master Thesis [T-MATH-105878]

**Responsible:** Dr. Sebastian Grensing  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-102917 - Master Thesis

**Type**  
Final Thesis

**Credits**  
30

**Version**  
1

**Final Thesis**  
This course represents a final thesis. The following periods have been supplied:

- **Submission deadline:** 6 months  
- **Maximum extension period:** 3 months  
- **Correction period:** 8 weeks
4.133 Course: Mathematical Methods in Signal and Image Processing [T-MATH-105862]

Responsible: Prof. Dr. Andreas Rieder
Organisation: KIT Department of Mathematics
Part of: M-MATH-102897 - Mathematical Methods in Signal and Image Processing

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Prerequisites:
none
Responsible: Prof. Dr. Andreas Rieder
Organisation: KIT Department of Mathematics
Part of: M-MATH-103260 - Mathematical Methods of Imaging

Type: Oral examination
Credits: 5
Recurrence: Irregular
Version: 1

Prerequisites
None
4.135 Course: Mathematical Modelling and Simulation in Practise [T-MATH-105889]

Responsible: PD Dr. Gudrun Thäter
Organisation: KIT Department of Mathematics
Part of: M-MATH-102929 - Mathematical Modelling and Simulation in Practise

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Below you will find excerpts from events related to this course:

Mathematical Modelling and Simulation
0109400, WS 19/20, 2 SWS, Language: Englisch, Open in study portal

Literature
Hans-Joachim Bungartz e.a.: Modeling and Simulation: An Application-Oriented Introduction, Springer, 2013 (English)
4.136 Course: Mathematical Statistics [T-MATH-105872]

Responsible: Prof. Dr. Norbert Henze  
Dr. Bernhard Klar  

Organisation: KIT Department of Mathematics  
Part of: M-MATH-102909 - Mathematical Statistics

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Prerequisites  
none
### 4.137 Course: Mathematical Topics in Kinetic Theory [T-MATH-108403]

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**Prerequisites**
none
4.138 Course: Maxwell's Equations [T-MATH-105856]

**Responsible:**
PD Dr. Tilo Arens
PD Dr. Frank Hettlich
Prof. Dr. Andreas Kirsch

**Organisation:**
KIT Department of Mathematics

**Part of:**
M-MATH-102885 - Maxwell's Equations

**Type**
Oral examination

**Credits**
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**Version**
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**Type**

- Oral examination

**Credits**

- 8

**Version**

- 1

Prerequisites

- none
4.140 Course: Mixed Integer Programming I [T-WIWI-102719]

**Responsible:** Prof. Dr. Oliver Stein

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101473 - Mathematical Programming
- M-WIWI-102832 - Operations Research in Supply Chain Management
- M-WIWI-103289 - Stochastic Optimization

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**Competence Certificate**

The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation. The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

The examination can also be combined with the examination of Mixed Integer Programming II[25140]. In this case, the duration of the written examination takes 120 minutes.

**Prerequisites**

None

**Recommendation**

It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

**Annotation**

The lecture is offered irregularly. The curriculum of the next three years is available online (kop.ior.kit.edu).

Below you will find excerpts from events related to this course:

**Mixed Integer Programming I**

2550138, WS 19/20, SWS, [Open in study portal](#)

**Learning Content**

Many optimization problems from economics, engineering and natural sciences are modeled with continuous as well as discrete variables. Examples are the energy minimal design of a chemical process in which several reactors may be switched on or off, or the time minimal covering of a distance with a vehicle equipped with a gear shift. While optimal points can be defined straightforwardly, for their numerical identification an interplay of ideas from discrete and continuous optimization is necessary.

The lecture treats methods for the numerical solution of linear optimization problems which depend on continuous as well as discrete variables. It is structured as follows:

- Existence results and concepts of linear as well as convex optimization
- LP relaxation and error bounds for rounding
- Gomory's cutting plane method
- Benders decomposition

Part II of the lecture treats nonlinear mixed integer programs.

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.
Literature

- J. Kallrath: Gemischt-ganzzahlige Optimierung, Vieweg, 2002
- D. Li, X. Sun: Nonlinear Integer Programming, Springer, 2006
Course: Mixed Integer Programming II [T-WIWI-102720]

**Responsible:** Prof. Dr. Oliver Stein

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101473 - Mathematical Programming
- M-WIWI-102832 - Operations Research in Supply Chain Management
- M-WIWI-103289 - Stochastic Optimization

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**Competence Certificate**
The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation.

The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

The examination can also be combined with the examination of Mixed Integer Programming I [2550138]. In this case, the duration of the written examination takes 120 minutes.

**Prerequisites**
None

**Recommendation**
It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

**Annotation**
The lecture is offered irregularly. The curriculum of the next three years is available online (kop.ior.kit.edu).
4.142 Course: Modeling and OR-Software: Advanced Topics [T-WIWI-106200]

**Responsible:** Prof. Dr. Stefan Nickel

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-102832 - Operations Research in Supply Chain Management

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**Events**

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<td>WS 19/20</td>
<td>2550490</td>
<td>Modellieren und OR-Software: Fortgeschrittene Themen</td>
<td>3 SWS</td>
<td>Practical course (P)</td>
</tr>
</tbody>
</table>

**Competence Certificate**

The assessment is a 120 minutes examination, including a written and a practical part (according to §4(2), 1 of the examination regulation).

The examination is held in the term of the software laboratory and the following term.

**Prerequisites**

None.

**Recommendation**

Basic knowledge as conveyed in the module Introduction to Operations Research is assumed.

Successful completion of the course Modeling and OR-Software: Introduction.

**Annotation**

Due to capacity restrictions, registration before course start is required. For further information see the webpage of the course.

The lecture is held in every term. The planned lectures and courses for the next three years are announced online.

*Below you will find excerpts from events related to this course:*  

**Modellieren und OR-Software: Fortgeschrittene Themen**

2550490, WS 19/20, 3 SWS, Language: Deutsch, [Open in study portal]

**Learning Content**

After an introduction to general concepts of modelling tools (implementation, data handling, result interpretation, ...), the software IBM ILOG CPLEX Optimization Studio and the corresponding modeling language OPL will be discussed which can be used to solve OR problems on a computer-aided basis.

Subsequently, a broad range of exercises will be discussed. The main goals of the exercises from literature and practical applications are to learn the process of modeling optimization problems as linear or mixed-integer programs, to efficiently utilize the presented tools for solving these optimization problems and to implement heuristic solution procedures for mixed-integer programs.

**Annotation**

Due to capacity restrictions, registration before course start is required. For further information see the webpage of the course.

The lecture is offered in every winter term. The planned lectures and courses for the next three years are announced online.

**Workload**

The total workload for this course is approximately 135.0 hours. For further information see German version.
4.143 Course: Modeling and OR-Software: Introduction [T-WIWI-106199]

Responsible: Prof. Dr. Stefan Nickel
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101413 - Applications of Operations Research

<table>
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<td>3 SWS</td>
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Competence Certificate
The assessment is a 120 minutes examination, including a written and a practical part (according to §4(2), 1 of the examination regulation).

The examination is held in the term of the software laboratory and the following term.

Prerequisites
None

Recommendation

Annotation
Due to capacity restrictions, registration before course start is required. For further information see the webpage of the course.

The lecture is offered in every term. The planned lectures and courses for the next three years are announced online.

Below you will find excerpts from events related to this course:

Modellieren und OR-Software: Einführung
2550490, SS 2019, 3 SWS, Language: Deutsch, Open in study portal

Learning Content
The task of solving combinatorial and nonlinear optimization problems imposes much higher requirements on suggested solution approaches as in linear programming.

During the course of this software laboratory, students get to know important methods from combinatorial optimization, e.g. Branch & Cut- or Column Generation methods and are enabled to solve problems with the software system IBM ILOG CPLEX Optimization Studio and the corresponding modeling language OPL. In addition, issues of nonlinear optimization, e.g. quadratic optimization, are addressed. As an important part of the software laboratory, students get the possibility to model combinatorial and nonlinear problems and implement solution approaches in the software system.

The software laboratory also introduces some of the most frequently used modelling and programming languages that are used in practice to solve optimization problems.

Annotation
Due to capacity restrictions, registration before course start is required. For further information see the webpage of the course.

The lecture is offered irregularly. The planned lectures and courses for the next three years are announced online.

Workload
The total workload for this course is approximately 135.0 hours. For further information see German version.
### 4.144 Course: Monotonicity Methods in Analysis [T-MATH-105877]

- **Responsible:** PD Dr. Gerd Herzog
- **Organisation:** KIT Department of Mathematics
- **Part of:** M-MATH-102887 - Monotonicity Methods in Analysis

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| SS 2019 | 0103000 | Monotoniemethoden in der Analysis | 2 SWS | Lecture (V) | Herzog |
### Course: Multivariate Statistical Methods [T-WIWI-103124]

**Responsible:** Prof. Dr. Oliver Grothe  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101473 - Mathematical Programming  
- M-WIWI-101637 - Analytics and Statistics  
- M-WIWI-101639 - Econometrics and Statistics II  
- M-WIWI-103289 - Stochastic Optimization

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#### Competence Certificate

The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation. A bonus program can improve the grade by one grade level (i.e. by 0.3 or 0.4).

The exam is offered every semester. Re-examinations are offered only for repeaters.

#### Prerequisites

None

#### Recommendation

The course covers highly advanced statistical methods with a quantitative focus. Hence, participants are necessarily expected to have advanced statistical knowledge, e.g. acquired in the course “Advanced Statistics”. Without this, participation in the course is not advised.

Previous attendance of the course Analysis of Multivariate Data is recommended. Alternatively, the script can be provided to interested students.
**4.146 Course: Nature-Inspired Optimization Methods [T-WIWI-102679]**

**Responsible:** Dr. rer. nat. Pradyumn Kumar Shukla  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101472 - Informatics

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<td>Shukla</td>
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**Competence Certificate**

The assessment consists of a written exam (60 min) (according to Section 4(2), 1 of the examination regulation) and an additional written examination called "bonus exam", 60 min (according Section 4(2), 3 of the examination regulation) or a selection of exercises. The bonus exam may be split into several shorter written tests.

The grade of this course is the achieved grade in the written examination. If this grade is at least 4.0 and at most 1.3, a passed bonus exam will improve it by one grade level (i.e. by 0.3 or 0.4).

**Prerequisites**

None

Below you will find excerpts from events related to this course:

**Nature-Inspired Optimization Methods**

2511106, SS 2019, 2 SWS, Language: Englisch, [Open in study portal](#)

**Learning Content**

Many optimization problems are too complex to be solved to optimality. A promising alternative is to use stochastic heuristics, based on some fundamental principles observed in nature. Examples include evolutionary algorithms, ant algorithms, or simulated annealing. These methods are widely applicable and have proven very powerful in practice. During the course, such optimization methods based on natural principles are presented, analyzed and compared. Since the algorithms are usually quite computational intensive, possibilities for parallelization are also investigated.
4 COURSES

Course: Non- and Semiparametrics [T-WIWI-103126]

4.147 Course: Non- and Semiparametrics [T-WIWI-103126]

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<tr>
<th>Responsible:</th>
<th>Prof. Dr. Melanie Schienle</th>
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<td>KIT Department of Economics and Management</td>
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<tr>
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Competence Certificate
The assessment consists of a written exam (90 minutes) (following §4(2), 1 of the examination regulation).

Prerequisites
None

Recommendation
Knowledge of the contents covered by the course "Applied Econometrics" [2520020]

Annotation
The course takes place every second winter semester: 2018/19 then 2020/21
4.148 Course: Nonlinear Analysis [T-MATH-107065]

**Responsible:** Prof. Dr. Tobias Lamm  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-103539 - Nonlinear Analysis

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**Prerequisites**

none
4.149 Course: Nonlinear Maxwell Equations [T-MATH-106484]

**Responsible:** Prof. Dr. Roland Schnaubelt

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-103257 - Nonlinear Maxwell Equations

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**Prerequisites**
Keine
4.150 Course: Nonlinear Maxwell Equations [T-MATH-110283]

**Responsible:** Prof. Dr. Roland Schnaubelt

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-105066 - Nonlinear Maxwell Equations

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**Prerequisites**

none
4.151 Course: Nonlinear Optimization I [T-WIWI-102724]

**Responsible:** Prof. Dr. Oliver Stein

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101414 - Methodical Foundations of OR
- M-WIWI-101473 - Mathematical Programming

**Type**
- Written examination

**Credits**
- 4.5

**Recurrence**
- Each winter term

**Version**
- 4

**Events**

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<td>2</td>
<td>Lecture (V)</td>
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<td>Each winter term</td>
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<td>Stein</td>
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<td>WS 19/20</td>
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<td>Exercises Nonlinear Optimization I + II</td>
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**Competence Certificate**
The assessment consists of a written exam (60 minutes) according to Section 4(2), 1 of the examination regulation and possibly of a compulsory prerequisite.

The exam takes place in the semester of the lecture and in the following semester.

The examination can also be combined with the examination of Nonlinear Optimization I[2550113]. In this case, the duration of the written examination takes 120 minutes.

**Prerequisites**
The module component exam T-WIWI-103637 "Nonlinear Optimization I and II" may not be selected.

**Annotation**
Part I and II of the lecture are held consecutively in the same semester.

*Below you will find excerpts from events related to this course:*

**Learning Content**
The lecture treats the minimization of smooth nonlinear functions under nonlinear constraints. For such problems, which occur very often in economics, engineering, and natural sciences, we derive optimality conditions that form the basis for numerical solution methods. The lecture is structured as follows:

- Introduction, examples, and terminology
- Existence results for optimal points
- First and second order optimality conditions for unconstrained problems
- Optimality conditions for unconstrained convex problems
- Numerical methods for unconstrained problems (line search, steepest descent method, variable metric methods, Newton method, Quasi Newton methods, CG method, trust region method)

Constrained problems are the contents of part II of the lecture.

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

**Annotation**
Part I and II of the lecture are held consecutively in the same semester.
Literature

Elective literature:

- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993
4.152 Course: Nonlinear Optimization I and II [T-WIWI-103637]

Responsible: Prof. Dr. Oliver Stein
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101414 - Methodical Foundations of OR
         M-WIWI-101473 - Mathematical Programming

Type: Written examination
Credits: 9
Recurrence: Each winter term
Version: 5

Events

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<td>Lecture (V)</td>
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Competence Certificate
The assessment consists of a written exam (120 minutes) according to Section 4(2), 1 of the examination regulation and possibly of a compulsory prerequisite.

The exam takes place in the semester of the lecture and in the following semester.

Prerequisites
None.

Annotation
Part I and II of the lecture are held consecutively in the same semester.

Below you will find excerpts from events related to this course:

Nonlinear Optimization I
2550111, WS 19/20, 2 SWS, Open in study portal

Learning Content
The lecture treats the minimization of smooth nonlinear functions under nonlinear constraints. For such problems, which occur very often in economics, engineering, and natural sciences, we derive optimality conditions that form the basis for numerical solution methods. The lecture is structured as follows:

- Introduction, examples, and terminology
- Existence results for optimal points
- First and second order optimality conditions for unconstrained problems
- Optimality conditions for unconstrained convex problems
- Numerical methods for unconstrained problems (line search, steepest descent method, variable metric methods, Newton method, Quasi Newton methods, CG method, trust region method)

Constrained problems are the contents of part II of the lecture.
The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Annotation
Part I and II of the lecture are held consecutively in the same semester.
Literature
Elective literature:

- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993

Nonlinear Optimization II
2550113, WS 19/20, 2 SWS, Open in study portal

Learning Content
The lecture treats the minimization of smooth nonlinear functions under nonlinear constraints. For such problems, which occur very often in economics, engineering, and natural sciences, we derive optimality conditions that form the basis for numerical solution methods. Part I of the lecture treats unconstrained optimization problems. Part II of the lecture is structured as follows:

- Topology and first order approximations of the feasible set
- Theorems of the alternative, first and second order optimality conditions for constrained problems
- Optimality conditions for constrained convex problems
- Numerical methods for constrained problems (penalty method, multiplier method, barrier method, interior point method, SQP method, quadratic optimization)

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Annotation
Part I and II of the lecture are held consecutively in the same semester.

Literature
Elective literature:

- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993
4 COURSES

Course: Nonlinear Optimization II [T-WIWI-102725]

4.153 Course: Nonlinear Optimization II [T-WIWI-102725]

**Responsible:** Prof. Dr. Oliver Stein

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101414 - Methodical Foundations of OR
- M-WIWI-101473 - Mathematical Programming

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<td>Practice (Ü)</td>
<td>Stein</td>
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<td>Nonlinear Optimization II</td>
<td>Lecture (V)</td>
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**Competence Certificate**
The assessment consists of a written exam (60 minutes) according to Section 4(2), 1 of the examination regulation and possibly of a compulsory prerequisite.
The exam takes place in the semester of the lecture and in the following semester.
The exam can also be combined with the examination of *Nonlinear Optimization* [2550111]. In this case, the duration of the written exam takes 120 minutes.

**Prerequisites**
None.

**Annotation**
Part I and II of the lecture are held consecutively in the same semester.

*Below you will find excerpts from events related to this course:*

**Nonlinear Optimization II**

2550113, WS 19/20, 2 SWS

Lecture (V)

**Learning Content**
The lecture treats the minimization of smooth nonlinear functions under nonlinear constraints. For such problems, which occur very often in economics, engineering, and natural sciences, we derive optimality conditions that form the basis for numerical solution methods. Part I of the lecture treats unconstrained optimization problems. Part II of the lecture is structured as follows:

- Topology and first order approximations of the feasible set
- Theorems of the alternative, first and second order optimality conditions for constrained problems
- Optimality conditions for constrained convex problems
- Numerical methods for constrained problems (penalty method, multiplier method, barrier method, interior point method, SQP method, quadratic optimization)

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

**Annotation**
Part I and II of the lecture are held consecutively in the same semester.

**Literature**

Elective literature:

- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993
# 4.154 Course: Nonparametric Statistics [T-MATH-105873]

**Responsible:** Prof. Dr. Norbert Henze  
Dr. Bernhard Klar  

**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-102910 - Nonparametric Statistics

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4.155 Course: Numerical Continuation Methods [T-MATH-105912]

**Responsible:** Prof. Dr. Jens Rottmann-Matthes

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102944 - Numerical Continuation Methods

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**Prerequisites**

none
### 4.156 Course: Numerical Linear Algebra for Scientific High Performance Computing [T-MATH-107497]

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**Responsible:** Dr. Hartwig Anzt  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-103709 - Numerical Linear Algebra for Scientific High Performance Computing

**Prerequisites**  
none
Course: Numerical Linear Algebra in Image Processing [T-MATH-108402]

Responsible: PD Dr. Volker Grimm
Organisation: KIT Department of Mathematics
Part of: M-MATH-104058 - Numerical Linear Algebra in Image Processing

Prerequisites
none

Type: Oral examination
Credits: 6
Recurrence: Irregular
Version: 1
# 4.158 Course: Numerical Methods for Differential Equations [T-MATH-105836]

**Responsible:** Prof. Dr. Willy Dörfler  
Prof. Dr. Marlis Hochbruck  
Prof. Dr. Tobias Jahnke  
Prof. Dr. Andreas Rieder  
Prof. Dr. Christian Wieners  

**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-102888 - Numerical Methods for Differential Equations  

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**Events**

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<td>Numerische Methoden für Differentialgleichungen</td>
<td>4 SWS</td>
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<td>WS 19/20</td>
<td>0110800</td>
<td>Übungen zu 0110700</td>
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**4.159 Course: Numerical Methods for Hyperbolic Equations [T-MATH-105900]**

**Responsible:** Prof. Dr. Willy Dörfler  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-102915 - Numerical Methods for Hyperbolic Equations

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<th>Numerical methods for hyperbolic equations</th>
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<td>0160810</td>
<td>Tutorial for 0160800 (Numerical Methods for Hyperbolic Equations)</td>
<td>1 SWS</td>
<td>Practice (Ü)</td>
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**Prerequisites**
none
4.160 Course: Numerical Methods for Integral Equations [T-MATH-105901]

Responsible:  
PD Dr. Tilo Arens  
PD Dr. Frank Hettlich  
Prof. Dr. Andreas Kirsch

Organisation:  
KIT Department of Mathematics

Part of:  
M-MATH-102930 - Numerical Methods for Integral Equations

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| Responsible          | Prof. Dr. Marlis Hochbruck  
|                      | Prof. Dr Tobias Jahnke      
| Organisation         | KIT Department of Mathematics  
| Part of              | M-MATH-102931 - Numerical Methods for Maxwell's Equations  

| Type            | Oral examination  
| Credits | 6  
| Version  | 1  

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**Responsible:** Prof. Dr. Marlis Hochbruck
Prof. Dr Tobias Jahnke

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102928 - Numerical Methods for Time-Dependent Partial Differential Equations

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</table>
4.163 Course: Numerical Methods in Computational Electrodynamics [T-MATH-105860]

**Responsible:** Prof. Dr. Willy Dörfler  
Prof. Dr. Marlis Hochbruck  
Prof. Dr Tobias Jahnke  
Prof. Dr. Andreas Rieder  
Prof. Dr. Christian Wieners

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102894 - Numerical Methods in Computational Electrodynamics

**Type:** Oral examination  
**Credits:** 6  
**Version:** 1

**Prerequisites**  
none
4.164 Course: Numerical Methods in Fluid Mechanics [T-MATH-105902]

**Responsible:** Prof. Dr. Willy Dörfler  
PD Dr. Gudrun Thäter

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102932 - Numerical Methods in Fluid Mechanics

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<td>Numerical Methods in Fluidmechanics</td>
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<td>Tutorial for 0161600</td>
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4.165 Course: Numerical Methods in Mathematical Finance [T-MATH-105865]

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Type: Oral examination
Credits: 8
Version: 1

Prerequisites:
none
4.166 Course: Numerical Methods in Mathematical Finance II [T-MATH-105880]

**Responsible:** Prof. Dr Tobias Jahnke

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102914 - Numerical Methods in Mathematical Finance II

---

**Type:** Oral examination

**Credits:** 8

**Version:** 1

---

**Competence Certificate**

Mündliche Prüfung im Umfang von ca. 30 Minuten

**Prerequisites**

none
4.167 Course: Numerical Optimisation Methods [T-MATH-105858]

Responsible: Prof. Dr. Willy Dörfler
Prof. Dr. Marlis Hochbruck
Prof. Dr. Tobias Jahnke
Prof. Dr. Andreas Rieder
Prof. Dr. Christian Wieners

Organisation: KIT Department of Mathematics
Part of: M-MATH-102892 - Numerical Optimisation Methods

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**Responsible:** Prof. Dr. Stefan Nickel  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-102805 - Service Operations

### Competence Certificate
The assessment is a 60 minutes written examination (according to §4(2), 1 of the examination regulation). The examination is held in the term of the lecture and the following lecture.

### Prerequisites
None

### Recommendation
Basic knowledge as conveyed in the module "Introduction to Operations Research" is assumed.

### Annotation
The course is offered irregularly. Planned lectures for the next three years can be found in the internet at http://dol.ior.kit.edu/english/Courses.php.

**Responsible:** Prof. Dr. Stefan Nickel

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101473 - Mathematical Programming
- M-WIWI-102805 - Service Operations
- M-WIWI-102832 - Operations Research in Supply Chain Management
- M-WIWI-103289 - Stochastic Optimization

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**Competence Certificate**
The assessment is a 60 minutes written examination (according to §4(2), 1 of the examination regulation).
The examination is held in the term of the lecture and the following lecture.

**Prerequisites**
None

**Recommendation**
Basic knowledge as conveyed in the module Introduction to Operations Research and in the lectures Facility Location and Strategic SCM, Tactical and operational SCMIs assumed.

**Annotation**
The course is offered irregularly. Planned lectures for the next three years can be found in the internet at http://dol.ior.kit.edu/english/Courses.php.

Below you will find excerpts from events related to this course:

Operations Research in Supply Chain Management
2550480, SS 2019, 2 SWS, Language: Englisch, Open in study portal

**Learning Content**
Supply Chain Management constitutes a general tool for logistics process planning in supply networks. To an increasing degree quantitative decision support is provided by methods and models from Operations Research. The lecture "OR in Supply Chain Management" conveys concepts and approaches for solving practical problems and presents an insight to current research topics. The lecture's focus is set on modeling and solution methods for applications originating in different domains of a supply chain. The emphasis is put on mathematical methods like mixed integer programming, valid inequalities or column generation, and the derivation of optimal solution strategies.

In form and content, the lecture addresses all levels of Supply Chain Management: After a short introduction, the tactical and operational level will be discussed with regard to inventory models, scheduling as well as cutting and packing. The strategic level will be discussed in terms of layout planning. Another main focus of the lecture is the application of methods from online optimization. This optimization discipline has gained more and more importance in the optimization of supply chains over the several past years due to an increasing amount of dynamic data flows.

**Annotation**
The course is offered irregularly. Planned lectures for the next three years can be found in the internet at http://dol.ior.kit.edu/english/Courses.php.

**Workload**
The total workload for this course is approximately 135.0 hours. For further information see German version.
Literature

- Dyckhoff, H.; Finke, U.: Cutting and Packing in Production and Distribution - A Typology and Bibliography, Physica-Verlag, 1992
### 4.170 Course: Optimisation and Optimal Control for Differential Equations [T-MATH-105864]

**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-102899 - Optimisation and Optimal Control for Differential Equations

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**Prerequisites**  
none
4.171 Course: Optimization in Banach Spaces [T-MATH-105893]

**Responsible:** Prof. Dr. Andreas Kirsch

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102924 - Optimization in Banach Spaces

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**Prerequisites**

none
Course: Optimization Models and Applications [T-WIWI-110162]

**Responsible:** Dr. Nathan Sudermann-Merx

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101473 - Mathematical Programming
- M-WIWI-102832 - Operations Research in Supply Chain Management
- M-WIWI-103289 - Stochastic Optimization

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**Competence Certificate**

The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

The prerequisite for participation in the exam is the achievement of a minimum number of points in online tests. Details will be announced at the beginning of the course.

**Prerequisites**

None.
4.173 Course: Optimization under Uncertainty [T-WIWI-106545]

- **Responsible:** Prof. Dr. Steffen Rebennack
- **Organisation:** KIT Department of Economics and Management
- **Part of:**
  - M-WIWI-101413 - Applications of Operations Research
  - M-WIWI-103289 - Stochastic Optimization

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**Competence Certificate**

The assessment consists of a written exam (60 minutes) according to Section 4(2), 1 of the examination regulation. The exam takes place in every the semester.

**Prerequisites**

None.
### 4.174 Course: Panel Data [T-WIWI-103127]

**Responsible:** Dr. Wolf-Dieter Heller  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101638 - Econometrics and Statistics I  
- M-WIWI-101639 - Econometrics and Statistics II

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**Prerequisites**  
None
4.175 Course: Parallel Computing [T-MATH-102271]

**Responsible:**
- Dr. rer. nat. Mathias Krause
- Prof. Dr. Christian Wieners

**Organisation:**
- KIT Department of Mathematics

**Part of:**
- M-MATH-101338 - Parallel Computing

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### 4.176 Course: Parametric Optimization [T-WIWI-102855]

**Responsible:** Prof. Dr. Oliver Stein  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101473 - Mathematical Programming

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**Competence Certificate**  
The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation. The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

**Prerequisites**  
None

**Recommendation**  
It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

**Annotation**  
The lecture is offered irregularly. The curriculum of the next three years is available online (www.ior.kit.edu).
## 4.177 Course: Percolation [T-MATH-105869]

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<th>Prof. Dr. Günter Last</th>
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### Prerequisites

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</table>
4.178 Course: Poisson Processes [T-MATH-105922]

**Responsible:** Prof. Dr. Vicky Fasen-Hartmann  
Prof. Dr. Daniel Hug  
Prof. Dr. Günter Last

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102922 - Poisson Processes

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**Prerequisites**

none
4.179 Course: Portfolio and Asset Liability Management [T-WIWI-103128]

Responsible: Dr. Mher Safarian
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101639 - Econometrics and Statistics II

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Events

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<td>2</td>
<td>Practice (Ü)</td>
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Competence Certificate

The assessment of this course consists of a written examination (following §4(2), 1 SPOs, 180 min.) and of possible additional assignments during the course (§4 (2), 3 SPO 2007 respectively §4 (3) SPO 2015).

Prerequisites
None

Below you will find excerpts from events related to this course:

Portfolio and Asset Liability Management
2520357, SS 2019, 2 SWS, Language: Englisch, Open in study portal

Description
Portfolio theory: principles of investment, Markowitz-portfolio analysis, Modigliani-Miller theorems and absence of arbitrage, efficient markets, capital asset pricing model (CAPM), multi factorial CAPM, arbitrage pricing theory (APT), arbitrage and hedging, multi factorial models, equity-portfolio management, passive strategies, active investment
Asset liability: statistical portfolio analysis in stock allocation, measures of success, dynamic multi seasonal models, models in building scenarios, stochastic programming in bond and liability management, optimal investment strategies, integrated asset liability management

Learning Content
Portfolio theory: principles of investment, Markowitz-portfolio analysis, Modigliani-Miller theorems and absence of arbitrage, efficient markets, capital asset pricing model (CAPM), multi factorial CAPM, arbitrage pricing theory (APT), arbitrage and hedging, multi factorial models, equity-portfolio management, passive strategies, active investment
Asset liability: statistical portfolio analysis in stock allocation, measures of success, dynamic multi seasonal models, models in building scenarios, stochastic programming in bond and liability management, optimal investment strategies, integrated asset liability management

Workload
The total workload for this course is approximately 150 hours. For further information see German version.

Literature
To be announced in lecture.

Elective literature:
To be announced in lecture.
4.180 Course: Potential Theory [T-MATH-105850]

**Responsible:** PD Dr. Tilo Arens  
PD Dr. Frank Hettlich  
Prof. Dr. Andreas Kirsch  
Prof. Dr. Wolfgang Reichel

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102879 - Potential Theory

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### 4.181 Course: Practical Seminar: Health Care Management (with Case Studies) [T-WIWI-102716]

**Responsible:** Prof. Dr. Stefan Nickel  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-102805 - Service Operations

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<td>SS 2019</td>
<td>2550498</td>
<td>Practical seminar: Health Care Management</td>
<td>5 SWS</td>
<td>Nickel, Reuter-Oppermann</td>
</tr>
</tbody>
</table>

**Competence Certificate**
The assessment consists in a case study, the writing of a corresponding paper, and an oral exam (according to §4(2), 2 of the examination regulation).

**Prerequisites**
None.

**Recommendation**
Basic knowledge as conveyed in the module Introductions to Operations Research is assumed.

**Annotation**
The credits have been reduced to 4.5 starting summer term 2016. The lecture is offered every term. The planned lectures and courses for the next three years are announced online.

Below you will find excerpts from events related to this course:

**Practical seminar: Health Care Management**
2550498, SS 2019, 5 SWS, Language: Deutsch, [Open in study portal](#)

**Learning Content**
Processes in a hospital are often grown historically (“We have always done it this way”), so that there has not been the need to analyze processes until reforms of the health system have put increasing pressure on hospitals. Consequently, nowadays hospitals look for possibilities to improve their processes. The students are confronted with case studies and are asked to develop a solution. Therefore they have to collect and analyze relevant data, processes and structures. When developing the solution the students have to bear in mind that besides the economic efficiency also the quality of care and patient satisfaction (e.g. measured in waiting time) may not be neglected in the health care sector.

**Annotation**
The lecture is offered every term. The planned lectures and courses for the next three years are announced online.

**Workload**
The total workload for this course is approximately 135 hours. For further information see German version.

**Literature**

**Elective literature:**
- Fleßa: Grundzüge der Krankenhausbetriebslehre, Oldenbourg, 2007  
- Fleßa: Grundzüge der Krankenhaussteuerung, Oldenbourg, 2008  
### 4.182 Course: Practical Seminar: Information Systems and Service Design [T-WIFI-108437]

- **Responsible:** Prof. Dr. Alexander Mädche
- **Organisation:** KIT Department of Economics and Management
- **Part of:** M-WIWI-104068 - Information Systems in Organizations

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<tr>
<td>SS 2019 2540554</td>
<td>4.5</td>
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#### Competence Certificate
The assessment of this course is according to §4(2), 3 SPO in form of a written documentation, a presentation of the outcome of the conducted practical components and an active participation in class. Please take into account that, beside the written documentation, also a practical component (e.g. implementation of a prototype) is part of the course. Please examine the course description for the particular tasks. The final mark is based on the graded and weighted attainments (such as the written documentation, presentation, practical work and an active participation in class). In the winter terms, the course is only offered as a seminar.

#### Prerequisites
None.

#### Recommendation
Attending the course „Digital Service Design” is recommended, but not mandatory.

#### Annotation
The course is held in English.

Below you will find excerpts from events related to this course:

#### Description
Contemporary trends of every increasing digitalization in businesses lead to new challenges and fusion of technologies blurring the lines between the digital, physical and biological spheres, thereby calling for a new approaches for corporate management. Recently, physician Michio Kaku put it like the following: “The destiny of computers – like other mass technologies like electricity, paper, and running water- is to become invisible, that is, to disappear into the fabric of our lives, to be everywhere and nowhere, silently and seamlessly carrying out our wishes.” Michio Kaku (2016)

In the Practical Seminar Digital Service Design students address a real-world challenge in businesses and apply digital service design practices and tools. Furthermore, during the time of the seminar the students prototypical implement a running digital service.

Real-world challenges will vary over time. This time, the challenges are from the domain of Future Corporate Management. The practical seminar is carried out in close cooperation with SAP SE and leverages state-of-the-art digital platforms for prototyping.

#### Learning Content
- Foundations
- Digital Service Design Challenges in Future Corporate Management
- Basics of Digital Service Design practices and tools
- Prototyping and development Digital Services
- Delivering digital service prototypes
4.183 Course: Predictive Mechanism and Market Design [T-WIWI-102862]

**Responsible:** Prof. Dr. Johannes Philipp Reiß  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101505 - Experimental Economics

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<td>Practice (Ü)</td>
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**Competence Certificate**

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

**Prerequisites**

None

**Annotation**

The course is given every second fall term, e.g., WS2017/18, WS2019/20, ...

The retake exam is given in the summer term subsequent to the fall term where the course (lecture and final exam) is given.
4.184 Course: Pricing [T-WIWI-102883]

Responsible: Dr. Sven Feurer
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101490 - Marketing Management

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Events

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<td>WS 19/20</td>
<td>2572169 Übung zu Pricing</td>
<td>1 SWS</td>
<td>Practice (Ü)</td>
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Competence Certificate
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

Prerequisites
None

Recommendation
None

Below you will find excerpts from events related to this course:

Pricing
2572157, WS 19/20, 2 SWS, Language: Deutsch, Open in study portal

Learning Content
This course addresses central elements and peculiarities of pricing goods and services. The topics are below others:

- Price demand functions
- Concept of the price elasticity of demand
- Key concepts of behavioral pricing
- Decision-making areas in pricing

Annotation
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

Workload
The total workload for this course is approximately 135.0 hours. For further information see German version.
T 4.185 Course: Probability Theory and Combinatorial Optimization [T-MATH-105923]

Responsibility: Prof. Dr. Daniel Hug
Prof. Dr. Günter Last

Organisation: KIT Department of Mathematics

Part of: M-MATH-102947 - Probability Theory and Combinatorial Optimization

Type: Oral examination
Credits: 8
Version: 1

Prerequisites
none
4.186 Course: Process Mining [T-WIWI-109799]

**Responsibility:** Prof. Dr. Andreas Oberweis

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-101472 - Informatics

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<th>Workload</th>
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<td>Lecture (V)</td>
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<td>SS 2019 2511205 Exercise Process Mining</td>
<td>1 SWS</td>
<td>Practice (Ü)</td>
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**Competence Certificate**
The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation in the first week after lecture period.

**Prerequisites**
None

**Annotation**
Former name (up to winter semester 2018/1019) "Workflow Management".

*Below you will find excerpts from events related to this course:*

**Process Mining**
2511204, SS 2019, 2 SWS, Language: Deutsch, [Open in study portal](#)

**Learning Content**
The area of process mining covers approaches which aim at deducting new knowledge on the basis of logfiles generated by information systems. Such information systems are e.g., workflow-management-systems which are used for an efficient control of processes in enterprises and organisations. The lecture introduces the foundations of processes and respective modeling and analysis techniques. In the following, the foundations of process mining and the three classical types of approaches - discovery, conformance and enhancement - will be taught. In addition to the theoretical basics, tools, application scenarios in practice and open research questions are covered as well.

**Workload**
Lecture 30h
Exercise 15h
Preparation of lecture 30h
Preparation of exercises 30h
Exam preparation 44h
Exam 1h
Total: 150h
Literature


Further literature is given in the lecture.
### Course: Product and Innovation Management [T-WIWI-109864]

**Responsible:** Prof. Dr. Martin Klarmann  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101490 - Marketing Management

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<td>3</td>
<td>Each summer term</td>
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</table>

**Competence Certificate**  
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

**Prerequisites**  
None

**Annotation**  
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

Below you will find excerpts from events related to this course:

### Product and Innovation Management  
2571154, SS 2019, 2 SWS, Language: Englisich, Open in study portal  
Lecture (V)

**Learning Content**  
This course addresses topics around the management of new as well as existing products. After the foundations of product management, especially the product choice behavior of customers, students get to know in detail different steps of the innovation process. Another section regards the management of the existing product portfolio.

**Annotation**  
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

**Workload**  
Total effort for 3 credit points: approx. 90 hours  
Presence time: 30 hours  
Preparation and wrap-up of LV: 45.0 hours  
Exam and exam preparation: 15.0 hours

**Literature**  
4.188 Course: Project Centered Software-Lab [T-MATH-105907]

**Responsible:** PD Dr. Gudrun Thäter

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102938 - Project Centered Software-Lab

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<tr>
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**Events**

| Events | SS 2019 | 0161700 | Projektorientiertes Softwarepraktikum | 4 SWS | Practical course (P) | Thäter, Krause, Klemens |

**Prerequisites**

none
4.189 Course: Project Lab Cognitive Automobiles and Robots [T-WIWI-109985]

**Responsible:** Prof. Dr.-Ing. Johann Marius Zöllner

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-101472 - Informatics

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<td>Each winter term</td>
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**Events**

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<td>WS 19/20</td>
<td>2512501</td>
<td>Projektpraktikum Kognitive Automobile und Roboter</td>
<td>3 SWS</td>
<td>Practical course (P)</td>
<td>Zöllner</td>
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</table>

**Competence Certificate**
The non exam assessment (§4(2), 3 SPO 2007) or alternative exam assessment (§ 4(2), 3 SPO 2015) consists of:

- a practical work
- a presentation and
- a written seminar thesis

Details of the grade formation will be announced at the beginning of the course.

**Prerequisites**

None
4.190 Course: Project Lab Machine Learning [T-WIWI-109983]

**Responsible:** Prof. Dr.-Ing. Johann Marius Zöllner

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-101472 - Informatics

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**Events**

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<th>2512500</th>
<th>Projektpraktikum Maschinelles Lernen</th>
<th>3 SWS</th>
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</table>

**Competence Certificate**

The non exam assessment (§4(2), 3 SPO 2007) or alternative exam assessment (§ 4(2), 3 SPO 2015) consists of:

- a practical work
- a presentation and
- a written seminar thesis

Details of the grade formation will be announced at the beginning of the course.

**Prerequisites**

None
4.191 Course: Public Management [T-WIWI-102740]

Responsible: Prof. Dr. Berthold Wigger
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101504 - Collective Decision Making

Events

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<th>Recurrence</th>
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<td>2561127</td>
<td>Public Management</td>
<td>3 SWS</td>
<td>Lecture / Practice (VÜ)</td>
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</table>

Competence Certificate
The assessment consists of an 1h written exam following Art. 4, para. 2, clause 1 of the examination regulation. The grade for this course equals the grade of the written exam.

Prerequisites
None

Recommendation
Basic knowledge of Public Finance is required.

Below you will find excerpts from events related to this course:

Public Management
2561127. WS 19/20, 3 SWS, Language: Deutsch, Open in study portal
Lecture / Practice (VÜ)

Learning Content
The lecture "Public Management" deals with the economic theory of public sector administration. It is divided into four parts. The first section gives an overview of the legal framework of governmental administration in the Federal Republic of Germany and introduces the classical theory of administration as developed by Weber. Part two studies concepts of public decision-making, which have a significant impact on the operation of public sector administrations and where one focus is on consistency problems of collective decision-making. The third chapter deals with efficiency problems arising in conventionally organized public administrations and companies. X-inefficiency, information and control problems, the isolated consideration of income-spending-relations as well as rent-seeking problems will be considered. In section four the concept of New Public Management, which is a new approach to public sector administration that is mainly based in contract theory, is introduced. Its foundations in institutional economics are developed, with a focus on the specific incentive structures in self-administered administrations. Finally, the achievements of New Public Management approaches are discussed.

Workload
The total workload for this course is approximately 135.0 hours. For further information see German version.

Literature
Elective literature:
Course: Python for Computational Risk and Asset Management [T-WIWI-110213]

**Responsible:** Prof. Dr Maxim Ulrich  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-105032 - Data Science for Finance

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### Events

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<td>2 SWS</td>
<td>Python for Computational Risk and Asset Management</td>
<td>Each winter term</td>
<td>Ulrich</td>
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</table>

### Competence Certificate

The assessment is carried out in form of twelve weekly Python programming tasks and offered each winter term. The grade of this course is determined by the points achieved in the programming tasks.

### Prerequisites

None.

### Recommendation

Good knowledge of statistics and first programming experience with Python is recommended.

Below you will find excerpts from events related to this course:

#### Python for Computational Risk and Asset Management

**2500016, WS 19/20, 2 SWS, Language: Englisch,** Open in study portal

**Description**

The aim of this course is to provide students with strong knowledge in Python to independently solve real-world data problems related to automated robo investment advisory.

**Learning Content**

The course covers several topics from a programming perspective, among them:

- Quantitative Portfolio Strategies: Extensions to Mean-Variance Portfolio Optimization
- Return Densities: Forecasting with Traditional and Machine Learning Approaches, Monte Carlo Simulation
- Financial Economics: Rationalizing Risk Premiums via Stochastic Discount Factor
- Multi-Asset Valuation: DCF Approach, No-Arbitrage and Ito Calculus

**Workload**

The total workload for this course is approximately 90 hours.
4.193 Course: Random Graphs [T-MATH-105929]

**Responsible:** Dr. Matthias Schulte  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-102951 - Random Graphs

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**Prerequisites**

none
4.194 Course: Ruin Theory [T-MATH-108400]

Responsible: Prof. Dr. Vicky Fasen-Hartmann
Organisation: KIT Department of Mathematics
Part of: M-MATH-104055 - Ruin Theory

Prerequisites
none
### 4.195 Course: Scattering Theory [T-MATH-105855]

**Responsible:**  
PD Dr. Tilo Arens  
PD Dr. Frank Hettlich  
Prof. Dr. Andreas Kirsch

**Organisation:**  
KIT Department of Mathematics  
Part of: M-MATH-102884 - Scattering Theory

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4.196 Course: Selected Issues in Critical Information Infrastructures [T-WIWI-109251]

- **Responsible:** Prof. Dr. Ali Sunyaev
- **Organisation:** KIT Department of Economics and Management
- **Part of:** M-WIWI-101472 - Informatics

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<td>Each summer term</td>
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**Competence Certificate**
Alternative exam assessment (§ 4(2), 3 SPO). Details will be announced in the respective course.

**Prerequisites**
None.

**Annotation**
T-WIWI-109251 "Selected Issues in Critical Information Infrastructures" serves to credit an extracurricular course in the module "Critical Digital Infrastructures".
4.197 Course: Selected Topics in Harmonic Analysis [T-MATH-109065]

Responsibility: Prof. Dr. Dirk Hundertmark
Organisation: KIT Department of Mathematics
Part of: M-MATH-104435 - Selected Topics in Harmonic Analysis

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Prerequisites: none
4.198 Course: Semantic Web Technologies [T-WIWI-102874]

**Responsible:** Prof. Dr. York Sure-Vetter  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101472 - Informatics

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<td>2 SWS</td>
<td>Sure-Vetter, Acosta Deibe, Käfer</td>
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<tr>
<td>SS 2019 2511311</td>
<td>Exercises to Semantic Web Technologies</td>
<td>1 SWS</td>
<td>Sure-Vetter, Acosta Deibe, Käfer</td>
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**Competence Certificate**
The assessment consists of an 1h written exam following §4, Abs. 2, 1 of the examination regulation or of an oral exam (20 min) following §4, Abs. 2, 2 of the examination regulation.
The exam takes place every semester and can be repeated at every regular examination date.

**Prerequisites**
None

**Recommendation**
Lectures on Informatics of the Bachelor on Information Systems (Semester 1-4) or equivalent are required.

*Below you will find excerpts from events related to this course:*

**Semantic Web Technologies**

2511310, SS 2019, 2 SWS, Language: Englisch, [Open in study portal](#)

**Description**
The aim of the Semantic Web is to make the meaning (semantics) of data on the web usable in intelligent systems, e.g. in e-commerce and internet portals. Central concepts are the representation of knowledge in form of RDF and ontologies, the access via Linked Data, as well as querying the data by using SPARQL. This lecture provides the foundations of knowledge representation and processing for the corresponding technologies and presents example applications.

**Learning Content**
The following topics are covered:
- Resource Description Framework (RDF) and RDF Schema (RDFS)
- Web Architecture and Linked Data
- Web Ontology Language (OWL)
- Query language SPARQL
- Rule languages
- Applications

**Workload**
- The total workload for this course is approximately 150 hours
- Time of presentness: 45 hours
- Time of preparation and postprocessing: 67.5 hours
- Exam and exam preparation: 37.5 hours
Exercises to Semantic Web Technologies
2511311, SS 2019, 1 SWS, Language: Englisch, Open in study portal

Description
Multiple exercises are held that capture the topics, held in the lecture Semantic Web Technologies, and discuss them in detail. Thereby, practical examples are given to the students in order to transfer theoretical aspects into practical implementation.

Learning Content
The following topics are covered:

- Resource Description Framework (RDF) and RDF Schema (RDFS)
- Web Architecture and Linked Data
- Web Ontology Language (OWL)
- Query language SPARQL
- Rule languages
- Applications

Workload
The total workload for the lecture Semantic Web Technologies is given out on the description of the lecture.

Additional Literature

### 4.199 Course: Seminar in Business Administration A (Master) [T-WIWI-103474]

**Responsible:** Professorenschaft des Fachbereichs Betriebswirtschaftslehre  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-102971 - Seminar

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Competence Certificate
Alternative exam assessment (§ 4(2), 3 SPO 2015). The following aspects are included:

- Regular participation in the seminar dates
- Preparation of a seminar paper on a partial aspect of the seminar topic according to scientific methods
- Lecture on the topic of the seminar paper.

The point scheme for the assessment is determined by the lecturer of the respective course. It will be announced at the beginning of the course.

Prerequisites
None.

Recommendation
See seminar description in the course catalogue of the KIT (https://campus.kit.edu/)

Annotation
The listed seminar titles are placeholders. Currently offered seminars of each semester will be published on the websites of the institutes and in the course catalogue of the KIT. In general, the current seminar topics of each semester are already announced at the end of the previous semester. Furthermore for some seminars there is an application required.

The available places are listed on the internet: https://portal.wiwi.kit.edu.

Below you will find excerpts from events related to this course:

Seminar Human Resource Management (Master)
2500006, SS 2019, 2 SWS, Open in study portal

Notes
See Module Handbook

Seminar Human Resources and Organizations (Master)
2500007, SS 2019, 2 SWS, Open in study portal

Notes
See Module Handbook

Automated Financial Advisory
2530372, SS 2019, 2 SWS, Language: Englisch, Open in study portal

Learning Content
At the beginning of the semester, a selection of seminar topics will be discussed with each student of the seminar.

Workload
The total workload for this course is approximately 90 hours.
Literature
Literature will be distributed during the first lecture.

**Seminar in Finance (Master, Prof. Uhrig-Homburg)**
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2530580, SS 2019, 2 SWS, Language: Deutsch, [Open in study portal]

**Learning Content**
Within this seminar different topics of current concern are treated. These topics have their foundations in the contents of certain lectures. The topics of the seminar are published on the website of the involved finance chairs at the end of the foregoing semester.

**Workload**
The total workload for this course is approximately 90 hours. For further information see German version.

**Literature**
Will be announced at the end of the foregoing semester.

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**Masterseminar Big Data Mining in Finance**
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2540510, SS 2019, 2 SWS, Language: Deutsch/Englisch, [Open in study portal]

**Literature**

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**Hospital Management**
---
2550493, SS 2019, 2 SWS, Language: Deutsch, [Open in study portal]

**Description**
The seminar 'Hospital Management' presents internal organization structures, work conditions and work environments at the example of hospitals and relates this to common and expected conditions of other service industries. Covered topics include normative environment, intra-organizational structure, personnel management, quality, external networking and market appearance. The course consists of two full-day sessions.

**Learning Content**
The seminar 'Hospital Management' presents internal organization structures, work conditions and work environments at the example of hospitals and relates this to common and expected conditions of other service industries. Covered topics include normative environment, intra-organizational structure, personnel management, quality, external networking and market appearance. The course consists of two full-day sessions.

**Annotation**
It is planned to offer the course every semester.

**Workload**
The total workload for this course is approximately 90 hours.

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**Seminar Management Accounting**
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2579904, SS 2019, 2 SWS, Language: Englisch, [Open in study portal]

**Notes**
see Module Handbook
Learning Content
The course will be a mix of lectures, discussions, and student presentations. Students will write a paper in small groups, and present this in the final week. You are to a large extent free to select your own topic. The seminar course is concentrated in four meetings that are spread throughout the semester.

Meeting 1: Introductory lecture. You need to conduct a first literature search and at the end of the first week you should identify (provisionally) the topic for your paper.

Meeting 2 and 3: The purpose of the second week is to define the topics and research questions in much more detail. Different types of papers may be selected: literature review, research paper, descriptive case study, or teaching case. Students will present their ideas and all participants should ask questions, help each other focus, offer ideas, etc.

Meeting 4: In the third week we are going to present and discuss the final papers.

Annotation
Maximum of 24 students.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced in the course.

Special Topics in Management Accounting
2579905, SS 2019, 2 SWS, Language: Englisch, Open in study portal

Notes
see Module Handbook

Learning Content
The course will be a mix of lectures, discussions, and student presentations. Students will write a paper in small groups, and present this in the final week. Topics are selectively prediscibed. The seminar course is concentrated in four meetings that are spread throughout the semester.

Meeting 1: Introductory lecture. You need to conduct a first literature search and at the end of the first week you should identify (provisionally) the topic for your paper.

Meeting 2 and 3: The purpose of the second week is to define the topics and research questions in much more detail. Different types of papers may be selected: literature review, research paper, descriptive case study, or teaching case. Students will present their ideas and all participants should ask questions, help each other focus, offer ideas, etc.

Meeting 4: In the third week we are going to present and discuss the final papers.

Annotation
Maximum of 24 students.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced in the course.

Seminar Human Resource Management (Master)
2500006, WS 19/20, 2 SWS, , Open in study portal

Notes
See Module Handbook

Seminar Human Resources and Organizations (Master)
2500007, WS 19/20, 2 SWS, , Open in study portal

Notes
See Module Handbook
Seminar in Data Science for Finance
2500029, WS 19/20, 2 SWS, Language: Englisch, Open in study portal

Description
The aim of this seminar is to master real-world challenges of computational risk and asset management. The CRAM team offers a wide range of topics across different asset classes and different stages of the investment process.

Learning Content
Students will work on a quantitative problem related to risk and asset management. This seminar is ideally suited for students who want to deepen and apply their statistics / programming skills and knowledge about financial markets. Industry-relevant problems will be solved with financial data and modern statistical tools in close collaboration with a supervisor. Topics which students solved in the past include the option-based pricing of dividends during the Euro crisis, the estimation of risk neutral moments with high-frequent data and the application of a particle filter to estimate stochastic volatility. The current topics will be presented during the first meeting.

Workload
The total workload for this course is approximately 90 hours (3 ECTS). Depending on the realization of the work, the times may vary. The main focus is always on working independently.

Digital Service Design Seminar
2540559, WS 19/20, 3 SWS, Open in study portal

Description
Contemporary trends of every increasing digitalization in businesses lead to new challenges and fusion of technologies blurring the lines between the digital, physical and biological spheres, thereby calling for a new approaches for corporate management. Recently, physician Michio Kaku put it like the following: “The destiny of computers – like other mass technologies like electricity, paper, and running water- is to become invisible, that is, to disappear into the fabric of our lives, to be everywhere and nowhere, silently and seamlessly carrying out our wishes.” Michio Kaku (2016)

In the Practical Seminar Digital Service Design students address a real-world challenge in businesses and apply digital service design practices and tools. Furthermore, during the time of the seminar the students prototypical implement a running digital service.

Real-world challenges will vary over time. This time, the challenges are from the domain of Future Corporate Management. The practical seminar is carried out in close cooperation with SAP SE and leverages state-of-the-art digital platforms for prototyping.

Learning Content
- Foundations
- Digital Service Design Challenges in Future Corporate Management
- Basics of Digital Service Design practices and tools
- Prototyping and development Digital Services
- Delivering digital service prototypes

Annotation
Students interested in master thesis positions at the chair of marketing should participate in the marketing seminar. For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu)

Workload
The total workload for this course is approximately 90 hours. For further information see German version.
Literature
will be announced in the seminar.

Seminar: Human Resources and Organizations (Bachelor)
2573010, WS 19/20, 2 SWS, , Open in study portal

Notes
See Module Handbook

Seminar: Human Resource Management (Bachelor)
2573011, WS 19/20, 2 SWS, , Open in study portal

Notes
See Module Handbook
### 4.200 Course: Seminar in Business Administration B (Master) [T-WIWI-103476]

**Responsible:** Professorenschaft des Fachbereichs Betriebswirtschaftslehre  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-102972 - Seminar

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### Competence Certificate
Alternative exam assessment (§ 4(2), 3 SPO 2015). The following aspects are included:

- Regular participation in the seminar dates
- Preparation of a seminar paper on a partial aspect of the seminar topic according to scientific methods
- Lecture on the topic of the seminar paper.

The point scheme for the assessment is determined by the lecturer of the respective course. It will be announced at the beginning of the course.

### Prerequisites
None.

### Recommendation
See seminar description in the course catalogue of the KIT (https://campus.kit.edu/)

### Annotation
The listed seminar titles are placeholders. Currently offered seminars of each semester will be published on the websites of the institutes and in the course catalogue of the KIT. In general, the current seminar topics of each semester are already announced at the end of the previous semester. Furthermore, for some seminars there is an application required.

The available places are listed on the internet: https://portal.wiwi.kit.edu.

---

**Below you will find excerpts from events related to this course:**

### Seminar Human Resource Management (Master)
2500006, SS 2019, 2 SWS, Open in study portal

**Notes**
See Module Handbook

### Seminar Human Resources and Organizations (Master)
2500007, SS 2019, 2 SWS, Open in study portal

**Notes**
See Module Handbook

### Automated Financial Advisory
2530372, SS 2019, 2 SWS, Language: Englisch, Open in study portal

**Learning Content**
At the beginning of the semester, a selection of seminar topics will be discussed with each student of the seminar.

**Workload**
The total workload for this course is approximately 90 hours.

**Literature**
Literature will be distributed during the first lecture.
**Seminar in Finance (Master, Prof. Uhrig-Homburg)**
2530580, SS 2019, 2 SWS, Language: Deutsch, [Open in study portal](#)

**Learning Content**
Within this seminar different topics of current concern are treated. These topics have their foundations in the contents of certain lectures.

The topics of the seminar are published on the website of the involved finance chairs at the end of the foregoing semester.

**Workload**
The total workload for this course is approximately 90 hours. For further information see German version.

**Literature**
Will be announced at the end of the foregoing semester.

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**Masterseminar Big Data Mining in Finance**
2540510, SS 2019, 2 SWS, Language: Deutsch/Englisch, [Open in study portal](#)

**Literature**

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**Hospital Management**
2550493, SS 2019, 2 SWS, Language: Deutsch, [Open in study portal](#)

**Description**
The seminar 'Hospital Management' presents internal organization structures, work conditions and work environments at the example of hospitals and relates this to common and expected conditions of other service industries.

Covered topics include normative environment, intra-organizational structure, personnel management, quality, external networking and market appearance. The course consists of two full-day sessions.

**Learning Content**
The seminar 'Hospital Management' presents internal organization structures, work conditions and work environments at the example of hospitals and relates this to common and expected conditions of other service industries.

Covered topics include normative environment, intra-organizational structure, personnel management, quality, external networking and market appearance. The course consists of two full-day sessions.

**Annotation**
It is planned to offer the course every semester.

**Workload**
The total workload for this course is approximately 90 hours.

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**Seminar Management Accounting**
2579904, SS 2019, 2 SWS, Language: Englisch, [Open in study portal](#)

**Notes**
see Module Handbook
Learning Content
The course will be a mix of lectures, discussions, and student presentations. Students will write a paper in small groups, and present this in the final week. You are to a large extent free to select your own topic. The seminar course is concentrated in four meetings that are spread throughout the semester.

Meeting 1: Introductory lecture. You need to conduct a first literature search and at the end of the first week you should identify (provisionally) the topic for your paper.

Meeting 2 and 3: The purpose of the second week is to define the topics and research questions in much more detail. Different types of papers may be selected: literature review, research paper, descriptive case study, or teaching case. Students will present their ideas and all participants should ask questions, help each other focus, offer ideas, etc.

Meeting 4: In the third week we are going to present and discuss the final papers.

Annotation
Maximum of 24 students.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced in the course.

Notes
see Module Handbook
Seminar in Data Science for Finance
2500029, WS 19/20, 2 SWS, Language: Englisch, Open in study portal

Description
The aim of this seminar is to master real-world challenges of computational risk and asset management. The CRAM team offers a wide range of topics across different asset classes and different stages of the investment process.

Learning Content
Students will work on a quantitative problem related to risk and asset management. This seminar is ideally suited for students who want to deepen and apply their statistics / programming skills and knowledge about financial markets. Industry-relevant problems will be solved with financial data and modern statistical tools in close collaboration with a supervisor. Topics which students solved in the past include the option-based pricing of dividends during the Euro crisis, the estimation of risk neutral moments with high-frequency data and the application of a particle filter to estimate stochastic volatility. The current topics will be presented during the first meeting.

Masterseminar in Data Science and Machine Learning
2540510, WS 19/20, 2 SWS, Language: Deutsch, Open in study portal

Workload
The total workload for this course is approximately 90 hours (3 ECTS). Depending on the realization of the work, the times may vary. The main focus is always on working independently.

Digital Service Design Seminar
2540559, WS 19/20, 3 SWS, Open in study portal

Description
Contemporary trends of every increasing digitalization in businesses lead to new challenges and fusion of technologies blurring the lines between the digital, physical and biological spheres, thereby calling for a new approaches for corporate management. Recently, physician Michio Kaku put it like the following: "The destiny of computers – like other mass technologies like electricity, paper, and running water- is to become invisible, that is, to disappear into the fabric of our lives, to be everywhere and nowhere, silently and seamlessly carrying out our wishes." Michio Kaku (2016)

In the Practical Seminar Digital Service Design students address a real-world challenge in businesses and apply digital service design practices and tools. Furthermore, during the time of the seminar the students prototypical implement a running digital service.

Real-world challenges will vary over time. This time, the challenges are from the domain of Future Corporate Management. The practical seminar is carried out in close cooperation with SAP SE and leverages state-of-the-art digital platforms for prototyping.

Learning Content
- Foundations
- Digital Service Design Challenges in Future Corporate Management
- Basics of Digital Service Design practices and tools
- Prototyping and development Digital Services
- Delivering digital service prototypes

Marketing Seminar (S)
2572181, WS 19/20, 2 SWS, Language: Deutsch, Open in study portal

Learning Content
The seminar teaches students to gain a systematic overview of a field of literature in Marketing - an important prerequisite for a successful master thesis. Central aspects are identification of relevant literature sources, systematization of the field, working out central insights, writing comprehensively, and identification of research gaps.

Annotation
Students interested in master thesis positions at the chair of marketing should participate in the marketing seminar. For further information please contact Marketing & Sales Research Group (marketing.lism.kit.edu)

Workload
The total workload for this course is approximately 90 hours. For further information see German version.
Literature
will be announced in the seminar.

<table>
<thead>
<tr>
<th>Seminar: Human Resources and Organizations (Bachelor)</th>
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**Notes**
See Module Handbook

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**Notes**
See Module Handbook
4.201 Course: Seminar in Economics A (Master) [T-WIWI-103478]

**Responsible:** Professorenschaft des Fachbereichs Volkswirtschaftslehre

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-102971 - Seminar

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**Events**

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<td>2560282</td>
<td>Wirtschaftspolitisches Seminar</td>
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<td>SS 2019</td>
<td>2560552</td>
<td>Topics in Political Economics (Master)</td>
<td>2</td>
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<td>SS 2019</td>
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<td>2</td>
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<td>Morals &amp; Social Behavior (Bachelor &amp; Master)</td>
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**Competence Certificate**

Alternative exam assessment (§ 4(2), 3 SPO 2015). The following aspects are included:

- Regular participation in the seminar dates
- Preparation of a seminar paper on a partial aspect of the seminar topic according to scientific methods
- Lecture on the topic of the seminar paper.

The point scheme for the assessment is determined by the lecturer of the respective course. It will be announced at the beginning of the course.

**Prerequisites**

None.

**Recommendation**

See seminar description in the course catalogue of the KIT (https://campus.kit.edu/)

**Annotation**

The listed seminar titles are placeholders. Currently offered seminars of each semester will be published on the websites of the institutes and in the course catalogue of the KIT. In general, the current seminar topics of each semester are already announced at the end of the previous semester. Furthermore for some seminars there is an application required.

The available places are listed on the internet: https://portal.wiwi.kit.edu.

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**Below you will find excerpts from events related to this course:**

**Advanced Topics in Econometrics**

2521310, SS 2019, 2 SWS, Language: Englisch, Open in study portal

**Annotation**

The course will be offered in English.
Topics in Political Economics (Master)
2560552, SS 2019, 2 SWS, Language: Englisch, Open in study portal

Description
In many companies relative reward schemes are used whereby employees earn a bonus if they perform better than their colleagues. Moreover, hierarchical structures mean that in many organizations, employees find themselves in constant competition for promotions. This is meant to provide incentives for higher performance. However, competitive remuneration schemes could also have detrimental effects such that individual workers may view their colleagues as direct competitors generating more selfish and/or less helpful behavior in the workplace. Furthermore, age, gender and culture seem to have impacts on willingness to compete. For example, in western cultures, adult men sometimes enter competition even though their performance level is way too low for success, i.e., they harm themselves by over-competitiveness. In contrast, adult females sometimes compete less than they could do successfully.

Another challenge in contest design, e.g. in sports, is that when competition takes place among workers with mixed abilities it may lead to a discouragement effect, which establishes that lower ability individuals often reduce effort competing against an individual they do not feel up to (e.g. it has been found that average golf players performed significantly worse when competing against a superstar like Tiger Woods). One solution suggested by the economic literature is to level the playing field between advantaged and disadvantaged individuals by favoring weaker individuals through bid-caps, asymmetric tie-breaking rules, or advances. In sports, asymmetric tie-breaking is already common, for instance, in the Champions League soccer playoffs “away goals” become the decisive factor in determining the winning team in case of a tie.

Contests are not only a well-established mechanism for incentivizing workers but also for encouraging innovation and advancing R&D. Elements of research and innovation contests can be found in the procurement of various goods and services. For instance, the construction of new buildings, proposals in a venture capital firm or TV shows for entertainment companies all flow through a similar innovation process that involves the solicitation of bids from multiple potential suppliers and the preparation of a pilot or a proposal. In other cases, e.g., in lobbying contests, it is often discussed whether investments are beneficial or not. Some authors have argued that investments into lobbying should be capped in order to soften competition among asymmetrically strong interest groups (e.g. the lobbying industry versus consumers’ interest groups). Of course, then the question arises whether such caps achieve the respective design goal or not.

In this seminar, we discuss questions like: How can we design workplaces and labor contracts to increase motivation and productivity? How can contests be used to foster innovation? Which role should social preferences play and how could they inspire specific contest designs? How should sport contests be engineered depending on the respective goals? How should we design lobbying contests?

Also related topics are very welcome!

Notes
Participation will be limited to 12 students.

Annotation
For further questions, please contact Patrick Maus (Patrick.Maus@kit.edu).

Workload
About 90 hours

Literature

Morals and Social Behavior (Master)
2560554, SS 2019, 2 SWS, Language: Englisch, Open in study portal

Description
For a long time, economists studied given markets and mechanisms to predict outcomes, future developments or generally the participants’ behavior. In contrast, Market Design uses theory, empirical and experimental work to design markets which incentivize their participants in a way that leads to a “desirable” outcome. In this, the designer can have different objectives, for example: Maximizing efficiency, welfare or minimizing negative externalities.

Prominent applications of Market Design include, quite topical, Germany's auction of 5G mobile licenses and matching markets, where there are two large populations that need to be matched to one another (think of hospitals and interns, students and dorm rooms or kidney donors and receivers). In this seminar, we think about ways to either design new markets or how we could alter existing ones in a socially beneficial way. Alternatively, research ideas could focus on finding failures or shortcomings of ineffectively designed markets.
Notes
Participation will be limited to 12 students.

Annotation
For further questions, please contact David Huber (david.huber@kit.edu).

Workload
About 90 hours.

Topics on Political Economics (Bachelor)
2560140, WS 19/20, 2 SWS, Language: Englisch, Open in study portal

Workload
About 90 hours.

Topics on Political Economics (Master)
2560142, WS 19/20, 2 SWS, Language: Englisch, Open in study portal

Workload
About 90 hours.
4.202 Course: Seminar in Economics B (Master) [T-WIWI-103477]

Responsibility: Professorenschaft des Fachbereichs Volkswirtschaftslehre
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-102972 - Seminar

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Competence Certificate
Alternative exam assessment (§ 4(2), 3 SPO 2015). The following aspects are included:
- Regular participation in the seminar dates
- Preparation of a seminar paper on a partial aspect of the seminar topic according to scientific methods
- Lecture on the topic of the seminar paper.

The point scheme for the assessment is determined by the lecturer of the respective course. It will be announced at the beginning of the course.

Prerequisites
None.

Recommendation
See seminar description in the course catalogue of the KIT [https://campus.kit.edu/]

Annotation
The listed seminar titles are placeholders. Currently offered seminars of each semester will be published on the websites of the institutes and in the course catalogue of the KIT. In general, the current seminar topics of each semester are already announced at the end of the previous semester. Furthermore for some seminars there is an application required.

The available places are listed on the internet: [https://portal.wiwi.kit.edu/]

Below you will find excerpts from events related to this course:

Advanced Topics in Econometrics
2521310, SS 2019, 2 SWS, Language: Englisch, [Open in study portal]

Annotation
The course will be offered in English.
Topics in Political Economics (Master)
2560552, SS 2019, 2 SWS, Language: Englisch, Open in study portal

Description
In many companies relative reward schemes are used whereby employees earn a bonus if they perform better than their colleagues. Moreover, hierarchical structures mean that in many organizations, employees find themselves in constant competition for promotions. This is meant to provide incentives for higher performance. However, competitive remuneration schemes could also have detrimental effects such that individual workers may view their colleagues as direct competitors generating more selfish and/or less helpful behavior in the workplace. Furthermore, age, gender and culture seem to have impacts on willingness to compete. For example, in western cultures, adult men sometimes enter competition even though their performance level is way too low for success, i.e., they harm themselves by over-competitiveness. In contrast, adult females sometimes compete less than they could do successfully.

Another challenge in contest design, e.g. in sports, is that when competition takes place among workers with mixed abilities it may lead to a discouragement effect, which establishes that lower ability individuals often reduce effort competing against an individual they do not feel up to (e.g. it has been found that average golf players performed significantly worse when competing against a superstar like Tiger Woods). One solution suggested by the economic literature is to level the playing field between advantaged and disadvantaged individuals by favoring weaker individuals through bid-caps, asymmetric tie-breaking rules, or advances. In sports, asymmetric tie-breaking is already common, for instance, in the Champions League soccer playoffs "away goals" become the decisive factor in determining the winning team in case of a tie.

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Also related topics are very welcome!

Notes
Participation will be limited to 12 students.

Annotation
For further questions, please contact Patrick Maus (Patrick.Maus@kit.edu).

Workload
About 90 hours

Literature

Morals and Social Behavior (Master)
2560554, SS 2019, 2 SWS, Language: Englisch, Open in study portal

Description
For a long time, economists studied given markets and mechanisms to predict outcomes, future developments or generally the participants’ behavior. In contrast, Market Design uses theory, empirical and experimental work to design markets which incentivize their participants in a way that leads to a “desirable” outcome. In this, the designer can have different objectives, for example: Maximizing efficiency, welfare or minimizing negative externalities.

Prominent applications of Market Design include, quite topical, Germany’s auction of 5G mobile licenses and matching markets, where there are two large populations that need to be matched to one another (think of hospitals and interns, students and dorm rooms or kidney donors and receivers). In this seminar, we think about ways to either design new markets or how we could alter existing ones in a socially beneficial way. Alternatively, research ideas could focus on finding failures or shortcomings of ineffectively designed markets.

Economathematics M.Sc.
Module Handbook as of 22.08.2019
Notes
Participation will be limited to 12 students.

Annotation
For further questions, please contact David Huber (david.huber@kit.edu).

Workload
About 90 hours.

Topics on Political Economics (Bachelor)
2560140, WS 19/20, 2 SWS, Language: Englisch, Open in study portal

Workload
About 90 hours.

Topics on Political Economics (Master)
2560142, WS 19/20, 2 SWS, Language: Englisch, Open in study portal

Workload
About 90 hours.
4.203 Course: Seminar in Informatics A (Master) [T-WIWI-103479]

Responsibility: Professorenchaft des Fachbereichs Informatik
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-102973 - Seminar

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<td>Data Science &amp; Real-time Big Data Analytics</td>
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<td>SS 2019 2595470</td>
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<td>Weinhardt, Nickel, Fichtner, Satzger, Sure-Vetter, Fromm</td>
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<td>WS 19/20 2512301</td>
<td>Linked Data and the Semantic Web</td>
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<td>WS 19/20 2595470</td>
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Competence Certificate
Alternative exam assessment (§ 4(2), 3 SPO 2015). The following aspects are included:

- Regular participation in the seminar dates
- Preparation of a seminar paper on a partial aspect of the seminar topic according to scientific methods
- Lecture on the topic of the seminar paper.

The point scheme for the assessment is determined by the lecturer of the respective course. It will be announced at the beginning of the course.

Prerequisites
None.

Recommendation
See seminar description in the course catalogue of the KIT (https://campus.kit.edu/)

Annotation
Placeholders for seminars offered by the Institute AIFB.
Currently offered seminars of each semester will be published on the websites of the institutes and in the course catalogue of the KIT. In general, the current seminar topics of each semester are already announced at the end of the previous semester. Furthermore, for some seminars there is an application required.

The available places are listed on the internet: https://portal.wiwi.kit.edu.

Below you will find excerpts from events related to this course:
**Knowledge Discovery and Data Mining**
2512300, SS 2019, 3 SWS, Language: Englisch, Open in study portal

**Description**
The seminar includes different methods of machine learning and data mining. Participants of the seminar should have basic knowledge of machine learning and programming skills.

**Notes**
The exact dates and information for registration will be announced at the event page.

**Learning Content**
Domains of interest include, but are not limited to:
- Medicine
- Social Media
- Finance Market

**Literature**
Detailed references are indicated together with the respective subjects. For general background information look up the following textbooks:
- Mitchell, T.; Machine Learning

**Data Science & Real-time Big Data Analytics**
2513306, SS 2019, 2 SWS, Language: Deutsch/Englisch, Open in study portal

**Description**
Event processing and real-time data are everywhere: financial market data, sensors, business intelligence, social media analytics, logistics. Many applications collect large volumes of data in real time and are increasingly faced with the challenge of being able to process them quickly and react promptly. The challenges of this real-time processing are currently also receiving a great deal of attention under the term "Big Data". The complex processing of real-time data requires both knowledge of methods for data analysis (data science) and their processing (real-time analytics). Seminar papers are offered on both of these areas as well as on interface topics, the input of own ideas is explicitly desired.

**Seminar Service Science, Management & Engineering**
2595470, SS 2019, 2 SWS, Language: Deutsch, Open in study portal

**Learning Content**
Each Semester, the seminar will cover topics from a different selected subfield of Service Science, Management & Engineering. Topics include service innovation, service economics, service computing, transformation and coordination of service value networks as well as collaboration for knowledge intensive services.

See the KSRI website for more information about this seminar: www.ksri.kit.edu

**Workload**
The total workload for this course is approximately 90 hours. For further information see German version.

**Literature**
The student will receive the necessary literature for his research topic.

**Linked Data and the Semantic Web**
2512301, WS 19/20, 3 SWS, Language: Deutsch/Englisch, Open in study portal
Description
The Linked Data principles are a set of practices for data publishing on the web. Linked Data builds on the web architecture and uses HTTP for data access, and RDF for describing data, thus aiming towards web-scale data integration. There is a vast amount of data available published according to those principles: recently, 4.5 billion facts have been counted with information about various domains, including music, movies, geography, natural sciences. Linked Data is also used to make web-pages machine-understandable, corresponding annotations are considered by the big search engine providers. On a smaller scale, devices on the Internet of Things can also be accessed using Linked Data which makes the unified processing of device data and data from the web easy.

In this practical seminar, students will build prototypical applications and devise algorithms that consume, provide, or analyse Linked Data. Those applications and algorithms can also extend existing applications ranging from databases to mobile apps.

For the seminar, programming skills or knowledge about web development tools/technologies are highly recommended. Basic knowledge of RDF and SPARQL are also recommended, but may be acquired during the seminar. Students will work in groups. Seminar meetings will take place as 'Block-Seminar'.

Notes
The exact dates and information for registration will be announced at the event page.

Learning Content
Topics of interest include, but are not limited to:

- Travel Security
- Geo data
- Linked News
- Social Media

Real-World Challenges in Data Science and Analytics
2512311, WS 19/20, 3 SWS, Language: Deutsch/Englisch, [Open in study portal]

Notes
The exact dates and information for registration will be announced at the event page.

Seminar Service Science, Management & Engineering
2595470, WS 19/20, 3 SWS, Language: Deutsch, [Open in study portal]  
Seminar (S)

Learning Content
Each Semester, the seminar will cover topics from a different selected subfield of Service Science, Management & Engineering. Topics include service innovation, service economics, service computing, transformation and coordination of service value networks as well as collaboration for knowledge intensive services.

See the KSRI website for more information about this seminar: [www.ksri.kit.edu](http://www.ksri.kit.edu)

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
The student will receive the necessary literature for his research topic.
4.204 Course: Seminar in Informatics B (Master) [T-WIWI-103480]

**Responsible:** Professorenschaft des Fachbereichs Informatik

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-102974 - Seminar

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<td>WS 19/20 2400125 Security and Privacy Awareness</td>
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<tr>
<td>WS 19/20 2512301 Linked Data and the Semantic Web</td>
<td>3 SWS</td>
<td>Seminar (S)</td>
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</tr>
<tr>
<td>WS 19/20 2512311 Real-World Challenges in Data Science and Analytics</td>
<td>3 SWS</td>
<td>Seminar (S)</td>
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<tr>
<td>WS 19/20 2513500 Cognitive Automobiles and Robots</td>
<td>2 SWS</td>
<td>Seminar (S)</td>
<td>1</td>
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<tr>
<td>WS 19/20 2595470 Seminar Service Science, Management &amp; Engineering</td>
<td>3 SWS</td>
<td>Seminar (S)</td>
<td>1</td>
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</table>

**Competence Certificate**

Alternative exam assessment (§ 4(2), 3 SPO 2015). The following aspects are included:

- Regular participation in the seminar dates
- Preparation of a seminar paper on a partial aspect of the seminar topic according to scientific methods
- Lecture on the topic of the seminar paper.

The point scheme for the assessment is determined by the lecturer of the respective course. It will be announced at the beginning of the course.

**Prerequisites**

None.

**Recommendation**

See seminar description in the course catalogue of the KIT (https://campus.kit.edu/)

**Annotation**

Placeholder for seminars offered by the Institute AIFB.

The listed seminar titles are placeholders. Currently offered seminars of each semester will be published on the websites of the institutes and in the course catalogue of the KIT. In general, the current seminar topics of each semester are already announced at the end of the previous semester. Furthermore for some seminars there is an application required.

The available places are listed on the internet: https://portal.wiwi.kit.edu.

Below you will find excerpts from events related to this course:
Knowledge Discovery and Data Mining
2512300, SS 2019, 3 SWS, Language: Englisch, Open in study portal

**Description**
The seminar includes different methods of machine learning and data mining. Participants of the seminar should have basic knowledge of machine learning and programming skills.

**Notes**
The exact dates and information for registration will be announced at the event page.

**Learning Content**
Domains of interest include, but are not limited to:
- Medicine
- Social Media
- Finance Market

**Literature**
Detailed references are indicated together with the respective subjects. For general background information look up the following textbooks:
- Mitchell, T.; Machine Learning

Data Science & Real-time Big Data Analytics
2513306, SS 2019, 2 SWS, Language: Deutsch/Englisch, Open in study portal

**Description**
Event processing and real-time data are everywhere: financial market data, sensors, business intelligence, social media analytics, logistics. Many applications collect large volumes of data in real time and are increasingly faced with the challenge of being able to process them quickly and react promptly. The challenges of this real-time processing are currently also receiving a great deal of attention under the term "Big Data". The complex processing of real-time data requires both knowledge of methods for data analysis (data science) and their processing (real-time analytics). Seminar papers are offered on both of these areas as well as on interface topics, the input of own ideas is explicitly desired.

Seminar Service Science, Management & Engineering
2595470, SS 2019, 2 SWS, Language: Deutsch, Open in study portal

**Learning Content**
Each Semester, the seminar will cover topics from a different selected subfield of Service Science, Management & Engineering. Topics include service innovation, service economics, service computing, transformation and coordination of service value networks as well as collaboration for knowledge intensive services.

See the KSRI website for more information about this seminar: www.ksri.kit.edu

**Workload**
The total workload for this course is approximately 90 hours. For further information see German version.

**Literature**
The student will receive the necessary literature for his research topic.

Linked Data and the Semantic Web
2512301, WS 19/20, 3 SWS, Language: Deutsch/Englisch, Open in study portal
Description
The Linked Data principles are a set of practices for data publishing on the web. Linked Data builds on the web architecture and uses HTTP for data access, and RDF for describing data, thus aiming towards web-scale data integration. There is a vast amount of data available published according to those principles: recently, 4.5 billion facts have been counted with information about various domains, including music, movies, geography, natural sciences. Linked Data is also used to make web-pages machine-understandable, corresponding annotations are considered by the big search engine providers. On a smaller scale, devices on the Internet of Things can also be accessed using Linked Data which makes the unified processing of device data and data from the web easy.

In this practical seminar, students will build prototypical applications and devise algorithms that consume, provide, or analyse Linked Data. Those applications and algorithms can also extend existing applications ranging from databases to mobile apps.

For the seminar, programming skills or knowledge about web development tools/technologies are highly recommended. Basic knowledge of RDF and SPARQL are also recommended, but may be acquired during the seminar. Students will work in groups. Seminar meetings will take place as 'Block-Seminar'.

Notes
The exact dates and information for registration will be announced at the event page.

Learning Content
Topics of interest include, but are not limited to:
- Travel Security
- Geo data
- Linked News
- Social Media

Real-World Challenges in Data Science and Analytics
2512311, WS 19/20, 3 SWS, Language: Deutsch/Englisch, Open in study portal

Notes
The exact dates and information for registration will be announced at the event page.

Seminar Service Science, Management & Engineering
2595470, WS 19/20, 3 SWS, Language: Deutsch, Open in study portal

Learning Content
Each Semester, the seminar will cover topics from a different selected subfield of Service Science, Management & Engineering. Topics include service innovation, service economics, service computing, transformation and coordination of service value networks as well as collaboration for knowledge intensive services.

See the KSRI website for more information about this seminar: www.ksri.kit.edu

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
The student will receive the necessary literature for his research topic.
### 4.205 Course: Seminar in Operations Research A (Master) [T-WIWI-103481]

**Responsible:** Prof. Dr. Stefan Nickel  
Prof. Dr. Steffen Rebennack  
Prof. Dr. Oliver Stein

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-102973 - Seminar

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<th>Version</th>
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<tr>
<td>SS 2019 2550132</td>
<td>Seminar zur Mathematischen Optimierung (MA)</td>
<td>2 SWS</td>
<td>Seminar (S)</td>
<td>Stein, Mohr, Neumann</td>
</tr>
<tr>
<td>SS 2019 2550473</td>
<td>Seminar on Power Systems Optimization (Master)</td>
<td>2 SWS</td>
<td>Seminar (S)</td>
<td>Rebennack, Assistenten</td>
</tr>
<tr>
<td>SS 2019 2550491</td>
<td>Seminar zur diskreten Optimierung</td>
<td>SWS</td>
<td>Block (B)</td>
<td>Nickel, Mitarbeiter</td>
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<td>WS 19/20 2550473</td>
<td>Seminar on Power Systems Optimization (Master)</td>
<td>2 SWS</td>
<td>Seminar (S)</td>
<td>Rebennack, Sinske</td>
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<tr>
<td>WS 19/20 2550491</td>
<td>Seminar: Modern OR and Innovative Logistics</td>
<td>2 SWS</td>
<td>Seminar (S)</td>
<td>Nickel, Mitarbeiter</td>
</tr>
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</table>

**Competence Certificate**  
Alternative exam assessment (§ 4(2), 3 SPO 2015). The following aspects are included:

- Regular participation in the seminar dates
- Preparation of a seminar paper on a partial aspect of the seminar topic according to scientific methods
- Lecture on the topic of the seminar paper.

The point scheme for the assessment is determined by the lecturer of the respective course. It will be announced at the beginning of the course.

**Prerequisites**  
None.

**Recommendation**  
See seminar description in the course catalogue of the KIT (https://campus.kit.edu/)

**Annotation**  
The listed seminar titles are placeholders. Currently offered seminars of each semester will be published on the websites of the institutes and in the course catalogue of the KIT. In general, the current seminar topics of each semester are already announced at the end of the previous semester. Furthermore for some seminars there is an application required.

The available places are listed on the internet: https://portal.wiwi.kit.edu.

**Below you will find excerpts from events related to this course:**

**Seminar zur diskreten Optimierung**  
2550491, SS 2019, SWS, Language: Deutsch, [Open in study portal](#)

**Learning Content**  
The topics of the seminar will be announced at the beginning of the term in a preliminary meeting. Dates will be announced on the internet.

**Annotation**  
The seminar is offered in each term.
Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Literature and relevant sources will be announced at the beginning of the seminar.

Learning Content
The topics of the seminar will be announced at the beginning of the term in a preliminaty meeting. Dates will be announced on the internet.

Annotation
The seminar is offered in each term.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Literature and relevant sources will be announced at the beginning of the seminar.
Course: Seminar in Operations Research B (Master) [T-WIWI-103482]

**Responsible:**
Prof. Dr. Stefan Nickel  
Prof. Dr. Steffen Rebennack  
Prof. Dr. Oliver Stein

**Organisation:**
KIT Department of Economics and Management

**Part of:**
M-WIWI-102974 - Seminar

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<td>Seminar zur diskreten Optimierung</td>
<td>SWS</td>
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<td>Nickel, Mitarbeiter</td>
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**Competence Certificate**

Alternative exam assessment (§ 4(2), 3 SPO 2015). The following aspects are included:

- Regular participation in the seminar dates
- Preparation of a seminar paper on a partial aspect of the seminar topic according to scientific methods
- Lecture on the topic of the seminar paper.

The point scheme for the assessment is determined by the lecturer of the respective course. It will be announced at the beginning of the course.

**Prerequisites**

None.

**Recommendation**

See seminar description in the course catalogue of the KIT (https://campus.kit.edu/)

**Annotation**

The listed seminar titles are placeholders. Currently offered seminars of each semester will be published on the websites of the institutes and in the course catalogue of the KIT. In general, the current seminar topics of each semester are already announced at the end of the previous semester. Furthermore for some seminars there is an application required.

The available places are listed on the internet: https://portal.wiwi.kit.edu.

Below you will find excerpts from events related to this course:

**Seminar zur diskreten Optimierung**

2550491, SS 2019, SWS, Language: Deutsch, Open in study portal

**Learning Content**

The topics of the seminar will be announced at the beginning of the term in a preliminary meeting. Dates will be announced on the internet.

**Annotation**

The seminar is offered in each term.
Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Literature and relevant sources will be announced at the beginning of the seminar.

Seminar: Modern OR and Innovative Logistics
2550491, WS 19/20, 2 SWS, Language: Deutsch, Open in study portal

Learning Content
The topics of the seminar will be announced at the beginning of the term in a preliminary meeting. Dates will be announced on the internet.

Annotation
The seminar is offered in each term.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Literature and relevant sources will be announced at the beginning of the seminar.
### 4.207 Course: Seminar in Statistics A (Master) [T-WIWI-103483]

**Responsible:** Prof. Dr. Oliver Grothe  
Prof. Dr. Melanie Schienle  

**Organisation:** KIT Department of Economics and Management  

**Part of:** M-WIWI-102971 - Seminar

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**Events**

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<td>SS 2019</td>
<td>2521310</td>
<td>Advanced Topics in Econometrics</td>
<td>Each term</td>
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**Competence Certificate**  
Alternative exam assessment (§ 4(2), 3 SPO 2015). The following aspects are included:

- Regular participation in the seminar dates  
- Preparation of a seminar paper on a partial aspect of the seminar topic according to scientific methods  
- Lecture on the topic of the seminar paper.

The point scheme for the assessment is determined by the lecturer of the respective course. It will be announced at the beginning of the course.

**Prerequisites**  
None.

**Recommendation**  
See seminar description in the course catalogue of the KIT (https://campus.kit.edu/)

**Annotation**  
The listed seminar titles are placeholders. Currently offered seminars of each semester will be published on the websites of the institutes and in the course catalogue of the KIT. In general, the current seminar topics of each semester are already announced at the end of the previous semester. Furthermore for some seminars there is an application required.

The available places are listed on the internet: https://portal.wiwi.kit.edu.

**Below you will find excerpts from events related to this course:**

**Advanced Topics in Econometrics**  
2521310, SS 2019, 2 SWS, Language: Englisch, Open in study portal  

**Annotation**  
The course will be offered in English.
### 4.208 Course: Seminar in Statistics B (Master) [T-WIWI-103484]

**Responsible:** Prof. Dr. Oliver Grothe  
Prof. Dr. Melanie Schienle  

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-102972 - Seminar

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<td>Each term</td>
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**Events**

| SS 2019 | 2521310 | Advanced Topics in Econometrics | 2 SWS | Seminar (S) | Schienle, Chen, Görgen |

**Competence Certificate**  
Alternative exam assessment (§ 4(2), 3 SPO 2015). The following aspects are included:

- Regular participation in the seminar dates
- Preparation of a seminar paper on a partial aspect of the seminar topic according to scientific methods
- Lecture on the topic of the seminar paper.

The point scheme for the assessment is determined by the lecturer of the respective course. It will be announced at the beginning of the course.

**Prerequisites**  
None.

**Recommendation**  
See seminar description in the course catalogue of the KIT (https://campus.kit.edu/)

**Annotation**  
The listed seminar titles are placeholders. Currently offered seminars of each semester will be published on the websites of the institutes and in the course catalogue of the KIT. In general, the current seminar topics of each semester are already announced at the end of the previous semester. Furthermore for some seminars there is an application required.

The available places are listed on the internet: https://portal.wiwi.kit.edu.

Below you will find excerpts from events related to this course:

#### Advanced Topics in Econometrics  
2521310, SS 2019, 2 SWS, Language: Englisch, Open in study portal

**Annotation**  
The course will be offered in English.
4.209 Course: Seminar Mathematics [T-MATH-105686]

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102730 - Seminar

<table>
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<tr>
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</table>
4.210 Course: Simulation of Stochastic Systems [T-WIWI-106552]

Responsible: Prof. Dr. Oliver Grothe
Prof. Dr. Steffen Rebennack
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-103289 - Stochastic Optimization

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<td>Each summer term</td>
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Competence Certificate
The assessment consists of a written exam (60 minutes) according to Section 4(2), 1 of the examination regulation. The exam takes place in every the semester.

Prerequisites
None.
4.211 Course: Smart Energy Infrastructure [T-WIWI-107464]

**Responsible:**
Dr. Armin Ardone  
Dr. Dr. Andrej Marko Pustisek

**Organisation:**
KIT Department of Economics and Management

**Part of:**
M-WIWI-101452 - Energy Economics and Technology

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<tr>
<td>Written examination</td>
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<td>Each winter term</td>
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**Events**

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<tbody>
<tr>
<td>WS 19/20</td>
<td>2581023</td>
<td>(Smart) Energy Infrastructure</td>
<td>2 SWS</td>
</tr>
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</table>

**Competence Certificate**
The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

**Prerequisites**
None.

**Annotation**
**4.212 Course: Smart Grid Applications [T-WIWI-107504]**

**Responsible:** Prof. Dr. Christof Weinhardt

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-103720 - eEnergy: Markets, Services and Systems

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<td>Smart Grid Applications</td>
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<td>2540453</td>
<td>1 SWS Lecture (V) Staudt, Golla</td>
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**Competence Certificate**
The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulations). By successful completion of the exercises (§4 (2), 3 SPO 2007 respectively §4 (3) SPO 2015) a bonus can be obtained. If the grade of the written exam is at least 4.0 and at most 1.3, the bonus will improve it by one grade level (i.e. by 0.3 or 0.4).

**Prerequisites**
None

**Recommendation**
None

**Annotation**
The lecture will be read for the first time in winter term 2018/19.
### 4.213 Course: Sobolev Spaces [T-MATH-105896]

<table>
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<tr>
<th>Responsible</th>
<th>Prof. Dr. Andreas Kirsch</th>
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<tr>
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<td>KIT Department of Mathematics</td>
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</table>
4.214 Course: Social Choice Theory [T-WIWI-102859]

**Responsible:** Prof. Dr. Clemens Puppe

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101500 - Microeconomic Theory
- M-WIWI-101504 - Collective Decision Making

**Type**
- Written examination

**Credits**
- 4.5

**Recurrence**
- Each summer term

**Version**
- 1

**Events**

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<td>2520537</td>
<td>Social Choice Theory</td>
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<td>Lecture (V)</td>
<td>4.5</td>
<td>Each summer term</td>
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<td>SS 2019</td>
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<td>Übung zu Social Choice Theory</td>
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**Competence Certificate**

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

**Prerequisites**

None

*Below you will find excerpts from events related to this course:*

**Social Choice Theory**

2520537, SS 2019, 2 SWS, Language: Englisch, [Open in study portal](#)

**Learning Content**

The course provides a comprehensive treatment of preference and judgement aggregation, including proofs of general results that have Arrow's famous impossibility theorem and Gibbard's oligarchy theorem as corollaries. The second part of the course is devoted to voting theory. Among other things, we prove the Gibbard-Satterthwaite theorem.

**Workload**

The total workload for this course is approximately 135.0 hours. For further information see German version.

**Literature**

**Main texts:**

**Secondary texts:**
**4.215 Course: Sociotechnical Information Systems Development [T-WIWI-109249]**

- **Responsible:** Prof. Dr. Ali Sunyaev
- **Organisation:** KIT Department of Economics and Management
- **Part of:** M-WIWI-101472 - Informatics

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<td>WS 19/20</td>
<td>2512400</td>
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<td>3</td>
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<td>Sunyaev, Sturm</td>
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**Competence Certificate**

The non exam assessment (§4(2), 3 SPO 2007) or alternative exam assessment (§ 4(2), 3 SPO 2015) consists of an implementation and a final thesis documenting the development and use of the application.

**Prerequisites**

None.

Below you will find excerpts from events related to this course:

**Sociotechnical Information Systems Development**

2512400, WS 19/20, 3 SWS, Language: Deutsch/Englisch, [Open in study portal](#)

**Description**

The aim of this course is to provide a practical introduction into developing socio-technical information systems, such as web platforms, mobile apps, or desktop applications. Course participants will create (individually or in groups) software solutions for specific problems from various practical domains. The course tasks comprise requirements assessment, system design, and software implementation. Furthermore, course participants will gain insights into software quality assurance methods and software documentation.

**Workload**

4 ECTS = approx. 120 h
4.216 Course: Software Quality Management [T-WIWI-102895]

**Responsible:** Prof. Dr. Andreas Oberweis

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-101472 - Informatics

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**Events**

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<th>2511208</th>
<th>Software Quality Management</th>
<th>2 SWS</th>
<th>Lecture (V)</th>
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<td>2511209</td>
<td>Übungen zu Software-Qualitätsmanagement</td>
<td>1 SWS</td>
<td>Practice (Ü)</td>
<td>Oberweis, N.N.</td>
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</table>

**Competence Certificate**

The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation in the first week after lecture period.

**Prerequisites**

None

**Annotation**

This course was formerly named "Software Technology: Quality Management".

Below you will find excerpts from events related to this course:

**Software Quality Management**

2511208, SS 2019, 2 SWS, Language: Deutsch, Open in study portal

**Learning Content**

This lecture imparts fundamentals of active software quality management (quality planning, quality testing, quality control, quality assurance) and illustrates them with concrete examples, as currently applied in industrial software development. Keywords of the lecture content are: software and software quality, process models, software process quality, ISO 9000-3, CMM(I), BOOTSTRAP, SPICE, software tests.

**Annotation**

This course was formerly named "Software Technology: Quality Management".

**Workload**

Lecture 30h
Exercise 15h

Preparation of lecture 30h
Preparation of exercises 30h
Exam preparation 44h
Exam 1h

Total: 150h

**Literature**

- Peter Liggesmeyer: Software-Qualität, Testen, Analysieren und Verifizieren von Software. Spektrum Akademischer Verlag 2002
- Mauro Pezzè, Michal Young: Software testen und analysieren. Oldenbourg Verlag 2009

Further literature is given in lectures.
4.217 Course: Spatial Economics [T-WIWI-103107]

**Responsible:** Prof. Dr. Ingrid Ott  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101496 - Growth and Agglomeration

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<td>2 SWS</td>
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**Competence Certificate**  
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

**Prerequisites**  
None

**Recommendation**  
Basic knowledge of micro- and macroeconomics is assumed, as taught in the courses Economics I [2600012] and Economics II [2600014]. In addition, an interest in quantitative-mathematical modeling is required. The attendance of the course Introduction to economic policy [2560280] is recommended.

**Annotation**  
Due to the research semester of Prof. Dr. Ingrid Ott, the course is not offered in the winter term 2018/19.

*Below you will find excerpts from events related to this course:*

| Spatial Economics | 2561260, WS 19/20, 2 SWS, Language: Englisch, [Open in study portal](#) |

**Learning Content**  
Geography, trade and development  
Geography and economic theory  
Core models of economic geography and empirical evidence  
Agglomeration, home market effect, and spatial wages  
Applications and extensions

**Workload**  
The total workload for this course is approximately 135.0 hours. For further information see German version.

**Literature**  
Steven Brakman, Harry Garretsen, Charles van Marrewijk (2009), The New Introduction to Geographical Economics  
Further literature recommendations will be announced in the course of the lecture.
4.218 Course: Spatial Stochastics [T-MATH-105867]

**Responsible:** Prof. Dr. Daniel Hug  
Prof. Dr. Günter Last

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102903 - Spatial Stochastics

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<td>0105600</td>
<td>Räumliche Stochastik</td>
<td>4 SWS</td>
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<td>WS 19/20</td>
<td>0105610</td>
<td>Tutorial for 0105600 (Spatial Stochastics)</td>
<td>2 SWS</td>
<td>Practice (Ü)</td>
<td>Hug</td>
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**Prerequisites**

none
4.219 Course: Special Functions and Applications in Potential Theory [T-MATH-102274]

**Responsible:** Prof. Dr. Andreas Kirsch  
**Organisation:** KIT Department of Mathematics  
**Part of:** M-MATH-101335 - Special Functions and Applications in Potential Theory

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**Prerequisites**  
None
Course: Special Topics of Numerical Linear Algebra [T-MATH-105891]

**Responsible:** Prof. Dr. Marlis Hochbruck

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102920 - Special Topics of Numerical Linear Algebra

**Type:** Oral examination

**Credits:** 8

**Version:** 1

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<tr>
<td>SS 2019</td>
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</table>

**Prerequisites**
none
### 4.221 Course: Spectral Theory - Exam [T-MATH-103414]

**Responsible:**
- PD Dr. Gerd Herzog
- Dr. Peer Kunstmann
- Dr. Christoph Schmoeger
- Prof. Dr. Roland Schnaubelt
- Prof. Dr. Lutz Weis

**Organisation:**
- KIT Department of Mathematics

**Part of:**
- M-MATH-101768 - Spectral Theory

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**Events**

| SS 2019 | 0163700 | Spectral Theory | 4 SWS | Lecture (V) | Kunstmann |
| SS 2019 | 0163710 | Tutorial 0163700 (Spectral Theory) | 2 SWS | Practice (Ü) | Kunstmann |

Below you will find excerpts from events related to this course:

#### Spectral Theory

**0163700, SS 2019, 4 SWS, Language: Englisch, [Open in study portal](#)**

**Lecture (V)**

**Description**

The spectrum of a linear operator on a Banach space generalizes the concept of an eigenvalue of a matrix. In Banach spaces spectral theoretic methods play an equally important role as the eigenvalue theory in finite dimensions. These methods are used everywhere in analysis and its applications.

At the beginning we discuss the basic properties of the spectrum. In view of the applications on differential operators this is not only done for bounded operators, but also for a certain class of unbounded linear operators, the so-called closed operators. To treat differential operators on $L^p$ spaces, we introduce weak derivatives in the $L^p$ setting and Sobolev spaces. One can develop a detailed spectral theory for two main classes of operators. We first deal with compact operators, where the spectrum determined by the eigenvalues to a large extent. In this context we also prove the so-called Fredholm alternative, which has important applications e.g. to integral equations. Then we study (possibly only closed) self adjoint operators on Hilbert spaces. For such operators the spectral theorem is a far reaching extension of the diagonalisation of hermitian matrices. Finally, we treat the functional calculi for self adjoint, bounded and sectorial operators.

**Literature**

On my [webpage](#) one can find the PDF file of the manuscript of my lecture Spectral Theory from summer semester 2010. Presumably, an updated version will be delivered during lecture time. A few relevant monographs:

- D. Werner: Funktionalanalysis. Springer.
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**Responsible:** Stephan Klaus  
Prof. Dr. Wilderich Tuschmann  

**Organisation:** KIT Department of Mathematics  

**Part of:** M-MATH-102958 - Spin Manifolds, Alpha Invariant and Positive Scalar Curvature
4.223 Course: Statistical Modeling of Generalized Regression Models [T-WIWI-103065]

**Responsible:** Dr. Wolf-Dieter Heller

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101638 - Econometrics and Statistics I
- M-WIWI-101639 - Econometrics and Statistics II

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**Events**

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<td>Statistische Modellierung von Allgemeinen Regressionsmodellen</td>
<td>Lecture (V)</td>
<td>2 SWS</td>
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</table>

**Competence Certificate**

The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation.

**Prerequisites**

None

**Recommendation**

Knowledge of the contents covered by the course "Economics III: Introduction in Econometrics" [2520016]

**Below you will find excerpts from events related to this course:**

**Statistische Modellierung von Allgemeinen Regressionsmodellen**

2521350, WS 19/20, 2 SWS, 🔗[Open in study portal]

**Annotation**

Knowledge of the contents covered by the course "Economics III: Introduction in Econometrics" [2520016]

**Workload**

The total workload for this course is approximately 135 hours (4.5 credits).

- regular attendance: 30 hours
- self-study: 65 hours
- exam preparation: 40 hours
4.224 Course: Stein's Method [T-MATH-105914]

**Responsible:** Dr. Matthias Schulte

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102946 - Stein's Method

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**Prerequisites**
none
## Course: Stochastic Calculus and Finance [T-WIWI-103129]

**Responsible:** Dr. Mher Safarian  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101639 - Econometrics and Statistics II  

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### Events

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<td>Stochastic Calculus and Finance</td>
<td>2</td>
<td>Safarian</td>
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**Competence Certificate**

The assessment of this course consists of a written examination (§4(2), 1 SPOs, 180 min.) and of possible additional assignments during the course (§4 (3) SPO).

**Prerequisites**

None

**Annotation**

For more information see http://statistik.econ.kit.edu/

### Below you will find excerpts from events related to this course:

#### Stochastic Calculus and Finance

**2521331, WS 19/20, 2 SWS, Language: Englisch, Open in study portal**

**Lecture (V)**

**Description**

The course will provide rigorous yet focused training in stochastic calculus and finance. The program will cover modern approaches in stochastic calculus and mathematical finance. Topics to be covered:


Learning Content
The course will provide rigorous yet focused training in stochastic calculus and finance. The program will cover modern approaches in stochastic calculus and mathematical finance. Topics to be covered:


Stochastic processes (Poisson-process, Brownian motion, martingales), stochastic Integral (Integral, quadratic und co-variation, Itô-formula), stochastic differential equation for price-processes, trading strategies, option pricing(Feynman-Kac), neutral risk rating(equivalent martingale measure, Girsanov theorem), term structure models

Workload
The total workload for this course is approximately 150 hours. For further information see German version.

Literature
To be announced in lecture.

Elective literature:

- An Introduction to Stochastic Integration (Probability and its Applications) by Kai L. Chung , Ruth J. Williams , Birkhaueser,
- Methods of Mathematical Finance by Ioannis Karatzas , Steven E. Shreve , Springer 1998
Course: Stochastic Control [T-MATH-105871]

Responsible: Prof. Dr. Nicole Bäuerle
Organisation: KIT Department of Mathematics
Part of: M-MATH-102908 - Stochastic Control

**Type**  
Oral examination

**Credits**  
4

**Version**  
1

Prerequisites  
none
4.227 Course: Stochastic Differential Equations [T-MATH-105852]

**Responsible:** Prof. Dr. Roland Schnaubelt
Prof. Dr. Lutz Weis

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102881 - Stochastic Differential Equations

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</table>
4.228 Course: Stochastic Evolution Equations [T-MATH-105910]

Responsible: Prof. Dr. Lutz Weis
Organisation: KIT Department of Mathematics
Part of: M-MATH-102942 - Stochastic Evolution Equations

Type: Oral examination
Credits: 8
Version: 1

Prerequisites
none
### 4.229 Course: Stochastic Geometry [T-MATH-105840]

**Responsible:** Prof. Dr. Daniel Hug  
Prof. Dr. Günter Last  

**Organisation:** KIT Department of Mathematics  

**Part of:** M-MATH-102865 - Stochastic Geometry  

**Type**  
Oral examination  

**Credits**  
8  

**Version**  
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<td>Stochastic Geometry</td>
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<td>SS 2019</td>
<td>0152610</td>
<td>Übungen zu 0152600 (Stochastische Geometrie)</td>
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<td>Practice (Ü)</td>
<td>Hug</td>
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4.230 Course: Strategic Finance and Technology Change [T-WIWI-110511]

**Responsible:** Prof. Dr. Martin Ruckes  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101480 - Finance 3  
- M-WIWI-101483 - Finance 2

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**Competence Certificate**  
The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation. The exam is offered each semester. If there are only a small number of participants registered for the exam, we reserve the right to hold an oral examination instead of a written one.

**Prerequisites**  
None

**Recommendation**  
Attending the lecture "Financial Management" is strongly recommended.
4.231 Course: Strategic Management of Information Technology [T-WIWI-102669]

Responsible: Thomas Wolf
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

- **Type**: Written examination
- **Credits**: 4.5
- **Recurrence**: Each summer term
- **Version**: 2

### Events

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<th>Strategic Management of Information Technology</th>
<th>2 SWS</th>
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<tr>
<td>SS 2019</td>
<td>2511603</td>
<td>Übungen zu Strategisches Management der betrieblichen Informationsverarbeitung</td>
<td>1 SWS</td>
<td>Practice (Ü)</td>
<td>Wolf</td>
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### Competence Certificate

Please note that the exam for first writers will be offered for the last time in winter semester 2019/2020. A last examination possibility exists in the summer semester 2020 (only for repeaters).

The assessment of this course is a written (60 min.) or (if necessary) oral examination according (30 min.) to §4(2) of the examination regulation.

### Prerequisites

None

---

Below you will find excerpts from events related to this course:

#### V Strategic Management of Information Technology

2511602, SS 2019, 2 SWS, Language: Deutsch, [Open in study portal](#)

**Learning Content**

The following topics will be covered: strategic planing of ICT, architecture of ICT, overall planning of ICT, outsourcing, operation and controlling of ICT.

**Literature**

Course: Strategy and Management Theory: Developments and “Classics” [T-WIWI-106190]

**Responsible:** Prof. Dr. Hagen Lindstädt
**Organisation:** KIT Department of Economics and Management
**Part of:** M-WIWI-103119 - Advanced Topics in Strategy and Management

**Events**

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**Competence Certificate**
Non exam assessment (following §4(2) 3 of the examination regulation).

**Prerequisites**
None

**Recommendation**
Basic knowledge as conveyed in the bachelor module „Strategy and Organization” is recommended.

**Annotation**
This course is admission restricted. If you were already admitted to another course in the module "Advanced Topics in Strategy and Management" the participation at this course will be guaranteed.

The course is planned to be held for the first time in the winter term 2017/18.

Below you will find excerpts from events related to this course:

**Strategy and Management Theory: Developments and "Classics" (Master)**
2577921, WS 19/20, 2 SWS, Language: Deutsch, [Open in study portal]

**Notes**
This course is admission restricted. If you were already admitted to another course in the module "Advanced Topics in Strategy and Management" the participation at this course will be guaranteed.

**Learning Content**
In this lecture, students discuss and evaluate models in the field of strategic management with a focus on applicability and theory based limitations. Critical examination of current research results will be a substantial part of this course.

**Workload**
The total workload for this course is approximately 90 hours.
Lecture: 15 hours
Preparation of lecture: 75 hours
Exam preparation: n/a
### 4.233 Course: Supplement Enterprise Information Systems [T-WIWI-110346]

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<th>Prof. Dr. Andreas Oberweis</th>
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</table>

#### Competence Certificate

The assessment of this course is a written examination (60 min.) or (if necessary) oral examination (30 min.) according to §4(2) of the examination regulation.

#### Prerequisites

None
4.234 Course: Supplement Software- and Systemsengineering [T-WIWI-110372]

Responsible: Prof. Dr. Andreas Oberweis
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

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<tbody>
<tr>
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<td>Each term</td>
<td>1</td>
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Competence Certificate
The assessment consists of an 1h written exam in the first week after lecture period.

Prerequisites
None

Annotation
This course can be used in particular for the acceptance of external courses whose content is in the broader area of software and systems engineering, but cannot assigned to another course of this topic.
4.235 Course: Tactical and Operational Supply Chain Management [T-WIWI-102714]

Responsible: Prof. Dr. Stefan Nickel
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101413 - Applications of Operations Research
 M-WIWI-102832 - Operations Research in Supply Chain Management

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<td>2 SWS</td>
<td>Each summer term</td>
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<td>SS 2019 2550487</td>
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Competence Certificate
The assessment consists of a written exam (60 minutes) according to Section 4(2), 1 of the examination regulation. The exam takes place in every the semester. Prerequisite for admission to examination is the successful completion of the online assessments.

Prerequisites
Prerequisite for admission to examination is the successful completion of the online assessments.

Recommendation
None

Annotation
The lecture is held in every summer term. The planned lectures and courses for the next three years are announced online.

Below you will find excerpts from events related to this course:

V Taktisches und operatives SCM
2550486, SS 2019, 2 SWS, Language: Deutsch, Open in study portal Lecture (V)

Description
Since the classical work ‘Theory of the Location of Industries’ of Weber from 1909, the determination of an optimal location of a new facility with respect to existing customers is strongly connected to strategic logistics planning. Strategic decisions concerning the location of facilities as production plants, distribution centers or warehouses are of high importance for the rentability of supply chains. Thoroughly carried out, location planning allows an efficient flow of materials and leads to lower costs and increased customer service.

Subject of the course is an introduction to the most important terms and definitions in location planning as well as the presentation of basic quantitative location planning models. Furthermore, specialized location planning models for Supply Chain Management will be addressed as they are part in many commercial SCM tools for strategic planning tasks.

Learning Content
The lecture covers basic quantitative methods in location planning in the context of strategic Supply Chain Planning. Besides the discussion of several criteria for the evaluation of the locations of facilities, the students are acquainted with classical location planning models (planar models, network models and discrete models) and advanced location planning models designed for Supply Chain Management (single-period and multi-period models). The exercises accompanying the lecture offer the possibility to apply the considered models to practical problems.

Annotation
The lecture is held in every summer term. The planned lectures and courses for the next three years are announced online.
Literature

Elective Literature

- Love, Morris, Wesolowsky: Facilities Location: Models and Methods, North Holland, 1988
4.236 Course: The Riemann Zeta Function [T-MATH-105934]

**Responsible:** Dr. Fabian Januszewski

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102960 - The Riemann Zeta Function

**Type**
Oral examination

**Credits**
4

**Version**
1
Course: Theory of Endogenous Growth [T-WIWI-102785]

Responsible: Prof. Dr. Ingrid Ott
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101478 - Innovation and Growth
M-WIWI-101496 - Growth and Agglomeration

Type: Written examination
Credits: 4.5
Recurrence: Each winter term
Version: 1

Events
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Competence Certificate
The assessment consists of a written exam (60 min) according to Section 4(2), 1 of the examination regulation. The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Students will be given the opportunity of writing and presenting a short paper during the lecture time to achieve a bonus on the exam grade. If the mandatory credit point exam is passed, the awarded bonus points will be added to the regular exam points. A deterioration is not possible by definition, and a grade does not necessarily improve, but is very likely to (not every additional point improves the total number of points, since a grade can not become better than 1). The voluntary elaboration of such a paper can not countervail a fail in the exam.

Prerequisites
None

Recommendation
Basic knowledge of micro- and macroeconomics is assumed, as taught in the courses Economics I [2600012], and Economics II [2600014]. In addition, an interest in quantitative-mathematical modeling is required.

Annotation
Due to the research semester of Prof. Dr. Ingrid Ott, the course is not offered in the winter term 2018/19.

Below you will find excerpts from events related to this course:

Learning Content
- Basic models of endogenous growth
- Human capital and economic growth
- Modelling of technological progress
- Diversity Models
- Schumpeterian growth
- Directional technological progress
- Diffusion of technologies

Workload
The total workload for this course is approximately 135.0 hours. For further information see German version.
Literature

Excerpt:

### 4.238 Course: Time Series Analysis [T-MATH-105874]

**Responsible:** Prof. Dr. Norbert Henze  
Dr. Bernhard Klar  

**Organisation:** KIT Department of Mathematics  

**Part of:** M-MATH-102911 - Time Series Analysis

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**4.239 Course: Topics in Experimental Economics [T-WIWI-102863]**

**Responsible:** Prof. Dr. Johannes Philipp Reiß  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101505 - Experimental Economics

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**Competence Certificate**  
The assessment consists of a written exam (following §4(2), 1 of the examination regulation).

**Prerequisites**  
None

**Recommendation**  
Basic knowledge of Experimental Economics is assumed. Therefore, it is strongly recommended to attend the course Experimental Economics beforehand.

**Annotation**  
The course is offered in summer 2020 for the next time, not in summer 2018.
4.240 Course: Traveling Waves [T-MATH-105897]

**Responsible:** Prof. Dr. Jens Rottmann-Matthes

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-102927 - Traveling Waves

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4.241 Course: Uncertainty Quantification [T-MATH-108399]

Responsible: Prof. Dr. Martin Frank
Organisation: KIT Department of Mathematics
Part of: M-MATH-104054 - Uncertainty Quantification

Type: Oral examination
Credits: 4
Recurrence: Irregular
Version: 1

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<th>Uncertainty Quantification</th>
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<td>Tutorial for 0164400</td>
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<td>Practice (Ü)</td>
<td>Frank</td>
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</table>

Prerequisites
none

Below you will find excerpts from events related to this course:

Uncertainty Quantification
0164400, SS 2019, 2 SWS, Language: Englisch, Open in study portal

Description
"There are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – there are things we do not know we don't know." (Donald Rumsfeld)

In this class, we learn to deal with the "known unknowns", a field called Uncertainty Quantification (UQ). More specifically, we focus on methods to propagate uncertain input parameters through differential equation models. Given uncertain input, how uncertain is the output? The first part of the course ("how to do it") gives an overview on techniques that are used. Among these are:

- Sensitivity analysis
- Monte-Carlo methods
- Spectral expansions
- Stochastic Galerkin method
- Collocation methods, sparse grids

The second part of the course ("why to do it like this") deals with the theoretical foundations of these methods. The so-called "curse of dimensionality" leads us to questions from approximation theory. We look back at the very standard numerical algorithms of interpolation and quadrature, and ask how they perform in many dimensions.

Notes
The course will start on May 2 with a lecture at 08:00 and another lecture at 15:45 (instead of the tutorial).

Learning Content
In the first part, we learn about the techniques used in UQ. In hands-on programming exercises, students apply these techniques to either a problem of their own choice or one of several given examples. In the second part, we study the theoretical foundations of these methods.

Literature
Course: Valuation [T-WIWI-102621]

**Responsible:** Prof. Dr. Martin Ruckes

**Organisation:** KIT Department of Economics and Management

**Part of:**
- M-WIWI-101480 - Finance 3
- M-WIWI-101482 - Finance 1
- M-WIWI-101483 - Finance 2

**Type**
- Written examination

**Credits**
- 4.5

**Recurrence**
- Each winter term

**Version**
- 1

**Events**

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</table>

**Competence Certificate**

See German version.

**Prerequisites**

None

**Recommendation**

None

**Below you will find excerpts from events related to this course:**

**Valuation**

2530212, WS 19/20, 2 SWS, Language: Englisch, [Open in study portal]

**Description**

Firms prosper when they create value for their shareholders and stakeholders. This is achieved by investing in projects that yield higher returns than their according cost of capital. Students are told the basic tools for firm and project valuation as well as ways to implement these tools in order to enhance a firm’s value and improve its investment decisions. Among other things, the course will deal with the valuation of firms and individual projects using discounted cash flow and relative valuation approaches and the valuation of flexibility deploying real options.

**Learning Content**

Topics:
- Projections of cash flows
- Estimation of the cost of capital
- Valuation of the firm
- Mergers and acquisitions
- Real options

**Literature**

**Elective Literature**

4.243 Course: Variational Methods [T-MATH-110302]

**Responsible:** Prof. Dr. Wolfgang Reichel

**Organisation:** KIT Department of Mathematics

**Part of:** M-MATH-105093 - Variational Methods

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</table>
4.244 Course: Wavelets [T-MATH-105838]

**Responsible:** Prof. Dr. Andreas Rieder
**Organisation:** KIT Department of Mathematics
**Part of:** M-MATH-102895 - Wavelets

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**Competence Certificate**
Mündliche Prüfung im Umfang von ca. 30 Minuten.

**Prerequisites**
none
4.245 Course: Web Science [T-WIWI-103112]

**Responsible:** Prof. Dr. York Sure-Vetter  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101472 - Informatics

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<td>Sure-Vetter, Heling</td>
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**Competence Certificate**

The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation or an oral exam (20 min) following §4, Abs. 2, 2 of the examination regulation.

The exam takes place every semester and can be repeated at every regular examination date.

**Prerequisites**

None

**Annotation**


*Below you will find excerpts from events related to this course:*

**Web Science**  
2511312, WS 19/20, 2 SWS, Language: Englisch, [Open in study portal](#)

**Description**

Web Science is the emergent study of the people and technologies, applications, processes and practices that shape and are shaped by the World Wide Web. Web Science aims to draw together theories, methods and findings from across academic disciplines, and to collaborate with industry, business, government and civil society, to develop our knowledge and understanding of the Web: the largest socio-technical infrastructure in human history.

The lecture provides an introduction to basic concepts of Web Science. Essential theoretical foundations, phenomena and approaches are presented and explained.

**Learning Content**

This course aims to provide students with a basic knowledge and understanding about the structure and analysis of selected web phenomena and technologies. Topics include the small world problem, network theory, social network analysis, graph search and technologies/standards/architectures.

**Workload**

- The total workload for this course is approximately 150 hours
- Time of presentness: 45 hours
- Time of preparation and postprocessing: 67.5 hours
- Exam and exam preparation: 37.5 hours

**Literature**

Exercises to Web Science
2511313, WS 19/20, 1 SWS, Language: Englisch, Open in study portal

Description
Multiple exercises are held that capture the topics, held in the lecture Web Science and discuss them in detail. Thereby, practical examples are given to the students in order to transfer theoretical aspects into practical implementation.

Learning Content
This course aims to provide students with a basic knowledge and understanding about the structure and analysis of selected web phenomena and technologies. Topics include the small world problem, network theory, social network analysis, graph search and technologies/standards/architectures.

Workload
The total workload for the lecture Web Science is given out on the description of the lecture.

Literature
4.246 Course: Workshop Business Wargaming – Analyzing Strategic Interactions [T-WIWI-106189]

**Responsible:** Prof. Dr. Hagen Lindstädt

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-103119 - Advanced Topics in Strategy and Management

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**Competence Certificate**
Non exam assessment (following §4(2) 3 of the examination regulation).

**Prerequisites**
None

**Recommendation**
Basic knowledge as conveyed in the bachelor module „Strategy and Organization“ is recommended.

**Annotation**
This course is admission restricted. If you were already admitted to another course in the module “Advanced Topics in Strategy and Management” the participation at this course will be guaranteed.

The course is planned to be held for the first time in the summer term 2018.

Below you will find excerpts from events related to this course:

**Notes**
This course is admission restricted. If you were already admitted to another course in the module “Advanced Topics in Strategy and Management” the participation at this course will be guaranteed.

**Learning Content**
In this course, students simulate and analyze real-life conflict situations using Business Wargaming methods. The students will be able to understand the underlying structure and dynamics of various conflicts, this includes making own conclusions as well as deriving strategic recommendations.

**Workload**
The total workload for this course is approximately 90 hours.

- Lecture: 15 hours
- Preparation of lecture: 75 hours
- Exam preparation: n/a
4.247 Course: Workshop Current Topics in Strategy and Management [T-WIWI-106188]

**Responsible:** Prof. Dr. Hagen Lindstädt

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-103119 - Advanced Topics in Strategy and Management

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<td>Seminar ($)</td>
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<td>WS 19/20</td>
<td>2577922</td>
<td>Workshop Business Wargaming - Analyse strategischer Interaktionen (Master)</td>
<td>2 SWS</td>
<td>Seminar ($)</td>
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**Competence Certificate**
Non exam assessment (following §4(2) 3 of the examination regulation).

**Prerequisites**
None

**Recommendation**
Basic knowledge as conveyed in the bachelor module „Strategy and Organization“ is recommended.

**Annotation**
This course is admission restricted. If you were already admitted to another course in the module "Advanced Topics in Strategy and Management" the participation at this course will be guaranteed.
The course is planned to be held for the first time in the winter term 2017/18.

Below you will find excerpts from events related to this course:

**Workshop aktuelle Themen Strategie und Management (Master)**

2577923, SS 2019, 2 SWS, Language: Deutsch, [Open in study portal](#)

**Notes**
This course is admission restricted. If you were already admitted to another course in the module "Advanced Topics in Strategy and Management" the participation at this course will be guaranteed.

**Learning Content**
In this lecture, students discuss and evaluate models in the field of strategic management with a focus on applicability and theory based limitations. Critical examination of current research results will be a substantial part of this course.

**Workload**
The total workload for this course is approximately 90 hours.

- Lecture: 15 hours
- Preparation of lecture: 75 hours
- Exam preparation: n/a

**Workshop Business Wargaming - Analyse strategischer Interaktionen (Master)**

2577922, WS 19/20, 2 SWS, Language: Deutsch, [Open in study portal](#)
Learning Content
In this lecture, current economic trends will be discussed from a perspective of competition analysis and corporate strategies. Using appropriate frameworks, the students will be able to analyze collectively selected case studies and derive business strategies.

Annotation
This course is admission restricted. If you were already admitted to another course in the module "Advanced Topics in Strategy and Management" the participation at this course will be guaranteed.

Workload
The total workload for this course is approximately 90 hours.
Lecture: 15 hours
Preparation of lecture: 75 hours
Exam preparation: n/a