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1 General information

Welcome to the new module handbook of your study program! 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! In the following we would like to give you a short introduction to the most important terms and rules that are important in connection with the choice of modules, courses and examinations.

1.1 Structural elements

The program exists of several subjects (e.g. business administration, economics, operations research). Every subject is split into modules and every module itself consists of one or more interrelated module component exams. The extent of every module is indicated by credit points (CP), which will be credited after the successful completion of the module. Some of the modules are obligatory. According to the interdisciplinary character of the program, a great variety of individual specialization and deepening possibilities exists for a large number of modules. This enables the student to customize content and time schedule of the program according to personal needs, interest and job perspective. The module handbook describes the modules belonging to the program. It describes particularly:

- the structure of the modules
- the extent (in CP),
- the dependencies of the modules,
- the learning outcomes,
- the assessment and examinations.

The module handbook serves as a necessary orientation and as a helpful guide throughout the studies. The module handbook does not replace the course catalog, which provides important information concerning each semester and variable course details (e.g. time and location of the course).

1.2 Begin and completion of a module

Each module and each examination can only be selected once. The decision on the assignment of an examination to a module (if, for example, an examination in several modules is selectable) is made by the student at the moment when he / she is registered for the appropriate examination. A module is completed or passed when the module examination is passed (grade 4.0 or better). For modules in which the module examination is carried out over several partial examinations, the following applies: The module is completed when all necessary module partial examinations have been passed. In the case of modules which offer alternative partial examinations, the module examination is concluded with the examination with which the required total credit points are reached or exceeded. The module grade, however, is combined with the weight of the predefined credit points for the module in the overall grade calculation.

1.3 Module versions

It is not uncommon for modules to be revised due to, for example, new courses or cancelled examinations. As a rule, a new module version is created, which applies to all students who are new to the module. On the other hand, students who have already started the module enjoy confidence and remain in the old module version. These students can complete the module on the same conditions as at the beginning of the module (exceptions are regulated by the examination committee). The date of the student’s ”binding declaration” on the choice of the module in the sense of §5(2) of the Study and Examination Regulation is decisive. This binding declaration is made by registering for the first examination in this module.

In the module handbook, all modules are presented in their current version. The version number is given in the module description. Older module versions can be accessed via the previous module handbooks in the archive at http://www.wiwi.kit.edu/Archiv_MHB.php.

1.4 General and partial examinations

Module examinations can be either taken in a general examination or in partial examinations. If the module examination is offered as a general examination, the entire learning content of the module will be examined in a single examination. If the module examination is subdivided into partial examinations, the content of each course will be examined in corresponding partial examinations. Registration for examinations can be done online at the campus management portal. The following functions can be accessed on https://campus.studium.kit.edu/:

- Register/unregister for examinations
- Check for examination results
- Create transcript of records

For further and more detailed information, see https://campus.studium.kit.edu/faq.php.
1.5 Types of examinations
Examinations are split into written examinations, oral examinations and alternative exam assessments ("Prüfungsleistungen anderer Art"). Examinations are always graded. Non exam assessments ("Studienleistungen") can be repeated several times and are not graded.

1.6 Repeating examinations
Principally, a failed written exam, oral exam or alternative exam assessment can repeated only once. If the repeat examination (including an eventually provided verbal repeat examination) will be failed as well, the examination claim is lost. A request for a second repetition has to be made in written form to the examination committee two months after loosing the examination claim. For further information see http://www.wiwi.kit.edu/hinweiseZweitwdh.php.

1.7 Examiners
The examination committee has appointed the KIT examiners and lecturers listed in the module handbook for the modules and their courses as examiners for the courses they offer.

1.8 Additional accomplishments
Additional accomplishments are voluntarily taken exams, which have no impact on the overall grade of the student and can take place on the level of single courses or on entire modules. It is also mandatory to declare an additional accomplishment as such at the time of registration for an exam. Additional accomplishments with at most 30 CP may appear additionally in the certificate.

1.9 Further information
For current information about studying at the KIT Department of Economics and Management, please visit our website www.wiwi.kit.edu as well as Instagram, LinkedIn, and YouTube. Please also see current notices and announcements for students at: https://www.wiwi.kit.edu/studium.php.
Information around the legal and official framework of the study program can be found in the respective study and examination regulations of your study program. These are available under the Official Announcements of KIT (http://www.sle.kit.edu/amtllicheBekanntmachungen.php).
More detailed information about the legal and general conditions of the program can be found in the examination regulation of the program (http://www.sle.kit.edu/amtllicheBekanntmachungen.php).

1.10 Contact persons

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2 Study plan

The Master’s programme in Information Systems has a standard duration of four semesters and comprises 120 credit points. Depending on personal interests and goals, the specialist knowledge acquired in the Bachelor’s programme can be expanded and deepened within the scope of the study plan.

Figure 2 shows the subject and module structure with the allocation of credit points (LP) and, as an example, a possible distribution of modules over the semesters.

Within the scope of the master’s programme, modules from the subjects of Information Systems, Informatics, Economics and Law are to be completed and a master’s thesis is to be written.

In the subject Informatics, modules with a total volume of 30 credit points are to be taken. In the remaining subjects Information Systems, Economics and Law, modules with a total of 18 credit points must be proven.

In the subjects Information Systems, Informatics, Economics and Management and Law, two seminars of 3 LP each must be completed. The seminars have to be chosen from different subjects.

It is up to the individual study plan (taking into account the relevant requirements in the study and examination regulations as well as any module regulations) in which subject semester the selected module examinations are started or completed. However, it is recommended that all other academic achievements of the Master’s examination be proven before the start of the Master’s thesis.

All modules including options within the modules are described in the module handbook. WiWi seminars that can be attended as part of the seminar modules will be published on the Wiwi portal at https://portal.wiwi.kit.edu/Seminare.
3 Qualification goals

The KIT graduates of the interdisciplinary, four-semester Master’s program in Information Systems have an in-depth research-oriented expertise in Information Systems and the related disciplines of Informatics, Economics and Law. This specialist knowledge is supplemented by subject-independent competences that can be applied across several disciplines. Depending on their profile, their qualifications are particularly suitable for interdisciplinary activities as IT managers, management consultants, technology entrepreneurs, process managers, company founders and for a further scientific career (scientist).

KIT business IT specialists are characterized by their interdisciplinary methodological competence and their innovative ability in shaping the digital transformation of business and society. By combining their knowledge and competencies, they are able to independently recognize economic and information technology conditions as well as innovative development potentials for the digitization of processes, products and services and to implement them within the legal framework.

KIT business IT specialists design and develop interdisciplinary information goods and information systems from a socio-technical perspective with the aim of creating social and economic value through the digitisation of economy and society. They are able to analyse and structure complex subject-relevant problems and requirements and develop tailor-made solutions and options for action.

They know how to identify the advantages and disadvantages of existing processes, models, technologies and approaches, compare them with alternatives, evaluate them critically and transfer them to new areas of application. According to their needs, they can also combine, adapt or independently develop new solutions and implement them using innovative information and communication technologies. They can make and justify their decisions in a scientifically sound manner, taking into account social and ethical aspects.

They know how to critically interpret, validate, document and present the results obtained.

Graduates will be able to communicate with representatives at a scientific level and take on outstanding responsibility in a team.
## 4 Field of study structure

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**4.5 Law**

| Compulsory Elective Module in Law (Election: ) | Credits |
| M-INFO-101217 Public Business Law | 9 CR |
| M-INFO-101216 Private Business Law | 9 CR |
| M-INFO-101215 Intellectual Property Law | 9 CR |

**4.6 Seminars**

| Seminars (Election: at most 2 items) | Credits |
| M-INFO-102822 Seminar Module Informatics | 3 CR |
| M-INFO-101218 Seminar Module Law | 3 CR |
| M-WIWI-104815 Seminar Information Systems | 3 CR |
| M-WIWI-102736 Seminar Module Economic Sciences | 3 CR |

**Election notes**
In the subjects Information Systems, Informatics, Economics and Management and Law, two seminars of 3 LP each must be completed. The seminars have to be chosen from different subjects.
5 Modules

5.1 Module: Access Control Systems: Models and Technology [M-INFO-106303]

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**Mandatory**

T-INFO-112775 Access Control Systems: Models and Technology 5 CR Hartenstein

**Competence Certificate**
See Partial Achievements (Teilleistung).

**Prerequisites**
See Partial Achievements (Teilleistung).

**Competence Goal**

- The student understands the challenges of access control in the era of hyperconnectivity.
- The student understands that an information security model defines access rights that express for a given system which subjects are allowed to perform which actions on which objects. The student understands that a system is said to be secure with respect to a given information security model, if it enforces the corresponding access rights.
- The student is able to derive suitable access control models from scenario requirements and is able to specify concrete access control systems. The student is able to decide which concrete architectures and protocols are technically suited for realizing a given access control model.
- The student knows access control protocols using cryptographic methods and is able to compare protocol realizations based on different cryptographic building blocks.
- The student is aware of the limits of access control models and systems with respect to their analyzability and performance and security characteristics. The student is able to identify the resulting tradeoffs.
- The student knows the state of the art with respect to current research endeavors, e.g., access control in the context of decentralized and distributed systems, Trusted Execution Environments, AI, robotics, or hash-chain based systems.

**Content**

Access control systems are everywhere and the backbone of secure services as they incorporate who is and who is not authorized: think of operating systems, information systems, banking, vehicles, robotics, cryptocurrencies, or decentralized applications as examples. The course starts with current challenges of access control in the era of hyperconnectivity, i.e., in cyber-physical or decentralized systems. Based on the derived needs for next generation access control, we first study how to specify access control and analyze strengths and weaknesses of various approaches. We then focus on up-to-date proposals, like IoT and AI access control. We look at current cryptographic access control aspects, blockchains and cryptocurrencies, and trusted execution environments. We also discuss the ethical dimension of access management. Students prepare for lecture and exercise sessions by studying previously announced literature and by preparation of exercises that are jointly discussed in the sessions.

**Workload**

Lecture workload:

1. Attendance time
   - Lecture: 2 SWS: 2,0h x 15 = 30h
   - Exercises: 1 SWS: 1,0h x 15 = 15h
2. Self-study (e.g., independent review of course material, work on homework assignments)
   - Weekly preparation and follow-up of the lecture: 15 x 1h x 3 = 45h
   - Weekly preparation and follow-up of the exercise: 15 x 2h = 30h
3. Preparation for the exam: 30h

Σ = 150h = 5 ECTS

**Recommendation**
Basics according to the lectures "IT Security Management for Networked Systems" and "Telematics" are recommended.
5.2 Module: Advanced Artificial Intelligence [M-INFO-106299]

Responsible: Prof. Dr. Jan Niehues
Organisation: KIT Department of Informatics
Part of: Informatics

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<th>Grading scale</th>
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Mandatory

| T-INFO-112768 | Advanced Artificial Intelligence | 6 CR | Niehues |

Competence Certificate
See partial achievements (Teilleistung)

Prerequisites
See partial achievements (Teilleistung)

Competence Goal
- The students know the relevant elements of a technical cognitive system.
- The students understand the algorithms and methods of AI to model cognitive systems.
- The students are able to understand the different sub-components to develop and analyze a system.
- The students can transfer this knowledge to new applications, as well as analyze and compare different methods.

Content
Due to the successes in research, AI systems are increasingly integrated into our everyday lives. These are, for example, systems that can understand and generate language or analyze images and videos. In addition, AI systems are essential in robotics in order to be able to develop the next generation of intelligent robots.

Based on the knowledge of the lecture “Introduction to AI”, the students learn to understand, develop and evaluate these systems. In order to bring this knowledge closer to the students, the lecture is divided into 4 parts. First, the lecture investigates method of perception using different modalities. The second part deals with advanced methods of learning that go beyond supervised learning. Then methods are discussed that are required for the representation of knowledge in AI systems. Finally, methods that enable AI systems to generate content are presented.

Workload
Lecture with 3 SWS + 1 SWS exercise, 6 CP.
6 LP corresponds to approx. 180 hours, of which
approx. 45 hours lecture attendance
approx. 15 hours exercise visit
approx. 90 hours post-processing and processing of the exercise sheets
approx. 30 hours exam preparation
5.3 Module: Advanced Data Structures [M-INFO-102731]

**Responsible:** Prof. Dr. Peter Sanders  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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<td>Advanced Data Structures Project/Experiment</td>
<td>1 CR</td>
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**Competence Certificate**  
See partial achievements (Teilleistung)

**Prerequisites**  
See partial achievements (Teilleistung)

**Competence Goal**  
Students acquire a systematic understanding of algorithmic issues and solution approaches in the area of advanced data structures, building on existing knowledge in the subject area of algorithms. They will also be able to apply learned techniques to related problems and interpret and comprehend current research topics in this area.

Upon successful completion of the course, students will be able to:
- explain terms, structures, basic problem definitions, and algorithms from the lecture;
- select which algorithms and data structures are suitable for solving a problem and, if necessary, adapt them to the requirements of a specific problem;
- use algorithms and data structures, analyze them mathematically, and prove the algorithmic properties.

**Content**  
In this lecture we deal with modern data structures for fundamental objects such as trees, graphs, integers, and strings. These data structures are the basis for many applications and an important part of efficient algorithms. We look at highlights from different research areas and learn techniques for solving a wide variety of problems.

In addition to the theoretical analysis of data structures, we also look at the practical performance of the various data structures and their applications.

**Workload**  
The lectures including the project/experiment with 5 CP corresponds to 150 working hours, which are divided approximately as follows:
- ca. 30 hours attending lectures
- ca. 60 hours preparing and following-up lectures
- ca. 30 hours working on the project/experiment
- ca. 30 hours preparing for the examination
5.4 Module: Advanced Machine Learning and Data Science [M-WIWI-105659]

**Responsible:** Prof. Dr. Maxim Ulrich  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Economics and Management (Business Administration)

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<tr>
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<td>Advanced Machine Learning and Data Science</td>
<td>9 CR</td>
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**Competence Certificate**
DUE to the professor’s research sabbatical, the BSc module “Financial Data Science” and MSc module “Foundations for Advanced Financial -Quant and -Machine Learning Research” and the MSc module “Advanced Machine Learning and Data Science” along with the respective examinations will not be offered in SS2023. Bachelor and Master thesis projects are not affected and will be supervised.

The assessment is carried out in an alternative form. The final grade is evaluated based on the intermediate presentations during the project, the quality of the implementation, the final written thesis and a final presentation.

**Prerequisites**
see T-WIWI-106193 "Advanced Machine Learning and Data Science".

**Competence Goal**
After a successful project, the students can:
- select and apply modern machine learning methods to solve a data science problem;
- organize themselves in a team in a goal-oriented manner and bring an extensive software project in the field of data science and machine learning to success;
- deepen their data science and machine learning skills
- solve a finance problem with the help of data science and machine learning algorithm.

**Content**
The course is targeted at students with a major in Data Science and/or Machine Learning and/or Quantitative Finance. It offers students the opportunity to develop hands-on knowledge on new developments in the intersection of quantitative financial markets, data science and machine learning. The result of the project should not only be a final thesis, but the implementation of methods or development of an algorithm in machine learning and data science. Typically, problems and data are taken from current research and innovations in the field of quantitative asset and risk management.

**Workload**
Total effort for 9 credit points: approx. 270 hours are divided into the following parts:
- Communication: Exchange during the project: 30 h
- Final presentation: 10 h
- Implementation and thesis: Preparation before development (Problem analysis and solution design): 70 h
- Tests and quality assurance: 50 h

**Recommendation**
None
5.5 Module: Advanced Topics in Public Finance [M-WIWI-101511]

**Responsible:** Prof. Dr. Berthold Wigger

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

**Part of:** Economics and Management (Economics)

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**Electives (Election: between 1 and 2 items)**

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<th>Course Title</th>
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<tr>
<td>T-WIWI-108711</td>
<td>Basics of German Company Tax Law and Tax Planning</td>
<td>4,5 CR</td>
<td>Gutekust, Wigger</td>
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<tr>
<td>T-WIWI-102740</td>
<td>Public Management</td>
<td>4,5 CR</td>
<td>Wigger</td>
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**Supplementary Courses (Election: between 0 and 1 items)**

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<tbody>
<tr>
<td>T-WIWI-111304</td>
<td>Fundamentals of National and International Group Taxation</td>
<td>4,5 CR</td>
<td>Wigger</td>
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<tr>
<td>T-WIWI-102739</td>
<td>Public Revenues</td>
<td>4,5 CR</td>
<td>Wigger</td>
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</table>

**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.

**Prerequisites**

At least one of the courses "Public Management" or "Basics of German Company Tax Law and Tax Planning" is mandatory in the module and must be successfully examined.

**Competence Goal**

The student

- understands the theory and politics of taxation
- has knowledge in the area of public debt.
- understands efficiency problems of public organizations.
- is able to work on fiscal problems.

**Content**

As a branch of Economics, Public Finance is concerned with the theory and policy of the public sector and its interrelations with the private sector. It analyzes the economic role of the state from a normative as well as from a positive point of view. The normative view examines efficiency- and equity-oriented motives for government intervention and develops fiscal policy guidelines. The positive view explains the actual behavior of economic agents in public sector affairs.

In the course of the lectures within this module the students achieve knowledge in the areas of public revenues, national and international law of taxation and theory of public sector organizations.

**Annotation**

The course T-WIWI-102790 "Specific Aspects in Taxation" will no longer be offered in the module as of winter semester 2018/2019.

Students who successfully passed the exam in „Public Management” before the introduction of the module “Advanced Topics in Public Finance” in winter term 2014/15 are allowed to take both courses "Public Revenues" and "Specific Aspects in Taxation”.

**Workload**

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

**Recommendation**

Basic knowledge in the area of public finance and public management is required.
5.6 Module: Advanced Topics in Strategy and Management [M-WIWI-103119]

Responsible: Prof. Dr. Hagen Lindstädt
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Business Administration)

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Compulsory Elective Courses (Election: 9 credits)

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<td>T-WIWI-106188</td>
<td>Workshop Current Topics in Strategy and Management</td>
<td>3 CR</td>
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<tr>
<td>T-WIWI-106189</td>
<td>Workshop Business Wargaming – Analyzing Strategic Interactions</td>
<td>3 CR</td>
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<tr>
<td>T-WIWI-106190</td>
<td>Strategy and Management Theory: Developments and &quot;Classics&quot;</td>
<td>3 CR</td>
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</table>

Competence Certificate
The control of success takes place in the form of partial examinations (according to §4(2), 1-3 SPO) on the courses of the module, amounting to a total of 9 LP. The performance review is described for each course of this module. The overall grade of the module is formed from the LP-weighted grades of the partial examinations and truncated after the first decimal place.

Prerequisites
None

Competence Goal
Upon completion of the module, students will be able to,

- independently analyze strategic issues in a structured manner using appropriate models and frames of reference from management theory and derive recommendations.
- Convincingly present their position by means of a well thought-out argumentation in structured discussions.
- independently deal with a current, research-oriented issue from strategic management.
- draw his/her own conclusions from the little structured information by incorporating his/her interdisciplinary knowledge and selectively develop the current research results.
- apply and discuss theoretical contents of management theory to real situations by intensively dealing with a variety of practice-relevant case studies.

Content
In terms of content, three focal points will be set. First, strategic issues are discussed and analyzed on the basis of jointly selected case studies. Secondly, the students deal intensively with the topic of business wargaming in a workshop and analyze strategic interactions. Thirdly, topics of strategy and management theory will be elaborated in a written paper.

Annotation
The module is admission restricted. Upon successful admission to a course, the student is guaranteed the opportunity to complete the module. Examinations are offered at least every other semester so that the entire module can be completed in two semesters.

Workload
Total effort for 9 credit points: approx. 270 hours. The exact distribution is done according to the credit points of the courses of the module. The workload for courses with 3 credits is approx. 90h.
5.7 Module: Algorithm Engineering [M-INFO-100795]

**Responsible:** Prof. Dr. Peter Sanders  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

### Mandatory

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#### T-INFO-101332  
Algorithm Engineering  
4 CR  
Sanders

#### T-INFO-111856  
Algorithm Engineering Pass  
1 CR  
Sanders

### Prerequisites

There are two partial achievements Algorithm Engineering and Algorithm Engineering Exercises. The partial achievement Algorithm Engineering Exercises must be started to be allowed to take the oral examination for Algorithm Engineering.

### Competence Goal

The students acquire a systematic understanding of algorithmic problems and solution approaches in the field of Algorithm Engineering, building on existing knowledge in the subject area of algorithms. In addition, they will be able to apply learned techniques to related problems and interpret and comprehend current research topics in the field of Algorithm Engineering.

Upon successful completion of the course, the student will be able to:

- Explain terms, structures, basic problem definitions, and algorithms from the lecture;
- select which algorithms and data structures are suitable for solving an algorithmic problem and, if necessary, adapt them to the requirements of a specific problem;
- Execute algorithms and data structures, analyze them mathematically precise and prove the algorithmic properties;
- Explain machine models from the lecture and analyze algorithms and data structures according to these models;
- Analyze new problems from applications, reduce them to their algorithmic core and create a suitable abstract model; based on the concepts and techniques learned in the lecture, design and analyze own solutions in this model, and prove algorithmic properties in this model.

### Content

- What is Algorithm Engineering, Motivation etc.
- Realistic modeling of machines and applications
- practice-oriented algorithm design
- implementation techniques
- experimental techniques
- evaluation of measurements

The above skills are taught primarily using concrete examples. In the past these were for example the following topics from the area of basic algorithms and data structures:

- linked lists without special cases
- sorting: parallel, external, superscalar,...
- priority queues (cache efficient,...)
- search trees for integer keys
- Full text indexes
- graph algorithms: minimal spanning trees (external,...), route planning

In each of these cases, the focus is on the best known practical and theoretical methods. These usually differ considerably from the methods taught in beginners' lectures.
Workload
Lecture and exercise with a combined 3 semester hours, 5 ECTS
5 ECTS correspond to about 150h of work, split into
about 45h visiting lectures and exercise or block seminar
about 25h preparation and follow-up on lectures
about 40h solving exercise tasks (programming, preparing presentation for mini seminar, etc)
about 40h exam preparation
### 5.8 Module: Algorithmic Graph Theory [M-INFO-100762]

**Responsible:** Dr. rer. nat. Torsten Ueckerdt  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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<tr>
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5.9 Module: Algorithms for Routing [M-INFO-100031]

**Responsible:** TT-Prof. Dr. Thomas Bläsius

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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<td>Algorithms for Routing</td>
<td>5 CR</td>
<td>Bläsius</td>
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### 5.10 Module: Algorithms for Visualization of Graphs [M-INFO-102094]

**Responsible:** Dr. rer. nat. Torsten Ueckerdt  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics  

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<td>Algorithms for Visualization of Graphs</td>
<td>5 CR</td>
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5.11 Module: Algorithms II [M-INFO-101173]

**Responsible:** Prof. Dr. Peter Sanders

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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**Mandatory**

| T-INFO-102020 | Algorithms II | 6 CR | Sanders |

**Competence Certificate**
See partial achievements (Teilleistung)

**Prerequisites**
See partial achievements (Teilleistung)

**Competence Goal**
The student has an in-depth insight into the theoretical and practical aspects of algorithms and is able to identify and formally formulate algorithmic problems in various application areas. Furthermore, they know advanced algorithms and data structures from the areas of graph algorithms, algorithmic geometry, string matching, algebraic algorithms, combinatorial optimization, and external memory algorithms. They are able to independently understand algorithms they are unfamiliar with, associate them with the above areas, apply them, determine their running time, evaluate them, and select appropriate algorithms for given applications. Furthermore, the student is able to adapt existing algorithms to related problems. In addition to algorithms for concrete problems, the student knows advanced techniques of algorithmic design. This includes parameterized algorithms, approximation algorithms, online algorithms, randomized algorithms, parallel algorithms, linear programming, and algorithm engineering techniques. For given algorithms, the student is able to identify techniques used to better understand these algorithms. In addition, they are able to select appropriate techniques for a given problem and use them to design their own algorithms.

**Content**
This module is designed to provide students with the basic theoretical and practical aspects of algorithm design, analysis, and engineering. It teaches general methods for designing and analyzing algorithms for basic algorithmic problems, as well as the basic principles of general algorithmic methods such as approximation algorithms, linear programming, randomized algorithms, parallel algorithms, and parameterized algorithms.

**Workload**

Lecture with 3 semester hours + 1 semester hour exercise
6 ECTS correspond to about 180 hours
- about 45h visiting the lectures
- about 15h visiting the exercises
- about 90h follow-up of lectures and solving the exercise sheets
- about 30h preparation for the exam
## 5.12 Module: Analytics and Statistics [M-WIWI-101637]

**Responsible:** Prof. Dr. Oliver Grothe  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Economics and Management (Statistics)

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<th>Credits</th>
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<tr>
<td>T-WIWI-106341</td>
<td>Machine Learning 2 – Advanced Methods</td>
<td>4,5 CR</td>
<td>Zöllner</td>
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<tr>
<td>T-WIWI-111247</td>
<td>Mathematics for High Dimensional Statistics</td>
<td>4,5 CR</td>
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<td>T-WIWI-103124</td>
<td>Multivariate Statistical Methods</td>
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<td>T-WIWI-103123</td>
<td>Advanced Statistics</td>
<td>4,5 CR</td>
<td>Grothe</td>
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<td>Topics in Stochastic Optimization</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 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.

### 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.
5.13 Module: Application Security Lab [M-INFO-103166]

**Responsible:** Prof. Dr. Jörn Müller-Quade

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

<table>
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Geiselmann, Müller-Quade
Module: Applied Strategic Decisions [M-WIWI-101453]

Responsible: Prof. Dr. Johannes Philipp Reiß
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Economics)

<table>
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Mandatory

T-WIWI-102861 Advanced Game Theory 4,5 CR Ehrhart, Puppe, Reiß

Supplementary Courses (Election: between 4.5 and 5 credits)

T-WIWI-113469 Advanced Corporate Finance 4,5 CR Ruckes
T-WIWI-102613 Auction Theory 4,5 CR Ehrhart
T-WIWI-102614 Experimental Economics 4,5 CR Weinhardt
T-WIWI-102623 Financial Intermediation 4,5 CR Ruckes
T-WIWI-112823 Platform & Market Engineering: Commerce, Media, and Digital Democracy 4,5 CR Weinhardt
T-WIWI-102862 Predictive Mechanism and Market Design 4,5 CR Reiß
T-WIWI-105781 Incentives in Organizations 4,5 CR Nieken

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.

Prerequisites
The course "Advanced Game Theory" is obligatory. Exception: The course "Introduction to Game Theory” was completed. Even those who have already successfully proven "Advanced Game Theory" in another master module can take the module. In this case you can choose freely from the rest of the offer. However, this choice can only be made by the examination office of the Department of Economics and Management.

Competence Goal
Students

- can model and analyze complex situations of strategic interaction using advanced game theoretic concepts;
- are provided with essential and advanced game theoretic solution concepts on a rigorous level and can apply them to understand real-life problems;
- learn about the experimental method, ranging from designing an economic experiment to data analysis.

Content
The module provides solid skills in game theory and offers a broad range of game theoretic applications. To improve the understanding of theoretical concepts, it pays attention to empirical evidence as well.

Annotation
The course Predictive Mechanism and Market Design is not offered each year.

Workload
The total workload for this module is approximately 270 hours. The exact distribution is made according to the credit points of the courses of the module.

Recommendation
Basic knowledge in game theory is assumed.
5.15 Module: Artificial Intelligence [M-WIWI-105366]

**Responsible:** Dr.-Ing. Michael Färber

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

**Part of:** Informatics

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**Compulsory Elective Courses (Election: at least 2 items)**

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<td>Knowledge Discovery</td>
<td>4.5 CR</td>
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<td>T-WIWI-110848</td>
<td>Semantic Web Technologies</td>
<td>4.5 CR</td>
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<td>T-WIWI-110548</td>
<td>Advanced Lab Informatics (Master)</td>
<td>4.5 CR</td>
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</table>

**Competence Certificate**

The assessment mix of each course of this module is defined for each course separately. The final mark for the module is the average of the marks for each course weighted by the credits and truncated after the first decimal.

**Prerequisites**

None

**Competence Goal**

The student

- understands the concepts behind Semantic Web and Linked Data technologies
- develops ontologies to be employed in semantic web-based applications and chooses suitable representation languages,
- is familiar with approaches in the area of knowledge representation and modelling,
- is able to transfer the methods and technologies of semantic web technologies to new application sectors,
- evaluates the potential of semantic web for new application sectors,
- understands the challenges in the areas of Data and system integration on the web is able to develop solutions.
- know the basics of machine learning, data mining and knowledge discovery
- can design, train and evaluate systems that are capable of learning
- carry out knowledge discovery projects, taking into account algorithms, representations and applications.

**Content**

The focus of the module is on Semantic Web Technologies as well as machine learning and data mining methods for knowledge acquisition from large databases.

The goal of the semantic web is the meaning (semantics) of data on the web for intelligent systems, e.g., in e-commerce and to make Internet portals usable. The representation of knowledge in the form of RDF and ontologies, the provision of data as Linked Data, as well as the request of data using SPARQL. In this lecture the basics of knowledge representation and processing for the corresponding technologies and application examples are presented.

The lecture "Knowledge Discovery" gives an overview of approaches of machine learning and data mining for knowledge extraction from large data sets. These are examined especially with regard to algorithms, applicability to different data representations and the use in real application scenarios.

Knowledge Discovery is an established research area with a large community that investigates methods for discovering patterns and regularities in large amounts of data, including unstructured text. A variety of methods exist to extract patterns and provide previously unknown insights. This information can be predictive or descriptive. The lecture gives an overview of Knowledge Discovery. Specific techniques and methods, challenges and current and future research topics in this research area will be taught.

Contents of the lecture cover the entire machine learning and data mining process with topics on supervised and unsupervised learning and empirical evaluation. Covered learning methods range from classical approaches like decision trees, support vector machines and neural networks to selected approaches from current research. Learning problems considered include feature vector-based learning and text mining.

**Workload**

The total workload for this module is approximately 270 hours.
5.16 Module: Automated Planning and Scheduling [M-INFO-104447]

**Responsible:** Prof. Dr. Peter Sanders

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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<td>5</td>
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</table>
5.17 Module: Automated Visual Inspection and Image Processing [M-INFO-100826]

**Responsible:** Prof. Dr.-Ing. Jürgen Beyerer

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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### 5.18 Module: Automotive Software Engineering (ASE) [M-INFO-106019]

**Responsible:** Prof. Dr.-Ing. Ina Schaefer

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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5.19 Module: Biologically Inspired Robots [M-INFO-100814]

**Responsible:** Prof. Dr.-Ing. Rüdiger Dillmann

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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**Mandatory**

| T-INFO-101351 | Biologically Inspired Robots | 3 CR | Rönnau |
Compulsory Elective Courses (Election: 9 credits)

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<td>Digital Democracy</td>
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<td>T-WIWI-112757</td>
<td>Digital Services: Innovation &amp; Business Models</td>
<td>4,5</td>
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<td>T-WIWI-110887</td>
<td>Practical Seminar: Service Innovation</td>
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<tr>
<td>T-WIWI-102847</td>
<td>Recommender Systems</td>
<td>4,5</td>
<td>Geyer-Schulz</td>
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<tr>
<td>T-WIWI-109940</td>
<td>Special Topics in Information Systems</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 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.

Prerequisites

None

Competence Goal
The student should

- learn to develop and implement new markets with regards to the technological progresses of information and communication technology and the increasing economic networking
- learn to restructure and develop new business processes in markets under those conditions
- understand service competition as a sustainable competitive strategy and understand the effects of service competition on the design of markets, products, processes and services.
- improve his statistics skills and apply them to appropriate cases
- learn to elaborate solutions in a team

Content
This module addresses the challenges of creating new kinds of products, processes, services, and markets from a service perspective in the context of new developed information and communication technologies and the globalization process. The module describes service competition as a business strategy in the long term that leads to the design of business processes, business models, forms of organization, markets, and competition. This will be shown by actual examples from personalized services, recommender services and social networks.

Annotation
All practical Seminars offered at the IM can be chosen for Special Topics in Information Systems. Please update yourself on www.iism.kit.edu/im/lehre.

From summer semester 2023, the course Service Innovation will be offered with a revised course concept and content. The focus will be on the closer integration of the topics of service innovation and digitalization. Current foundational content (e.g., on service innovation challenges or human-centered innovation methods) will remain. New content will cover topics such as digital platforms and ecosystems, IoT and smart service innovation, and business models.

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

Recommendation
None
5.21 Module: Collective Decision Making [M-WIWI-101504]

Responsible: Prof. Dr. Clemens Puppe
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Economics)

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Compulsory Elective Courses (Election: )

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

Prerequisites
None

Competence Goal
Students
- are able to model and assess problems in public economics and to analyze them with respect to positive and normative aspects,
- 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.

Content
The focus of the module is on mechanisms for public decision 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.
Module: Computational Complexity Theory, with a View Towards Cryptography [M-INFO-101575]

**Responsible:** Prof. Dr. Jörn Müller-Quade

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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**Mandatory**

| T-INFO-103014 Computational Complexity Theory, with a View Towards Cryptography | 6 CR Hofheinz, Müller-Quade |
## 5.23 Module: Computational Geometry [M-INFO-102110]

**Responsible:** TT-Prof. Dr. Thomas Bläsius  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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## 5.24 Module: Computer Architecture [M-INFO-100818]

**Responsible:** Prof. Dr. Wolfgang Karl  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Mandatory**

| T-INFO-101355 | Computer Architecture | 6 CR | Karl |
## 5.25 Module: Computer Graphics [M-INFO-100856]

**Responsible:** Prof. Dr.-Ing. Carsten Dachsbacher  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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<td>T-INFO-104313</td>
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## 5.26 Module: Context Sensitive Systems [M/INFO-100728]

**Responsible:** Prof. Dr.-Ing. Michael Beigl  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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5.27 Module: Cooperative Autonomous Vehicles [M-WIWI-106631]

Responsible: Prof. Dr. Alexey Vinel
Organisation: KIT Department of Economics and Management
Part of: Informatics

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Compulsory Elective Courses (Election: )

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<td>T-WIWI-113059</td>
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<td>4,5 CR</td>
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Competence Certificate
The assessment is carried out as partial exams 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.

Prerequisites
None.

Competence Goal
Students
- know the fundamentals of vehicular communications and networking,
- look critically into current research topics in the field of autonomous driving,
- explain basic concepts in cooperative vehicles,
- apply mathematical methods for the performance evaluation of cooperative driving systems,
- apply simulation tools for the modeling of cooperative autonomous vehicles.

Content
The module focuses on the aspects of communication, coordination, and cooperation of highly automated and autonomous vehicles. We explain the state-of-the-art of the vehicular communications (V2X) and respective cooperative driving applications from an interdisciplinary viewpoint. The module includes selected material from wireless networking, formal description methods, human-computer interaction, robotics, and machine learning. The students work with mathematical models, simulation environments and lab equipment.

Module grade calculation
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.

Workload
The total workload for this module is approximately 270 hours. The exact distribution is made according to the credit points of the courses of the module.
5.28 Module: Critical Digital Infrastructures [M-WIWI-104403]

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

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

**Part of:** Informatics

<table>
<thead>
<tr>
<th>Credits</th>
<th>Grading scale</th>
<th>Recurrence</th>
<th>Duration</th>
<th>Language</th>
<th>Level</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Grade to a tenth</td>
<td>Each term</td>
<td>2 terms</td>
<td>German/English</td>
<td>4</td>
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</table>

### Mandatory Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-WIWI-109248</td>
<td>Critical Information Infrastructures</td>
<td>4,5 CR</td>
<td>Sunyaev</td>
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### Compulsory Elective Courses (Election: at most 4,5 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-WIWI-112690</td>
<td>Cooperative Autonomous Vehicles</td>
<td>4,5 CR</td>
<td>Vinel</td>
</tr>
<tr>
<td>T-WIWI-109246</td>
<td>Digital Health</td>
<td>4,5 CR</td>
<td>Sunyaev</td>
</tr>
<tr>
<td>T-WIWI-110144</td>
<td>Emerging Trends in Digital Health</td>
<td>4,5 CR</td>
<td>Sunyaev</td>
</tr>
<tr>
<td>T-WIWI-110143</td>
<td>Emerging Trends in Internet Technologies</td>
<td>4,5 CR</td>
<td>Sunyaev</td>
</tr>
<tr>
<td>T-WIWI-109249</td>
<td>Sociotechnical Information Systems Development</td>
<td>4,5 CR</td>
<td>Sunyaev</td>
</tr>
<tr>
<td>T-WIWI-111126</td>
<td>Advanced Lab Blockchain Hackathon (Master)</td>
<td>4,5 CR</td>
<td>Sunyaev</td>
</tr>
<tr>
<td>T-WIWI-113026</td>
<td>Trustworthy Emerging Technologies</td>
<td>4,5 CR</td>
<td>Sunyaev</td>
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</table>

### Competence Certificate

The assessment is carried out as partial exams according to § 4 paragraph 2 Nr. 1 – Nr. 3 SPO of the examination regulation of the core course and further single courses of this module, whose sum of credits must meet 9 credits.

The learning control is described in each course. The overall score of the module is made up of the sub-scores weighted with creditpoints and is cut off after the first comma point.

### Prerequisites

None

### Competence Goal

The students ...

- have foundational knowledge about the design and operation of critical digital infrastructures
- have in-depth methodological knowledge in design science research and related scientific domains
- can distinguish between the challenges and opportunities of critical digital infrastructures in different domains
- can evaluate and improve sociotechnical systems
- combine theoretical and practical contents of the courses in the module to solve existing problems in the domain of critical digital infrastructures

### Content

Critical digital infrastructures are sociotechnical systems comprising essential software components and information systems with pivotal impact on individuals, organizations, governments, economies, and society. Critical information infrastructures require careful design, development, and evaluation to ensure reliable, secure, and purposeful operation. This module features a strong focus on different subject areas, including, but not limited to, internet technologies, health care, and information privacy. The lectures in the module introduce students to a domain relevant to critical digital infrastructures and the labs allow to gain hands-on experience in this interesting domain.

### Workload

30 hours per ECTS

Total workload for 9 ECTS: approx. 270 hours

The exact allocation is made according to the credit points of the courses.

### Recommendation

The courses in the module may be held in English. Participants should be well versed in written and spoken English.

The courses can be visited independently. Participants can start the module in the winter as well as in the summer term.

Programming skills may be required in some courses.

Experience in writing scientific papers is helpful but not required.
5.29 Module: Cross-Functional Management Accounting [M-WIWI-101510]

**Responsible:** Prof. Dr. Marcus Wouters

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

**Part of:** Economics and Management (Business Administration)

<table>
<thead>
<tr>
<th>Credits</th>
<th>Grading scale</th>
<th>Recurrence</th>
<th>Duration</th>
<th>Language</th>
<th>Level</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
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**Mandatory**

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<th>Course Name</th>
<th>Credits (CR)</th>
<th>Responsible</th>
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<tbody>
<tr>
<td>T-WIWI-102885</td>
<td>Advanced Management Accounting</td>
<td>4,5</td>
<td>Wouters</td>
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**Supplementary Courses (Elective: 4.5 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits (CR)</th>
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<tbody>
<tr>
<td>T-WIWI-105777</td>
<td>Business Intelligence Systems</td>
<td>4,5</td>
<td>Mädche</td>
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<tr>
<td>T-WIWI-105781</td>
<td>Incentives in Organizations</td>
<td>4,5</td>
<td>Nieken</td>
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<tr>
<td>T-WIWI-102835</td>
<td>Marketing Strategy Business Game</td>
<td>1,5</td>
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<td>T-WIWI-107720</td>
<td>Market Research</td>
<td>4,5</td>
<td>Klarmann</td>
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<td>T-WIWI-111848</td>
<td>Online Concepts for Karlsruhe City Retailers</td>
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<td>T-WIWI-109864</td>
<td>Product and Innovation Management</td>
<td>3</td>
<td>Klarmann</td>
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<td>T-WIWI-102621</td>
<td>Valuation</td>
<td>4,5</td>
<td>Ruckes</td>
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<tr>
<td>T-WIWI-108651</td>
<td>Extraordinary Additional Course in the Module Cross-Functional Management Accounting</td>
<td>4,5</td>
<td>Wouters</td>
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</table>

**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.

**Prerequisites**
The course “Advanced Management Accounting” is compulsory. The additional courses can only be chosen after the compulsory course has been completed successfully.

**Competence Goal**
Students will be able to apply advanced management accounting methods to managerial decision-making problems in marketing, finance, organization and strategy.

**Content**
The module includes a course on several advanced management accounting methods that can be used for various decisions in operations and innovation management. By selecting another course, each student looks in more detail at one interface between management accounting a particular field in management, namely marketing, finance, or organization and strategy.

**Annotation**
The module “Cross-functional Management Accounting” always includes the compulsory course “Advanced Management Accounting.” Students look at the interface between management accounting and another field in management. Students build the module by adding a course from the specified list. Students can also suggest another suitable course for this module for evaluation by the coordinator.

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

**Recommendation**
None
5.30 Module: Cryptographic Voting Schemes [M-INFO-100742]

- **Responsible:** Prof. Dr. Jörn Müller-Quade
- **Organisation:** KIT Department of Informatics
- **Part of:** Informatics

<table>
<thead>
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<th>Credits</th>
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<th>Duration</th>
<th>Language</th>
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<tr>
<td>T-INFO-101279</td>
<td>Cryptographic Voting Schemes</td>
<td>3 CR</td>
<td>Müller-Quade</td>
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5.31 Module: Curves and Surfaces for Geometric Design [M-INFO-101231]

**Responsible:** Prof. Dr. Hartmut Prautzsch

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

<table>
<thead>
<tr>
<th>Credits</th>
<th>Grading scale</th>
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<th>Duration</th>
<th>Language</th>
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<th>Version</th>
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<tbody>
<tr>
<td>T-INFO-102041</td>
<td>Curves and Surfaces for Geometric Design II</td>
<td>5 CR</td>
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</table>

**Competence Certificate**

See partial achievement.

**Prerequisites**

See partial achievement.

**Competence Goal**

Students of this course are knowledgeable about Bézier and B-spline techniques for surfaces and are able to solve typical problems arising in surface design.

**Content**

Bézier- and B-spline techniques for bi- and multivariate splines, polar forms, de Casteljau algorithm, smooth and geometric smooth joints, subdivision, convexity, various conversions between various surface presentations, patch rendering, intersection algorithms, interpolation and approximation, Powell-Sabin and Clough-Tocher elements, splines over triangulations, Piper's construction, box splines, B-patches and similar topics

**Workload**

approx. 150h thereof

- 30h for attending the lecture
- 30h for post-processing
- 15h for attending the exercises
- 45h for solving the exercises
- 30h for exam preparation
**Module: Curves and Surfaces in CAD I [M-INFO-100837]**

**Responsible:** Prof. Dr. Hartmut Prautzsch  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

<table>
<thead>
<tr>
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<th>Grading scale</th>
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**Mandatory**

<table>
<thead>
<tr>
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<th>Curves and Surfaces in CAD I</th>
<th>5 CR</th>
<th>Prautzsch</th>
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</table>

**Competence Certificate**
See partial achievement.

**Prerequisites**
See partial achievement.

**Competence Goal**
Students of this course are knowledgeable about Bézier and B-spline techniques for curves and tensor product surfaces and are able to solve typical problems arising in curve design.

**Content**
Bézier- and B-spline techniques, polar forms, de Casteljau algorithm, de Boor algorithm, Oslo algorithm, smooth joints (Staerk construction), subdivision, variation diminishing property, convexity, various conversions between various curve presentations, curve rendering, intersection algorithms, interpolation and approximation, tensor product splines, T-splines and similar topics.

**Workload**
approx. 150h thereof:  
30h for attending the lecture  
30h for post-processing  
15h for attending the exercises  
45h for solving the exercises  
30h for exam preparation
5.33 Module: Curves and Surfaces in CAD III [M-INFO-101213]

**Responsible:** Prof. Dr. Hartmut Prautzsch

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

<table>
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<th>Grading scale</th>
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<th>Lecturer</th>
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<tbody>
<tr>
<td>T-INFO-102006</td>
<td>Curves and Surfaces in CAD II</td>
<td>5 CR</td>
<td>Prautzsch</td>
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### Module: Data Privacy: From Anonymization to Access Control [M-INFO-104045]

<table>
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<th>Duration</th>
<th>Language</th>
<th>Level</th>
<th>Version</th>
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<td>1 term</td>
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</table>

**Responsible:** Prof. Dr.-Ing. Klemens Böhm

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

**Mandatory**

<table>
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<th>Credits</th>
<th>Responsible</th>
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<tbody>
<tr>
<td>T-INFO-108377</td>
<td>Data Privacy: From Anonymization to Access Control</td>
<td>3 CR</td>
<td>Böhm</td>
</tr>
</tbody>
</table>
# 5.35 Module: Data Science [M-INFO-106505]

**Responsible:** Prof. Dr.-Ing. Klemens Böhm  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

<table>
<thead>
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<th>Credits</th>
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<th>Duration</th>
<th>Language</th>
<th>Level</th>
<th>Version</th>
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<tr>
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<td>Grade to a tenth</td>
<td>Each winter term</td>
<td>2 terms</td>
<td>German</td>
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</table>

**Mandatory**

| T-INFO-113124 | Data Science | 8 CR | Böhm |

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# 5.36 Module: Data Science for Finance [M-WIWI-105032]

**Responsible:** Prof. Dr. Maxim Ulrich  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Economics and Management (Business Administration)

<table>
<thead>
<tr>
<th>Credits</th>
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<th>Level</th>
<th>Version</th>
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<tbody>
<tr>
<td>9</td>
<td>Grade to a tenth</td>
<td>Each winter term</td>
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<td>English</td>
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**Mandatory**

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<tbody>
<tr>
<td>T-WIWI-102878</td>
<td>Computational Risk and Asset Management</td>
<td>4,5 CR</td>
<td>Ulrich</td>
</tr>
<tr>
<td>T-WIWI-110213</td>
<td>Python for Computational Risk and Asset Management</td>
<td>4,5 CR</td>
<td>Ulrich</td>
</tr>
</tbody>
</table>

**Competence Certificate**
The module examination takes the form of an alternative exam assessment. The alternative exam assessment consists of a Python-based "Takehome Exam". At the end of the third week of January, the student is given a "Takehome Exam" which he processes and sends back independently within 4 hours using Python. Precise instructions will be announced at the beginning of the course. The alternative exam assessment can be repeated a maximum of once. A timely repeat option takes place at the end of the third week in March of the same year. More detailed instructions will be given at the beginning of the course.

**Competence Goal**
The aim of the module is to use data science, machine learning and financial market theories to generate better investment, risk and asset management decisions. The student gets to know the characteristics of different asset classes in an application-oriented manner using real financial market data. We use Python and web scraping techniques to extract, visualize and examine patterns of publicly available financial market data. Interesting and non-public financial market data such as option and futures data on shares and interest are provided. Financial market theories are also discussed to improve data analysis through theoretical knowledge. Students get to know stock, interest rate, futures and options markets through the "data science glasses". Through "finance theory glasses" students understand how patterns can be communicated and interpreted using finance theory. Python is the link through which we bring data science and modern financial market modeling together.

**Content**
The course covers several topics, among them:

- Pattern detection in price and return data in equity, interest rate, futures and option markets
- Quantitative Portfolio Strategies
- Modeling Return Densities using tools from financial econometrics, data science and machine learning
- Valuation of equity, fixed-income, futures and options in a coherent framework to possibly exploit arbitrage opportunities
- Neural networks and Natural Language Processing

**Workload**
The total workload for this module is 270 hours (9 credit points). The total number of hours resulting from income from studying online videos, answering quizzes, studying Ipython notebooks, active and interactive "Python Data Sessions" and reading literature you have heard.

**Recommendation**
Basic knowledge of capital market theory.
5.37 Module: Data Science: Data-Driven Information Systems [M-WIWI-103117]

Responsible: Prof. Dr. Alexander Mädche
Prof. Dr. Christof Weinhardt

Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Business Administration)

Credits 9  Grading scale: Grade to a tenth  Recurrence: Each term  Duration: 1 term  Language: German/English  Level: 4  Version: 9

Compulsory Elective Courses (Election: )

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Grade</th>
<th>Recurrence</th>
<th>Language</th>
<th>Level</th>
<th>Version</th>
</tr>
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<tr>
<td>T-WIWI-108715</td>
<td>Artificial Intelligence in Service Systems</td>
<td>4.5 CR</td>
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<td>Each term</td>
<td>Weinhardt</td>
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<tr>
<td>T-WIWI-111219</td>
<td>Artificial Intelligence in Service Systems - Applications in Computer Vision</td>
<td>4.5 CR</td>
<td></td>
<td>Each term</td>
<td>Satzger</td>
<td>4</td>
<td>9</td>
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<tr>
<td>T-WIWI-109863</td>
<td>Business Data Analytics: Application and Tools</td>
<td>4.5 CR</td>
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<td>Each term</td>
<td>Weinhardt</td>
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<tr>
<td>T-WIWI-106187</td>
<td>Business Data Strategy</td>
<td>4.5 CR</td>
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<tr>
<td>T-WIWI-105777</td>
<td>Business Intelligence Systems</td>
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<tr>
<td>T-WIWI-113160</td>
<td>Digital Democracy</td>
<td>4.5 CR</td>
<td></td>
<td>Each term</td>
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<tr>
<td>T-WIWI-110918</td>
<td>Introduction to Bayesian Statistics for Analyzing Data</td>
<td>4.5 CR</td>
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<td>Each term</td>
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<tr>
<td>T-WIWI-113459</td>
<td>Practical Seminar: Human-Centered Systems</td>
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<td>T-WIWI-111385</td>
<td>Responsible Artificial Intelligence</td>
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<td>Satzger, Weinhardt</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.

Prerequisites
None.

Competence Goal
The student

- understands the strategic role of integrating, transforming, and analyzing large and complex enterprise data in modern business information systems and is capable of comparing and assessing strategic alternatives
- has the core skills to design, model, and control complex, inter-organisational analytical, processes, including various business functions as well as customers and markets
- understands the usage of performance indicators for a variety of controlling and management issues and is able to define models for generating the relevant performance indicators under considerations of data availability
- distinguishes different analytics methods and concepts and learn when to apply to better understand and anticipate business relationships and developments of industrial and in particular service companies to derive fact- and data- founded managerial actions and strategies.
- knows how to capture uncertainty in the data and how to appropriately consider and visualize uncertainty in decision support or business intelligence systems and analytical processes as a whole.
Content
The amount of business-related data available in modern enterprise information systems grows exponentially, and the various data sources are more and more integrated, transformed, and analyzed jointly to gain valuable business insights, pro-actively control and manage business processes, to leverage planning and decision making, and to provide appropriate, potentially novel services to customers based on relationships and developments observed in the data.

Also, data sources are more and more connected and single business unit that used to operate on separate data pools are now becoming highly integrated, providing tremendous business opportunities but also challenges regarding how the data should be represented, integrated, preprocessed, transformed, and finally used in analytics planning and decision processes.

The courses of this module equip the students with core skills to understand the strategic role of integrating, transforming, and analyzing large and complex enterprise data in modern business information systems. Students will be capable to design, comparing, and evaluating strategic alternatives. Also, students will learn how to design, model, and control complex analytical processes, including various business functions of industrial and service companies including customers and markets. Students learn core skills to understand fundamental strategies for integrating analytic models and operative controlling mechanisms while ensuring the technical feasibility of the resulting information systems.

Furthermore, the student can distinguish different methods and concepts in the realm of data science and learns when to apply. She/he will know the means of characterizing and analyzing heterogeneous, high-dimensional data available data in data warehouses and external data sources to gain additional insights valuable for enterprise planning and decision making. Also, the students know how to capture uncertainty in the data and how to appropriately consider and visualize uncertainty in business information and business intelligence systems.

The module offers the opportunity to apply and deepen this knowledge in a seminar and hands-on tutorials that are offered with all lectures.

Texteintrag

Recommendation
The module requires a basic understanding of the tasks, systems and processes in business informatics. It is therefore recommended that students attend the course Fundamentals of Information Systems [2540450] beforehand. Furthermore, basic knowledge of operations research as well as descriptive and inferential statistics is required.
Module: Data Science: Data-Driven User Modeling [M-WIWI-103118]

Responsible: Prof. Dr. Christof Weinhardt
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Business Administration)

Credits: 9  Grading scale: Grade to a tenth  Recurrence: Each term  Duration: 1 term  Language: German/English  Level: 4  Version: 7

Compulsory Elective Courses (Election: at least 9 credits)

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<td>Business Data Analytics: Application and Tools</td>
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Competence Certificate
The assessment is carried out as partial exams 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.

Prerequisites
None

Competence Goal
Students of this module
- learn methods for planning empirical studies, in particular laboratory experiments,
- acquire theoretical knowledge and practical skills in analysing empirical data,
- familiarize with different ways of modelling user behaviour, are able to critically discuss, and to evaluate them

Content
Understanding and supporting user interactions with applications better plays an increasingly large role in the design of business applications. This applies both to interfaces for customers and to internal information systems. The data that is generated during user interactions can be channelled straight into business processes, for instance by analysing and decomposing purchase decisions, and by feeding this data into product design processes.

The Crowd Analytics section considers the analysis of data from online platforms, particularly of those following crowd- or peer-to-peer based business models. This includes platforms like Airbnb, Kickstarter and Amazon Mechanical Turk.

Theoretical models of user (decision) behaviour help analyzing the empirically observed user behaviour in a systematic fashion. Testing these models and their predictions in controlled experiments (primarily in the lab) in turn helps refine theory and to generate practically relevant design recommendations. Analyses are carried out using advanced analytic methods.

Students learn fundamental theoretical models for user behaviour in systems and apply them to cases. Students are also taught methods and skills for conceptualizing and planning empirical studies and for analyzing the resulting data.

Recommendation
Basic knowledge of Information Management, Operations Research, Descriptive Statistics, and Inferential Statistics is assumed.
5.39 Module: Data Science: Evidence-based Marketing [M-WIWI-101647]

**Responsible:** Prof. Dr. Martin Klarmann

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

**Part of:** Economics and Management (Business Administration)

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**Compulsory Elective Courses (Election: 9 credits)**

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<td>Market Research</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 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.

**Prerequisites**

Keine.

**Competence Goal**

Students

- possess advanced knowledge of relevant market research contents
- know many different qualitative and quantitative methods for measuring customer behavior, preparation of strategic decisions, making causal deductions, usage of social media data and sales forecasting
- possess the statistical skills required for working in marketing research

**Content**

This module provides in-depth knowledge of relevant quantitative and qualitative methods used in market research. Students can attend the following courses:

- The course “Market Research” provides contents of practical relevance for measuring customer attitudes and customer behavior. The participants learn using statistical methods for strategic decision-making in marketing. Students who are interested in writing their master thesis at the Marketing & Sales Research Group are required to take this course.
- The course “Marketing Analytics” is based on “Market Research” and teaches advanced statistical methods for analyzing relevant marketing and market research questions. Please note that a successful completion of “Market Research” is a prerequisite for the completion of “Marketing Analytics”.

**Workload**

The total workload for this module is approximately 270 hours.

**Recommendation**

None
5.40 Module: Data Science: Intelligent, Adaptive, and Learning Information Services [M-WIWI-105661]

**Responsible:** Prof. Dr. Andreas Geyer-Schulz  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Economics and Management (Business Administration)

### Compulsory Elective Courses (Election: 9 credits)

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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.

### Prerequisites
None

### Competence Goal
The student

- models, analyzes and optimizes the structure and dynamics of complex economic changes.
- designs and develops intelligent, adaptive or learning agents as essential elements of information services.
- knows the essential learning methods for this and can apply them (also on modern architectures) in a targeted manner.
- develops and implements personalized services, especially in the area of recommender systems.
- develops solutions in teams.

### Content
The Intelligent Architectures course addresses how to design modern agent-based systems. The focus here is on software architecture and design patterns relevant to learning systems. In addition, important machine learning methods that complete the intelligent system are discussed. Examples of systems presented include key-map architectures and genetic methods. The impact of management decisions in complex systems is considered in Business Dynamics. Understanding, modeling, and simulating complex systems enables analysis, purposeful design, and optimization of markets, business processes, regulations, and entire enterprises.

Special problems of intelligent systems are covered in Personalization and Services and Recommendersystems. The content includes approaches and methods to design user-oriented services. The measurement and monitoring of service systems is discussed, the design of personalized offers is discussed and the generation of recommendations based on collected data from products and customers is shown. The importance of user modeling and recognition is addressed, as well as data security and privacy.

### Annotation
The module replaces from summer semester 2021 M-WIWI-101470 "Data Science: Advanced CRM".

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

### Recommendation
None
5.41 Module: Database as a Service [M-INFO-105724]

**Responsible:** Prof. Dr.-Ing. Klemens Böhm  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Mandatory**

| T-INFO-111400 | Database as a Service | 5 CR | Böhm |

**Competence Goal**

At the end of the lecture the participants shall be able to explain what is specific to database functionality in the cloud, and what the advantages and disadvantages are. They shall have understood how cloud-enabled database technology differs from conventional technology of this kind, but also where the commonalities reside. Participants shall be able to explain the core ideas and approaches that define cloud-enabled database technology and discern them from each other.

**Content**

We currently witness owners of large data sets, be they big organizations, be they startups, to rent database functionality to a significant extent, rather than providing it themselves. The total costs of ownership just happen to be much lower in many cases. This lecture features database technology that facilitates exactly this. This concerns you if you want to make use of such services at some time in the future, but is also is of interest if you will have to do with 'conventional' database technology.

According to my perspective, the following features of "cloud-enabled" database technology are key, and the lecture will cover them:

- Fully automated tuning of individual database – the option to interact with a database administrator does not exist any more!
- Approximate query results suddenly are attractive. The monetary costs of evaluating a query are commensurate with the necessary effort – on the other side, high fixed costs that typically occur with owner-operated databases do not incur any more.
- Multi-tenancy. I.e., how to ensure tenants that are completely independent from each other to have a DBMS for their applications available, not only without interfering with each other, but also with performance guarantees for each tenant individually?
- Secure storage. Administering data and evaluating queries shall take place in the cloud. At the same time, the cloud provider must not be allowed to see the data. Both objectives in full beauty currently are incompatible – we will discuss possible compromises.

In this setting, conventional, established concepts like distributed transactions and distributed data management and query processing play an important role as well, and the lecture will address them equally.

**Literature**

Will be made available in the lecture. The following books cover foundations and specifics of at least some chapters of the lecture:

- *Principles of Distributed Database Systems*, Tamer Özsu, Patrick Valduriez

**Responsible:** Prof. Dr. Hannes Hartenstein  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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<tr>
<td>T-INFO-110820</td>
<td>Decentralized Systems: Fundamentals, Modeling, and Applications</td>
<td>6 CR</td>
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</table>

**Competence Goal**

1. **Fundamentals & Modeling**
   1. The student is able to recognize and distinguish distributed, federated, and decentralized systems.
   2. The student understands consensus, consistency and coordination within the context of networked and decentralized systems.
   3. The student understands the concept of Sybil attacks.
   4. The student is familiar with decentralized algorithms for leader election and mutual exclusion for execution contexts with various guarantees.
   5. The student understands the formally proven limits of fault tolerance and their underlying assumptions. This includes an understanding of synchronous and asynchronous network models which underpin the respective proofs. The student also understands several models for fault tolerance, notably silent and noisy crash as well as Byzantine fault tolerance within the context of decentralized and distributed systems.
   6. The student has a basic understanding of state machine replication.
   7. The student knows various models for and levels of consistency.

2. **Applications**
   1. The student understands conflict-free replicated data types and their use in decentralized systems like Matrix.
   2. The student has a fundamental understanding of blockchain-based cryptocurrencies (e.g. Bitcoin/Ethereum), Payment Channels, and decentralized communication systems like Matrix.
   3. The student understands trust relations in distributed and decentralized systems and applications.
   4. The student is able to understand how the previously introduced theoretical foundations relate to networked and decentralized systems in practice.
   5. The student understands concepts of decentralized storage systems.

**Content**

Decentralized Systems (like blockchain-based systems) represent distributed systems that are controlled by multiple parties who make their own independent decisions. In this course, we cover fundamental theoretical aspects as well as up-to-date decentralized systems and connect theory with current practice. We thereby address fault tolerance, security and trust, as well as performance aspects at the example of applications like Bitcoin, Ethereum, IPFS, and Matrix. As a research-oriented lecture, we may cover additional current topics like verifiable computing and/or identity and access management in decentralized settings. The lecture covers at least the following topics:

- **Fundamentals**
  - Peer-to-Peer Overlay Networks, Sybil and Eclipse Attacks
  - Formalization of decentralized systems, including models for their computation, communication, faults, and timing.
  - Leader election and mutual exclusion in decentralized systems based on different models for node identities and timing.
  - Byzantine consensus in synchronous and asynchronous settings, including Bracha's fundamental algorithm for reliable broadcast, Practical Byzantine Fault Tolerant consensus, and fundamental limits.
  - Consistency models and protocols including Conflict-Free Replicated Data Types.

- **Applications**
  - The Matrix decentralized messaging platform
  - Distributed Ledgers and Blockchains at the examples of Bitcoin and Ethereum, in particular Proof-of-Work and Proof-of-Stake consensus
  - Payment Channel Networks and Rollups
  - Decentralized storage systems, at the example of IPFS
Workload
1. Attendance time (Course, exercise, etc.)
   Lecture: 3 SWS: 3.0h x 15 = 45h
   Exercise: 1 SWS: 1.0h x 15 = 15h
2. Self-study (e.g. independent review of course material, work on homework assignments)
   Weekly preparation and follow-up of the lecture: 15 x 1h x 3 = 45h
   Weekly preparation and follow-up of the exercise: 15 x 2h = 30h
3. Preparation for the exam: 45 h
Σ = 180h = 6 ECTS

Recommendation
Prior knowledge in Foundations of IT-Security and Computer Networks is recommended.
## 5.43 Module: Deep Learning and Neural Networks [M-INFO-104460]

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<tr>
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<th>Prof. Dr. Jan Niehues</th>
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### 5.44 Module: Deep Learning for Computer Vision I: Basics [M-INFO-105753]

**Responsible:** Prof. Dr.-Ing. Rainer Stiefelhagen  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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<td>Deep Learning for Computer Vision I: Basics</td>
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**Competence Goal**

Students should be able to grasp the underlying concepts in the field of deep learning and its various applications.

- Understand the theoretical basis of deep learning
- Understand the Convolutional Neural Networks (CNN)
- Develop basis for the concepts and algorithms used in building and training the CNNs.
- Able to apply deep learning in different computer vision applications.

**Content**

In recent years tremendous progress has been made in analysing and understanding image and video content. The dominant approach in Computer Vision today are deep learning approaches, in particular the usage of Convolutional Neural Networks.

The lecture introduces the basics, as well as advanced aspects of deep learning methods and their application for a number of computer vision tasks. The following topics will be addressed in the lecture:

- Introduction to Deep Learning
- Convolutional Neural Networks (CNN): Background
- CNNs: basic architectures and learning algorithms
- Object Recognition with CNN
- Image Segmentation with CNN
- Recurrent Neural Networks
- Generating image descriptions (Image Captioning)
- Automatic question answering (Visual Question Answering)
- Generative Adversarial Networks (GAN) and their applications
- Deep Learning platforms and tools

**Annotation**

The course is partially given in German and English.
5.45 Module: Deep Learning for Computer Vision II: Advanced Topics [M-INFO-105755]

Responsible: Prof. Dr.-Ing. Rainer Stiefelhagen
Organisation: KIT Department of Informatics
Part of: Informatics

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Stiefelhagen
### 5.46 Module: Deployment of Database Systems [M-INFO-100780]

**Responsible:** Prof. Dr.-Ing. Klemens Böhm  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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## 5.47 Module: Design and Architectures of Embedded Systems (ES2) [M-INFO-100831]

**Responsible:** Prof. Dr.-Ing. Jörg Henkel  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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</table>
Module: Designing Interactive Information Systems [M-WIWI-104080]

**Responsible:** Prof. Dr. Alexander Mädiche

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

**Part of:** Economics and Management (Business Administration)

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<td>German/English</td>
<td>4</td>
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</table>

**Compulsory Elective Courses (Election: at least 1 item)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Grading scale</th>
<th>Recurrence</th>
<th>Language</th>
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</thead>
<tbody>
<tr>
<td>T-WIWI-113465</td>
<td>Designing Interactive Systems: Human-AI Interaction</td>
<td>4,5 CR</td>
<td>Mädiche</td>
<td></td>
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<tr>
<td>T-WIWI-113460</td>
<td>Engineering Interactive Systems: AI &amp; Wearables</td>
<td>4,5 CR</td>
<td>Mädiche</td>
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**Supplementary Courses (Election: at most 1 item)**

<table>
<thead>
<tr>
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<th>Credits</th>
<th>Grading scale</th>
<th>Recurrence</th>
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<tbody>
<tr>
<td>T-WIWI-111109</td>
<td>KD²Lab Hands-On Research Course: New Ways and Tools in Experimental Economics</td>
<td>4,5 CR</td>
<td>Weinhardt</td>
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<tr>
<td>T-WIWI-113459</td>
<td>Practical Seminar: Human-Centered Systems</td>
<td>4,5 CR</td>
<td>Mädiche</td>
<td></td>
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</tbody>
</table>

**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.

**Prerequisites**

In this module, the courses "Designing Interactive Systems" or "Engineering Interactive Systems" must be compulsorily taken.

**Competence Goal**

The student

- has a comprehensive understanding of conceptual and theoretical foundations of interactive systems
- knows design processes for interactive systems
- is aware of the most important techniques and tools for designing interactive systems and knows how to apply them to real-world problems
- is able to apply design principles for the design of most important classes of interactive systems,
- creates new solutions of interactive systems teams

**Content**

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. This module focuses on design processes and principles for interactive systems. The contents of the module abstract from the technical implementation details and focus on foundational concepts, theories, practices and methods for the design of interactive systems. The students get the necessary knowledge to guide the successful implementation of interactive systems in business and private life.

Each lecture in the module is accompanied with a capstone project that is carried out with an industry partner.

**Annotation**


**Workload**

The total workload for this module is approximately 270 hours.
5.49 Module: Development of Business Information Systems [M-WIWI-101477]

**Responsible:** Prof. Dr. Andreas Oberweis

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

**Part of:** Informatics

<table>
<thead>
<tr>
<th>Credits</th>
<th>Grading scale</th>
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<th>Duration</th>
<th>Language</th>
<th>Level</th>
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<tbody>
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**Compulsory Elective Courses (Election: between 1 and 2 items)**

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<th>Lecturer</th>
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<tr>
<td>T-WIWI-102661</td>
<td>Database Systems and XML</td>
<td>4.5 CR</td>
<td>Oberweis</td>
</tr>
<tr>
<td>T-WIWI-102895</td>
<td>Software Quality Management</td>
<td>4.5 CR</td>
<td>Oberweis</td>
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**Supplementary Courses (Election: at most 1 item)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</tr>
</thead>
<tbody>
<tr>
<td>T-WIWI-110346</td>
<td>Supplement Enterprise Information Systems</td>
<td>4.5 CR</td>
<td>Oberweis</td>
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<tr>
<td>T-WIWI-112599</td>
<td>Management of IT-Projects</td>
<td>4.5 CR</td>
<td>Schätzle</td>
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<tr>
<td>T-WIWI-110548</td>
<td>Advanced Lab Informatics (Master)</td>
<td>4.5 CR</td>
<td>Professorenschaft des Instituts AIFB</td>
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<tr>
<td>T-WIWI-112914</td>
<td>Advanced Lab Realization of Innovative Services (Master)</td>
<td>4.5 CR</td>
<td>Oberweis</td>
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<tr>
<td>T-WIWI-102669</td>
<td>Strategic Management of Information Technology</td>
<td>4.5 CR</td>
<td>Wolf</td>
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</table>

**Compentence Certificate**

The assessment mix of each course of this module is defined for each course separately. The final mark for the module is the average of the marks for each course weighted by the credits and truncated after the first decimal.

**Prerequisites**

The course Datenbanksysteme und XML or the course Software Quality Management must be examined.

**Competence Goal**

**Students**

- describe the structure and the components of enterprise information systems,
- explain functionality and architecture of the enterprise information system components ,
- choose and apply relevant components to solve given problems in a methodic approach,
- describe roles, activities and products in the field of software engineering management,
- compare process and quality models and choose an appropriate model in a concrete situation,
- write scientific theses in the areas of enterprise information system components and software engineering management and find own solutions for given problems and research questions.

**Content**

An enterprise information system contains the complete application software to store and process data and information in an organisation including design and management of databases, workflow management and strategic information planning.

Due to global networking and geographical distribution of enterprises as well as the increasing acception of eCommerce the application of distributed information systems becomes particular important.

This module teaches concepts and methods for design and application of information systems.

**Annotation**

The course T-WIWI-102759 “Requirements Analysis and Requirements Management” will no longer be offered in the module as of winter semester 2018/2019.

**Workload**

See German version.
5.50 Module: Digital Accessibility and Assistive Technologies [M-INFO-105882]

**Responsible:** Prof. Dr.-Ing. Rainer Stiefelhagen  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

<table>
<thead>
<tr>
<th>Credits</th>
<th>Grading scale</th>
<th>Recurrence</th>
<th>Duration</th>
<th>Language</th>
<th>Level</th>
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**Mandatory**

<table>
<thead>
<tr>
<th>CR</th>
<th>Course Code</th>
<th>Course Name</th>
<th>CR</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>T-INFO-111830</td>
<td>Digital Accessibility and Assistive Technologies</td>
<td>3 CR</td>
</tr>
</tbody>
</table>

**Competence Goal**

- Die Studierenden erhalten eine Einführung in die Thematik Barrierefreiheit insbesondere die digitale Barrierefreiheit und inklusive Digitalisierung. Mit der Verdeutlichung der gesellschaftlichen Mehrwerte für alle Nutzenden.
- Die Studierenden werden befähigt, die rechtlichen Grundlagen im Bereich "Barrierefreiheit" zu verstehen und anzuwenden, um die Bedürfnisse von Menschen mit Behinderungen zu berücksichtigen.
- Die Studierenden erlangen ein fundiertes Verständnis über Sehschädigungen, einschließlich deren Ursachen und Auswirkungen, um angemessene Lösungen und Unterstützung für Betroffene bereitzustellen.
- Die Studierenden entwickeln Kompetenzen im Umgang mit existierenden Assistiven Technologien (AT) für verschiedene Anwendungsfelder, darunter AT für den Alltag, Mobilitätsunterstützung und Informationszugang. und sie lernen die zugehörigen Feedback-Mechanismen kennen.
- Die Studierenden erlernen die Umsetzung von Richtlinien für die Entwicklung barrierefreier Webseiten und Softwareanwendungen, um sicherzustellen, dass digitale Inhalte für alle zugänglich sind.
- Die Studierenden erwerben Kenntnisse und Fertigkeiten in der barrierefreien Softwareentwicklung und Dokumentenerstellung, um inklusive Softwareprodukte und Dokumente zu gestalten.
- Die Studierenden werden mit aktuellen Forschungsansätzen im Bereich assistiver Technologien vertraut gemacht, insbesondere in Bezug auf die Nutzung von Methoden des Maschinellen Sehens (Computer Vision) zur Entwicklung innovativer AT-Lösungen.
- Die Studierenden sind in der Lage, Assistive Technologien zu evaluieren und deren Wirksamkeit und Nutzerfreundlichkeit zu bewerten, um sicherzustellen, dass sie den Bedürfnissen der Zielgruppen entsprechen.
Digital accessibility is a topic that affects us all. Accessing information digitally, from childhood to old age. Assistive technologies, such as smartphones, tablets, smartwatches, wearables in general have become a part of our everyday life. Exactly these things should be operable and usable by all people. Regardless of any barriers.

But what are the details behind this? What are the rights and foundations for this? What all has to be done to be "barrier-free"?

This can all be best illustrated by the example of "visual impairment".

According to the World Health Organization, there are approximately 285 million people with visual impairments worldwide, including approximately 39 million people who are blind. The partial or complete loss of vision significantly restricts blind and visually impaired people in their working and social lives. It is difficult for blind and visually impaired people to orient themselves and move around in public spaces without assistance. The reasons for this are problems in perceiving obstacles and landmarks as well as the resulting fear of accidents and orientation difficulties. Other problems in everyday life are: reading texts, recognizing banknotes, food, clothes or finding objects in the household.

For support, blind and visually impaired people can already rely on a number of technical aids. For example, digitized texts can be made accessible through speech output or Braille output devices. There are also various devices made specifically for the blind. The most important aid for improving mobility is by far the cane for the blind. In recent years, some electronic aids for obstacle detection or orientation support have also been developed, but these offer only very limited functionality at a relatively high price and are therefore rather rarely in use.

The lecture gives an overview of IT-based Assistive Technologies (AT) by example and includes the following topics:
- Legal basics
- Basics of visual impairments, their causes and effects
- Existing assistive technologies for different fields of application
- AT for information access
- Accessible software development
- Accessible design of websites
- Accessible documents
- Use of machine learning methods
- Feedback systems and their basics
- Insights into current research topics around the topic of digital accessibility

For the latest information, visit http://cvhci.anthropomatik.kit.edu/
5.51 Module: Digital Marketing [M-WIWI-106258]

Responsible: Prof. Dr. Ann-Kristin Kupfer
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Business Administration)

<table>
<thead>
<tr>
<th>Credits</th>
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<th>Recurrence</th>
<th>Duration</th>
<th>Language</th>
<th>Level</th>
<th>Version</th>
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<tbody>
<tr>
<td>9</td>
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<td>Each term</td>
<td>2 terms</td>
<td>English</td>
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### Mandatory Courses

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<th>Course Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>T-WIWI-112693</td>
<td>Digital Marketing</td>
<td>4.5 CR</td>
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Supplementary Courses (Election: at most 1 item)

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<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>T-WIWI-106981</td>
<td>Digital Marketing and Sales in B2B</td>
<td>1.5 CR</td>
</tr>
<tr>
<td>T-WIWI-111099</td>
<td>Judgement and Decision Making</td>
<td>4.5 CR</td>
</tr>
<tr>
<td>T-WIWI-107720</td>
<td>Market Research</td>
<td>4.5 CR</td>
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<tr>
<td>T-WIWI-112711</td>
<td>Media Management</td>
<td>4.5 CR</td>
</tr>
<tr>
<td>T-WIWI-111848</td>
<td>Online Concepts for Karlsruhe City Retailers</td>
<td>3 CR</td>
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</table>

### Competence Certificate

The assessment is carried out as partial exams 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.

### Prerequisites

None

### Competence Goal

**Students**

- have an advanced knowledge about central marketing contents
- have a fundamental understanding of the marketing instruments
- know current fundamental principles and latest trends in the field of digital marketing
- know and understand several strategic concepts and how to implement them
- are able to implement their extensive marketing knowledge in a practical context
- are able to critically discuss and question theoretical concepts and current practices in marketing
- have theoretical knowledge that is fundamental for writing a master thesis in the field of marketing
- have gained insight into scientific research that prepares them to independently write a master’s thesis
- have the theoretical knowledge and skills necessary to work in or collaborate with the marketing department of a company

### Content

The aim of this module is to deepen central marketing contents in different areas.

### Workload

Total effort for 9 credit points: approx. 270 hours.
The exact distribution is done according to the credit points of the courses of the module.
Module: Digital Service Systems in Industry [M-WIWI-102808]

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

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

**Part of:** Economics and Management (Business Administration)

**Credits:** 9  
**Grading scale:** Grade to a tenth  
**Recurrence:** Each term  
**Duration:** 2 terms  
**Language:** German  
**Level:** 4  
**Version:** 8

### Compulsory Elective Courses (Election: 9 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
<th>Grade</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>T-WIWI-102872</td>
<td>Challenges in Supply Chain Management</td>
<td>4,5 CR</td>
<td>Mohr</td>
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<tr>
<td>T-WIWI-112757</td>
<td>Digital Services: Innovation &amp; Business Models</td>
<td>4,5 CR</td>
<td>Satzger</td>
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<tr>
<td>T-WIWI-107043</td>
<td>Liberalised Power Markets</td>
<td>5,5 CR</td>
<td>Fichtner</td>
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<tr>
<td>T-WIWI-106200</td>
<td>Modeling and OR-Software: Advanced Topics</td>
<td>4,5 CR</td>
<td>Nickel</td>
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<tr>
<td>T-WIWI-106563</td>
<td>Practical Seminar Digital Service Systems</td>
<td>4,5 CR</td>
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### 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.

### Prerequisites

This module can only be assigned as an elective module.

### Competence Goal

Students

- understand the basics of the management of digital services applied on an industrial context
- gain an industry-specific insight into the importance and most relevant characteristics of information systems as key components of the digitalization of business processes, products and services
- are able to transfer and apply the models and methods introduced on practical scenarios and simulations.
- understand the control and optimization methods in the sector of service management and are able to apply them properly.

### Content

This module aims at deepening the fundamental knowledge of digital service management in the industrial context. Various mechanisms and methods to shape and control connected digital service systems in different industries are discussed and demonstrated with real-life application cases.

### 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](http://www.ksri.kit.edu/teaching)

From summer semester 2023, the course Service Innovation will be offered with a revised course concept and content. The focus will be on the closer integration of the topics of service innovation and digitalization. Current foundational content (e.g., on service innovation challenges or human-centered innovation methods) will remain. New content will cover topics such as digital platforms and ecosystems, IoT and smart service innovation, and business models.

### Workload

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

### Recommendation

None
5.53 Module: Distributed Computing [M-INFO-100761]

Responsibility: Prof. Dr. Achim Streit
Organisation: KIT Department of Informatics
Part of: Informatics

Mandatory

<table>
<thead>
<tr>
<th>Credits</th>
<th>Grading scale</th>
<th>Recurrence</th>
<th>Duration</th>
<th>Language</th>
<th>Level</th>
<th>Version</th>
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<tbody>
<tr>
<td>4</td>
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<td>Each winter term</td>
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</tr>
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</table>

T-INFO-101298 Distributed Computing 4 CR Streit

Competence Certificate
See partial achievements (Teilleistung)

Prerequisites
See partial achievements (Teilleistung)

Competence Goal
Students understand the basic concepts of distributed systems, in particular Grid and Cloud Computing as well as the management and analysis of big and distributed data. They apply underlying paradigms and services to given examples. Students analyze methods and technologies of Grid and Cloud Computing as well as distributed data management, which are suitable for use in everyday and industrial application areas or which are used today by Google, Facebook, Amazon, etc. For this purpose, students will compare web/grid services, elementary grid functionalities, data lifecycles, metadata, archiving, cloud service types (IaaS, SaaS, PaaS) and public/private clouds using real-world examples.

Content
The lecture introduces the world of distributed computing with a focus on fundamentals and technologies from Grid and Cloud Computing as well as the handling of Big Data. The lecture combines theory and application with the help of relevant examples from science and industry.

First, an introduction to the main characteristics of distributed systems is given. Then the topic of Grid Computing is discussed in more detail and the close relationship between Grid computing and distributed data management is illustrated using the example of the WLCG, the infrastructure for distributing, storing and analyzing data from the particle accelerator at CERN.

Subsequently, the topic of cloud computing is discussed and compared with the preceding. After the definition of basic terms and concepts, virtualization is introduced as one of the key technologies of Cloud Computing; finally, common architectures, services and components in the Cloud context are discussed using examples and in general.

Next, common methods for authorization and authentication in distributed environments will be discussed. The lecture includes the description of the basics of Authentication and Authorization Infrastructures (AAI) as well as different technologies, for example certificate- or token-based procedures.

In a further block of topics, concepts for the management and analysis of large or distributed data are presented. In this context tools and frameworks, as well as the lifecycle of data, its metadata and data storage are explained.

Workload
2 SWS = 120 h per semester
• 30 h in the weekly lecture during the semester
• 90 h post-processing of lectures and self-learning of the content due to its complexity
5.54 Module: Econometrics and Statistics I [M-WIWI-101638]

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

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

**Part of:** Economics and Management (Statistics)

<table>
<thead>
<tr>
<th>Credits</th>
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<th>Duration</th>
<th>Language</th>
<th>Level</th>
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<tbody>
<tr>
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<td>Grade to a tenth</td>
<td>Each term</td>
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**Mandatory**

<table>
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<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Grading Scale</th>
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<tbody>
<tr>
<td>T-WIWI-111388</td>
<td>Applied Econometrics</td>
<td>4,5 CR</td>
<td>Schienle</td>
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**Supplementary Courses (Electing between 4.5 and 5 credits)**

<table>
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<th>Credits</th>
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<tr>
<td>T-WIWI-103064</td>
<td>Financial Econometrics</td>
<td>4,5 CR</td>
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<tr>
<td>T-WIWI-103126</td>
<td>Non- and Semiparametrics</td>
<td>4,5 CR</td>
<td>Schienle</td>
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<tr>
<td>T-WIWI-103127</td>
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<td>4,5 CR</td>
<td>Heller</td>
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<td>T-WIWI-110868</td>
<td>Predictive Modeling</td>
<td>4,5 CR</td>
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<tr>
<td>T-WIWI-111387</td>
<td>Probabilistic Time Series Forecasting Challenge</td>
<td>4,5 CR</td>
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<tr>
<td>T-WIWI-103065</td>
<td>Statistical Modeling of Generalized Regression Models</td>
<td>4,5 CR</td>
<td>Heller</td>
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<tr>
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<td>Financial Econometrics II</td>
<td>4,5 CR</td>
<td>Schienle</td>
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</table>

**Competence Certificate**

The assessment is carried out as partial exams (according to Section 4(2), 1-3 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.

**Prerequisites**

The course "Applied Econometrics" [2520020] is compulsory and must be examined.

**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.

**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.
5.55 Module: Econometrics and Statistics II [M-WIWI-101639]

Responsible: Prof. Dr. Melanie Schienle
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Statistics)

Credits 9
Grading scale Grade to a tenth
Recurrence Each term
Duration 1 term
Language German
Level 4
Version 4

Election notes

This module will not count towards the degree until the module "Econometrics and Statistics I" has also been successfully completed. If the module "Econometrics and Statistics I" is booked out to the additional examinations, the "Econometrics and Statistics II" module loses its curricular validity/valuation for the degree.

Compulsory Elective Courses (Election: between 9 and 10 credits)

<table>
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<tr>
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<td>T-WIWI-103124</td>
<td>Multivariate Statistical Methods</td>
<td>4.5 CR</td>
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<td>T-WIWI-103126</td>
<td>Non- and Semiparametrics</td>
<td>4.5 CR</td>
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<td>T-WIWI-103127</td>
<td>Panel Data</td>
<td>4.5 CR</td>
<td>4</td>
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<td>T-WIWI-103128</td>
<td>Portfolio and Asset Liability Management</td>
<td>4.5 CR</td>
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<tr>
<td>T-WIWI-110868</td>
<td>Predictive Modeling</td>
<td>4.5 CR</td>
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<td>T-WIWI-111387</td>
<td>Probabilistic Time Series Forecasting Challenge</td>
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<tr>
<td>T-WIWI-103065</td>
<td>Statistical Modeling of Generalized Regression Models</td>
<td>4.5 CR</td>
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<td>Heller</td>
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<tr>
<td>T-WIWI-103129</td>
<td>Stochastic Calculus and Finance</td>
<td>4.5 CR</td>
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<tr>
<td>T-WIWI-110939</td>
<td>Financial Econometrics II</td>
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Competence Certificate

The assessment is carried out as partial exams (according to Section 4(2), 1-3 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.

Prerequisites

This module can only be passed if the module "Econometrics and Statistics I" has been finished successfully before.

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.

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.
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:** Economics and Management (Economics)

**Credits:** 9

**Grading scale:** Grade to a tenth

**Recurrence:** Each term

**Duration:** 1 term

**Language:** German/English

**Level:** 4

**Version:** 6

### Compulsory Elective Courses (Election: 1 item)

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<tr>
<td>T-WIWI-102609</td>
<td>Advanced Topics in Economic Theory</td>
<td>4.5 CR</td>
<td>Mitusch</td>
</tr>
<tr>
<td>T-WIWI-102861</td>
<td>Advanced Game Theory</td>
<td>4.5 CR</td>
<td>Ehrhart, Puppe, Reiß</td>
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### Supplementary Courses (Election: )

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<tr>
<td>T-WIWI-113469</td>
<td>Advanced Corporate Finance</td>
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<td>Ruckes</td>
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<tr>
<td>T-WIWI-102647</td>
<td>Asset Pricing</td>
<td>4.5 CR</td>
<td>Ruckes, Uhrig-Homburg</td>
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<tr>
<td>T-WIWI-109050</td>
<td>Corporate Risk Management</td>
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<tr>
<td>T-WIWI-102623</td>
<td>Financial Intermediation</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.

### Prerequisites

One of the courses T-WIWI-102861 "Advanced Game Theory" and T-WIWI-102609 "Advanced Topics in Economic Theory" is compulsory.

### 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

### 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:** Economics and Management (Business Administration)

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**Compulsory Elective Courses (Election: at least 9 credits)**

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<td>T-WIWI-109940</td>
<td>Special Topics in Information Systems</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.

**Prerequisites**

None.

**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.

**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.
5.58 Module: Electronic Markets [M-WIWI-101409]

**Responsible:** Prof. Dr. Andreas Geyer-Schulz  
**Organisation:** KIT Department of Economics and Management

**Part of:** Economics and Management (Business Administration)

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**Compulsory Elective Courses (Election: at least 9 credits)**

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<td>4.5 CR</td>
<td>Geyer-Schulz, Glenn</td>
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<tr>
<td>T-WIWI-112823</td>
<td>Platform &amp; Market Engineering: Commerce, Media, and Digital Democracy</td>
<td>4.5 CR</td>
<td>Weinhardt</td>
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<tr>
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<td>Price Management</td>
<td>4.5 CR</td>
<td>Geyer-Schulz, Glenn</td>
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<tr>
<td>T-WIWI-113147</td>
<td>Telecommunications and Internet – Economics and Policy</td>
<td>4.5 CR</td>
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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. 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.

**Prerequisites**

None

**Competence Goal**

The student

- knows coordination and motivation methods and analyzes them regarding their efficiency,
- classifies markets and describes the roles of the participants in a formal way,
- knows the conditions for market failure and knows and develops countermeasures,
- knows institutions and market mechanisms, their fundamental theories and empirical research results,
- knows the design criteria of market mechanisms and a systematical approach for creating new markets,
- models, analyzes and optimizes the structure and dynamics of complex business applications.

**Content**

What are the conditions that make electronic markets develop, and how can one analyze and optimize such markets?

In this module, the selection of the type of organization as an optimization of transaction costs is treated. Afterwards, the efficiency of electronic markets (price, information and allocation efficiency) as well as reasons for market failure are described. Finally, motivational issues like bounded rationality and information asymmetries (private information and moral hazard), as well as the development of incentive schemes, are presented. Regarding the market design, especially the interdependencies of market organization, market mechanisms, institutions and products are described, and theoretical foundations are lectured.

Electronic markets are dynamic systems that are characterized by feedback loops between many different variables. By means of the tools of business dynamics, such markets can be modelled. Simulations of complex systems allow the analysis and optimization of markets, business processes, policies, and organizations.

Topics include

- classification, analysis, and design of markets
- simulation of markets
- auction methods and auction theory
- automated negotiations
- nonlinear pricing
- continuous double auctions
- market-maker, regulation, control

**Workload**

The total workload for this module is approximately 270 hours. For further information see German version.
Recommendation
None
### 5.59 Module: Empirical Software Engineering [M-INFO-100798]

**Responsible:** Prof. Dr. Ralf Reussner  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Responsible:** Prof. Dr. Wolf Fichtner

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

**Part of:** Economics and Management (Business Administration)

<table>
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**Supplementary Courses (Election: )**

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<tr>
<td>T-WIWI-107501</td>
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<td>T-WIWI-112151</td>
<td>Energy Trading and Risk Management</td>
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<td>T-WIWI-108016</td>
<td>Simulation Game in Energy Economics</td>
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<td>T-WIWI-107446</td>
<td>Quantitative Methods in Energy Economics</td>
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<td>Plötz</td>
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<td>T-WIWI-102712</td>
<td>Regulation Theory and Practice</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 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.

**Prerequisites**

The lecture Liberalised Power Markets has to be examined.

**Competence Goal**

The student

- gains detailed knowledge about the new requirements of liberalised energy markets,
- describes the planning tasks on the different energy markets,
- knows solution approaches to respective planning tasks.

**Content**

Liberalised Power Markets: The European liberalisation process, energy markets, pricing, market failure, investment incentives, market power

Energy Trade and Risk Management: trade centres, trade products, market mechanisms, position and risk management

Simulation Game in Energy Economics: Simulation of the German electricity system

**Workload**

The total workload for this module is approximately 270 hours.

**Recommendation**

The courses are conceived in a way that they can be attended independently from each other. Therefore, it is possible to start the module in winter and summer term.
5.61 Module: Energy Economics and Technology [M-WIWI-101452]

Responsibility: Prof. Dr. Wolf Fichtner
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Business Administration)

<table>
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Compulsory Elective Courses (Elective: at least 9 credits)

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<th>Course Title</th>
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<th>Lecturer</th>
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<tr>
<td>T-WIWI-102793</td>
<td>Efficient Energy Systems and Electric Mobility</td>
<td>3,5 CR</td>
<td>Jochem</td>
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<td>T-WIWI-102650</td>
<td>Energy and Environment</td>
<td>3,5 CR</td>
<td>Karl</td>
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<td>T-WIWI-113073</td>
<td>Machine Learning and Optimization in Energy Systems</td>
<td>3,5 CR</td>
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<tr>
<td>T-WIWI-107464</td>
<td>Smart Energy Infrastructure</td>
<td>5,5 CR</td>
<td>Ardone, Pustisek</td>
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<tr>
<td>T-WIWI-102695</td>
<td>Heat Economy</td>
<td>3,5 CR</td>
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</table>

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.

Prerequisites
None

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.

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.
### 5.62 Module: Energy Informatics 1 [M-INFO-101885]

**Responsible:** Prof. Dr. Veit Hagenmeyer  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

<table>
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5.63 Module: Energy Informatics 2 [M-INFO-103044]

Responsible: Prof. Dr. Veit Hagenmeyer
Organisation: KIT Department of Informatics
Part of: Informatics

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Mandatory

| T-INFO-106059 | Energy Informatics 2 | 5 CR | Hagenmeyer |
5.64 Module: Engineering Self-Adaptive Systems [M/INFO-106626]

Responsible: Prof. Dr. Raffaela Mirandola
Organisation: KIT Department of Informatics
Part of: Informatics

<table>
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Mandatory

| T/INFO-113349 | Engineering Self-Adaptive Systems | 3 CR | Mirandola |

Competence Certificate
See partial achievements (Teilleistung)

Prerequisites
See partial achievements (Teilleistung)

Competence Goal
- Understand the motivation for self-adaptation
- Get familiar with the basic principles and conceptual model of self-adaptation
- Understand how to engineer self-adaptive software systems from a software engineering perspective
- Understand the decision-making process using formal analysis at runtime for quality assurance
- Understand the notion of uncertainty in self-adaptive systems and how to tame it with formal verification at runtime
- Understand the level of adoption of self-adaptive systems in industry.

Content
Self-adaptation is an important field of research and engineering that aims to address the challenging problem of how to engineer software systems that have to deal with uncertainties that can only be resolved at runtime.

The course presents the basic principles of self-adaptation and introduces a conceptual feedback loop model of a self-adaptive system. It introduces quality models which can be used to estimate quality properties at runtime by a self-adaptive system to provide guarantees for the quality goals. The role played by the different types of uncertainties is then explored analyzing different possible approaches.

Workload
Course workload:
30h in Class (lectures)
45h self-study during the semester
15h preparation for the exam
### 5.65 Module: Entrepreneurship (EnTechnon) [M-WIWI-101488]

**Responsible:** Prof. Dr. Orestis Terzidis  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Economics and Management (Business Administration)

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**Mandatory part (Election: 1 item)**

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**Compulsory Elective Courses (Election: between 1 and 2 items)**

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<th>Credits</th>
<th>Grading</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>T-WIWI-102866</td>
<td>Design Thinking</td>
<td>3</td>
<td>CR</td>
<td>Terzidis</td>
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<tr>
<td>T-WIWI-113151</td>
<td>Entrepreneurship Seasonal School</td>
<td>3</td>
<td>CR</td>
<td>Terzidis</td>
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<tr>
<td>T-WIWI-102865</td>
<td>Business Planning</td>
<td>3</td>
<td>CR</td>
<td>Terzidis</td>
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<tr>
<td>T-WIWI-110985</td>
<td>International Business Development and Sales</td>
<td>6</td>
<td>CR</td>
<td>Casenave, Klarmann, Terzidis</td>
</tr>
<tr>
<td>T-WIWI-109064</td>
<td>Joint Entrepreneurship Summer School</td>
<td>6</td>
<td>CR</td>
<td>Terzidis</td>
</tr>
<tr>
<td>T-WIWI-111561</td>
<td>Startup Experience</td>
<td>6</td>
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<td>Terzidis</td>
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**Supplementary Courses (Election: between 0 and 1 items)**

<table>
<thead>
<tr>
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<th>Grading</th>
<th>Instructor</th>
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<tbody>
<tr>
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<td>Entrepreneurship Research</td>
<td>3</td>
<td>CR</td>
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<tr>
<td>T-WIWI-102852</td>
<td>Case Studies Seminar: Innovation Management</td>
<td>3</td>
<td>CR</td>
<td>Weissenberger-Eibl</td>
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<tr>
<td>T-WIWI-102893</td>
<td>Innovation Management: Concepts, Strategies and Methods</td>
<td>3</td>
<td>CR</td>
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<tr>
<td>T-WIWI-102612</td>
<td>Managing New Technologies</td>
<td>3</td>
<td>CR</td>
<td>Reiß</td>
</tr>
<tr>
<td>T-WIWI-102853</td>
<td>Roadmapping</td>
<td>3</td>
<td>CR</td>
<td>Koch</td>
</tr>
</tbody>
</table>

**Competence Certificate**  
See German version.

**Prerequisites**  
None

**Competence Goal**  
Students are familiar with the basics and contents of entrepreneurship and ideally are able to start a company during or after their studies. The courses are therefore structured sequentially in modules, although in principle they can also be attended in parallel. In this way, the skills are taught to generate business ideas, to develop inventions into innovations, to write business plans for start-ups and to successfully establish a company. In the lecture, the basics of entrepreneurship will be developed, in the seminars, individual contents will be deepened. The overall learning objective is to enable students to develop and implement business ideas.

**Content**  
The lectures form the basis of the module and give an overview of the overall topic. The seminars deepen the phases of the foundation processes, in particular the identification of opportunities, the development of a value proposition (especially based on inventions and technical innovations), the design of a business model, business planning, the management of a start-up, the implementation of a vision as well as the acquisition on resources and the handling of risks. The lecture Entrepreneurship provides an overarching and connecting framework for this.

**Annotation**  
Please note: Seminars offered by Prof. Terzidis (or the members of his research group) are not eligible for crediting in a seminar module of the WiWi degree programs. Exception: Seminar "Entrepreneurship Research".

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

**Recommendation**  
None
5.66 Module: Environmental Economics [M-WIWI-101468]

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

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

**Part of:** Economics and Management (Economics)

<table>
<thead>
<tr>
<th>Credits</th>
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<th>Duration</th>
<th>Language</th>
<th>Level</th>
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<td>9</td>
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**Compulsory Elective Courses (Election: at least 9 credits)**

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<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Lecturer</th>
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<tbody>
<tr>
<td>T-WIWI-102650</td>
<td>Energy and Environment</td>
<td>3.5 CR</td>
<td>Karl</td>
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<tr>
<td>T-WIWI-100007</td>
<td>Transport Economics</td>
<td>4.5 CR</td>
<td>Mitusch, Szimba</td>
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<tr>
<td>T-WIWI-102615</td>
<td>Environmental Economics and Sustainability</td>
<td>3 CR</td>
<td>Walz</td>
</tr>
<tr>
<td>T-WIWI-102616</td>
<td>Environmental and Resource Policy</td>
<td>4 CR</td>
<td>Walz</td>
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<tr>
<td>T-BGU-111102</td>
<td>Environmental Law</td>
<td>3 CR</td>
<td>Smeddinck</td>
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</table>

**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.

**Prerequisites**

None

**Competence Goal**

The students

- understand the treatment of non-market resources as well as future resource shortages
- are able to model markets of energy and environmental goods
- are able to assess the results of government intervention
- know legal basics and are able to evaluate conflicts with regard to legal situation

**Content**

Environmental degradation and increasing resource use are global challenges, which have to be tackled on a worldwide level. The module addresses these challenges from the perspective of economics, and imparts the fundamental knowledge of environmental and sustainability economics, and environmental and resource policy to the students. Additional courses address environmental law, environmental pressure, and applications to the transport sector.

**Workload**

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

**Recommendation**

Knowledge of microeconomics is a prerequisite. For this reason, successful participation in the course Economics I (Microeconomics) [2600012] or a comparable course is strongly recommended.
5.67 Module: Experimental Economics [M-WIWI-101505]

Responsible: Prof. Dr. Johannes Philipp Reiß
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Economics)

<table>
<thead>
<tr>
<th>Credits</th>
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<th>Recurrence</th>
<th>Duration</th>
<th>Language</th>
<th>Level</th>
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Compulsory Elective Courses (Election: 2 items)

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<tr>
<td>T-WIWI-102614</td>
<td>Experimental Economics</td>
<td>4.5 CR</td>
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<tr>
<td>T-WIWI-105781</td>
<td>Incentives in Organizations</td>
<td>4.5 CR</td>
<td>Nieken</td>
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<td>T-WIWI-102862</td>
<td>Predictive Mechanism and Market Design</td>
<td>4.5 CR</td>
<td>Reiß</td>
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<tr>
<td>T-WIWI-102863</td>
<td>Topics in Experimental Economics</td>
<td>4.5 CR</td>
<td>Reiß</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.

Prerequisites
None.

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.

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.

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.

Recommendation
Basic knowledge in mathematics, statistics, and game theory is assumed.
5.68 Module: Explainable Artificial Intelligence [M-INFO-106302]

<table>
<thead>
<tr>
<th>Credits</th>
<th>Grading scale</th>
<th>Recurrence</th>
<th>Duration</th>
<th>Language</th>
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**Mandatory**

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<th>CR</th>
<th>Teacher</th>
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<tbody>
<tr>
<td>T-INFO-112774</td>
<td>Explainable Artificial Intelligence</td>
<td>3 CR</td>
<td>Lioutikov</td>
</tr>
</tbody>
</table>

**Competence Certificate**

See Partial Achievements (Teilleistung).

**Competence Goal**

- Students are able to understand problems and challenges of XAI
- Students can identify and differentiate different types and approaches of XAI
- Students can implement various XAI approaches
- Students understand current research questions and directions of XAI

**Content**

Recent advances in Machine Learning and Deep Learning in particular have lead to the imminent introduction of AI agents into a wide variety of applications. However, the apparent "black-box" nature of these approaches hinders their application in both critical systems and close human-robot interactions. The sub-field of eXplainable Artificial Intelligence (XAI) aims to address this shortcoming. This lecture will introduce and discuss various concepts and methods of XAI and consider them from perspective of Robot Learning and Human-Robot Interaction.

The lecture will start with a (brief) introduction into relevant deep learning approaches, before discussing interpretable scene, task and behavior representations. Afterward the lecture will consider itself with Data-Driven and Goal-Driven AI. Finally, first approaches that incorporate XAI and XAI-based human feedback directly into the learning process itself will be discussed. An exemplary list of topics is given below:

- Introduction to XAI
  - Interpretable Machine Learning vs Explainable Machine Learning
- Primer / Introduction to relevant Deep Learning Concepts
  - MLPs and CNNs
  - Graph Neural Networks
  - Transformers
  - Diffusion Models
  - Score Based Methods
- Interpretable Structures
  - Scene Representations
  - Task Representations
  - Behavior Representations
- Data-Driven Explainable AI: XAI Methods for
  - Shapley Values
  - Saliency Maps
  - Concept Activation Vectors
  - Linguistic Neuron Annotation
- Goal-Driven Explainable AI: XAI Methods for
  - Generative Explaining Models
  - Behavior Verbalization
  - Behavior Visualization
- Interactive Learning
  - Integrating Human Feedback
  - Explanatory Interactive Learning

**Workload**

Arbeitsaufwand = 90 h = 3 ECTS

- ca 30h Vorlesungsbesuch
- ca 30h Nachbearbeitung
- ca 30h Prüfungsvorbereitung
Recommendation

- Experience in Machine Learning is recommended, e.g. through prior coursework.
  - The Computer Science Department offers several great lectures e.g., "Maschinelles Lernen - Grundlagen und Algorithmen" and "Deep Learning"
- A good mathematical background will be beneficial
- Python / PyTorch experience could be beneficial when we discuss practical examples/ implementations.
5.69 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:** Economics and Management (Business Administration)

<table>
<thead>
<tr>
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<th>Duration</th>
<th>Language</th>
<th>Level</th>
<th>Version</th>
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**Compulsory Elective Courses (Election: 9 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Instructor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-WIWI-102643</td>
<td>Derivatives</td>
<td>4,5 CR</td>
<td>Uhrig-Homburg</td>
</tr>
<tr>
<td>T-WIWI-102621</td>
<td>Valuation</td>
<td>4,5 CR</td>
<td>Ruckes</td>
</tr>
<tr>
<td>T-WIWI-102647</td>
<td>Asset Pricing</td>
<td>4,5 CR</td>
<td>Ruckes, Uhrig-Homburg</td>
</tr>
</tbody>
</table>

**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.

**Prerequisites**

None

**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

**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.
5.70 Module: Finance 2 [M-WIWI-101483]

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

Organisation: KIT Department of Economics and Management  

Part of: Economics and Management (Business Administration)

Election notes

This module will not count towards the degree until the module Finance 1 has also been successfully completed. If the module Finance 1 is booked out to the additional examinations, the Finance 2 module loses its curricular validity/valuation for the degree.

Compulsory Elective Courses (Election: at least 9 credits)

<table>
<thead>
<tr>
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<th>Credits</th>
<th>Grade</th>
<th>Recurrence</th>
<th>Language</th>
<th>Level</th>
<th>Version</th>
</tr>
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<tbody>
<tr>
<td>T-WIWI-113469</td>
<td>Advanced Corporate Finance</td>
<td>4,5 CR</td>
<td></td>
<td>Each term</td>
<td>German/English</td>
<td>4</td>
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<tr>
<td>T-WIWI-110513</td>
<td>Advanced Empirical Asset Pricing</td>
<td>4,5 CR</td>
<td></td>
<td>Each term</td>
<td>German/English</td>
<td>4</td>
<td>9</td>
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<tr>
<td>T-WIWI-102647</td>
<td>Asset Pricing</td>
<td>4,5 CR</td>
<td></td>
<td>Each term</td>
<td>German/English</td>
<td>4</td>
<td>9</td>
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<tr>
<td>T-WIWI-110995</td>
<td>Bond Markets</td>
<td>4,5 CR</td>
<td></td>
<td>Each term</td>
<td>German/English</td>
<td>4</td>
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<tr>
<td>T-WIWI-110997</td>
<td>Bond Markets - Models &amp; Derivatives</td>
<td>3 CR</td>
<td></td>
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<td>German/English</td>
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<tr>
<td>T-WIWI-110996</td>
<td>Bond Markets - Tools &amp; Applications</td>
<td>1,5 CR</td>
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<td>T-WIWI-102643</td>
<td>Derivatives</td>
<td>4,5 CR</td>
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<td>4</td>
<td>9</td>
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<tr>
<td>T-WIWI-110797</td>
<td>eFinance: Information Systems for Securities Trading</td>
<td>4,5 CR</td>
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<td>T-WIWI-102900</td>
<td>Financial Analysis</td>
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<td>T-WIWI-102623</td>
<td>Financial Intermediation</td>
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<tr>
<td>T-WIWI-102626</td>
<td>Business Strategies of Banks</td>
<td>3 CR</td>
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<td>German/English</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>T-WIWI-102646</td>
<td>International Finance</td>
<td>3 CR</td>
<td></td>
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<td>Valuation</td>
<td>4,5 CR</td>
<td></td>
<td></td>
<td>German/English</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.

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.

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.

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.
5.71 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:** Economics and Management (Business Administration)

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**Election notes**

This module will not count towards the degree until the modules Finance 1 and Finance 2 have also been successfully completed. If the modules Finance 1 and/or Finance 2 are booked out to the additional examinations, the Finance 3 module loses its curricular validity/valuation for the degree.

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**Compulsory Elective Courses (Election: at least 9 credits)**

<table>
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<tr>
<th>Course Code</th>
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<tr>
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<td>T-WIWI-110513</td>
<td>Advanced Empirical Asset Pricing</td>
<td>4.5 CR</td>
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<td>Asset Pricing</td>
<td>4.5 CR</td>
<td>Ruckes, Uhrig-Homburg</td>
</tr>
<tr>
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<td>Bond Markets</td>
<td>4.5 CR</td>
<td>Uhrig-Homburg</td>
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<tr>
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<td>3 CR</td>
<td>Uhrig-Homburg</td>
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<td>Bond Markets - Tools &amp; Applications</td>
<td>1.5 CR</td>
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<td>Corporate Risk Management</td>
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<td>Derivatives</td>
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<td>Uhrig-Homburg</td>
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<td>Business Strategies of Banks</td>
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<tr>
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<td>Web App Programming for Finance</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.

**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.

**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.

**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.
## 5.72 Module: Formal Systems [M-INFO-100799]

**Responsible:** Prof. Dr. Bernhard Beckert  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Mandatory**

| T-INFO-101336 | Formal Systems | 6 CR | Beckert |
5.73 Module: Formal Systems II: Application [M-INFO-100744]

Responsible: Prof. Dr. Bernhard Beckert
Organisation: KIT Department of Informatics
Part of: Informatics

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5.74 Module: Formal Systems II: Theory [M-INFO-100841]

**Responsible:** Prof. Dr. Bernhard Beckert

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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**Responsible:** Prof. Dr. Maxim Ulrich  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Economics and Management (Business Administration)

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**Competence Certificate**
Due to the professor’s research sabbatical, the BSc module “Financial Data Science” and MSc module “Foundations for Advanced Financial -Quant and -Machine Learning Research” and the MSc module “Advanced Machine Learning and Data Science” along with the respective examinations will not be offered in SS2023. Bachelor and Master thesis projects are not affected and will be supervised.

The module examination is an alternative exam assessment with a maximum score of 100 points to be achieved. These points are distributed over 4 worksheets to be submitted during the semester. The worksheets cover the respective material of the module and are handed out, worked on and assessed in lecture weeks 3 (10 points), 6 (20 points), 9 (30 points) and 12 (40 points). The module-wide exam (all 4 worksheets) must be taken in the same semester.

The worksheets are a mixture of analytical tasks and programming tasks with financial data.

**Competence Goal**
This MSc module teaches students fundamental stats and analytics concepts, as well necessary financial economic intuition, necessary to identify, design and execute interesting research questions in quant finance and financial machine learning.

Topics include: Maximum Likelihood learning of arma-garch models, expectation maximization learning applied to stochastic volatility and valuation models, Kalman filter techniques to learn latent states, estimation of affine jump diffusion models with options and higher-order moments, stochastic calculus, dynamic modeling of asset markets (bond, equity, options), equilibrium determination of risk premiums, risk premiums for higher moment risk, risk decomposition (fundamental vs idiosyncratic), option-implied return distributions, mixture-density-networks and neural nets.

**Content**
Learning Objectives: Skills and understanding of how to successfully set-up, execute and interpret financial data driven research with the following methods: MLE, Kalman Filter, Expectation Maximization, Option Pricing, dynamic asset pricing theory, backward-looking historical return densities, forward-looking options-implied return densities, mixture-density-network, neural networks. Programming is not taught in this course, yet, some graded and non-graded exercises might make heavy use of software based data analysis. See the course's pre-requisites and comments in the modul handbook.

**Annotation**
- Strongly recommended to have good knowledge in financial econometrics (MLE, OLS, GLS, ARMA-GARCH), mathematics (differential equations, difference equations and optimization), investments (CAPM, factor models), asset pricing (SDF, SDF pricing), derivatives (Black-Scholes, risk-neutral pricing), and programming of statistical concepts (Java or R or Python or Matlab or C or ...)
- Strongly recommended to have a strong interest for interdisciplinary research work in statistics, programming, applied math and financial economics.
- Students lacking the prior knowledge might find the resources of the Chair helpful: [www.youtube.com/c/cram-kit](http://www.youtube.com/c/cram-kit).

**Workload**
The total workload for this course is approximately 270 hours. This is for a student with the appropriate prior knowledge in financial econometrics, finance, mathematics and programming. Students without programming experience of statistical concepts will need to invest extra time. Students who have struggled in math- or programming- or finance- oriented classes, will find this course very challenging. Please check the pre-requisites and comments in the module handbook.
### 5.76 Module: Fuzzy Sets [M-INFO-100839]

**Responsible:** Prof. Dr.-Ing. Uwe Hanebeck  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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Module: Geometric Optimization [M-INFO-100730]

**Responsible:** Prof. Dr. Hartmut Prautzsch

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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# Module: Graph Partitioning and Graph Clustering in Theory and Practice [M/INFO-100758]

**Responsible:** Prof. Dr. Peter Sanders  
Dr. rer. nat. Torsten Ueckerdt

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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### Module: Growth and Agglomeration [M-WIWI-101496]

- **Responsible**: Prof. Dr. Ingrid Ott
- **Organisation**: KIT Department of Economics and Management
- **Part of**: Economics and Management (Economics)

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#### Compulsory Elective Courses (Election: 9 credits)

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#### 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.

#### Prerequisites
None

#### 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

#### Content
The module includes the contents of the lectures *Endogenous Growth Theory*, *Spatial Economics* and *Dynamic Macroeconomics*. While the first lecture focuses on dynamic programming in modern macroeconomics, the other two lectures are more formal and analytical.

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

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

#### 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.
5.80 Module: Hands-on Bioinformatics Practical [M-INFO-101573]

**Responsible:** Prof. Dr. Alexandros Stamatakis

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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Information Systems M.Sc.
Module Handbook as of 11/04/2024
# 5.81 Module: Heterogeneous Parallel Computing Systems [M-INFO-100822]

**Responsible:** Prof. Dr. Wolfgang Karl  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Responsible:** Prof. Dr.-Ing. Tamim Asfour  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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## 5.83 Module: Human Computer Interaction [M-INFO-100729]

**Responsible:** Prof. Dr.-Ing. Michael Beigl  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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5.84 Module: Human Factors in Security and Privacy [M-WIWI-104520]

**Responsibility:** Prof. Dr. Melanie Volkamer

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

**Part of:** Informatics

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**Competence Certificate**

The module examination is carried out in the form of partial examinations on the selected courses of the module, with which the minimum requirement at creditpoints is fulfilled. The learning control is described in each course. The overall score of the module is made up of the sub-scores weighted with creditpoints and is cut off after the first comma point.

**Prerequisites**

None

**Competence Goal**

Students ...

- know why many existing security and privacy mechanisms are not usable and why many awareness/education/training approaches are not effective
- can explain for concrete examples why these are not usable / not effective including why people are likely to face problems with these
- can explain what mental models are, why they are important and how they can be identified
- know how to conduct a cognitive walkthrough to identify problems with existing mechanisms and approaches
- know how to conduct semi-structured interviews
- know how user studies in the security context differ from those conducted in other contexts
- can explain the process of human centered security / privacy by design
- know the advantages and disadvantages of various graphical password schemes
- know concepts such as just in time and place security interventions
Content
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 module discusses 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. The main focus of the lab will be to replicate a quantitative based user study.

Annotation
This new module can be chosen from winter term 2018/2019.

Workload
The total workload for this module is approximately 270 hours.
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5.86 Module: Humanoid Robotics Laboratory [M-INFO-105792]

**Responsible:** Prof. Dr.-Ing. Tamim Asfour  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics  

**Mandatory**

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| T-INFO-111590 | Humanoid Robotics Laboratory | 6 CR | Asfour |

**Competence Goal**

- Students will be able to independently understand, structure, analyze, and solve a complex humanoid robotics problem using existing programming skills, alone or in a small team.
- Students can convey complex technical content in a presentation.

**Content**

In this practical course, a is worked on alone or in small teams with up to 3 students. Questions of humanoid robotics are dealt with, such as semantic scene interpretation, active perception, planning of grasping and manipulation tasks, action representation with motion primitives, and programming by demonstration.

The project work (alone or in groups) is performed largely independently but supported by scientific staff of the H2T. At the end of the practical course, the work has to be documented and presented in a scientific talk.

**Annotation**

- Internship dates are always by arrangement with the supervising staff member.
- An extension work of the topic as a master thesis is possible in principle.
- The number of participants in this practical course is generally limited and varies with the number of available research projects at the institute.

**Workload**

Practical course with 4 SWS, 6 LP.
6 LP corresponds to ca. 180 hours, thereof
c. 10h Attendance time in project discussion meetings
c. 10h Preparation and follow-up of the above
c. 150h Self-study to work on the topic
c. 10h Preparation and giving of a scientific presentation

**Recommendation**

- Very good programming skills in at least one high-level programming language are strongly recommended.
- Attendance of the lectures Robotics 1, Robotics 2, Robotics 3, as well as the robotics practical course are recommended.
- Project-specific recommendations (knowledge of C++, Python, ...) will be announced in the individual project descriptions.
Module: Incentives, Interactivity & Decisions in Organizations [M-WIWI-105923]

### Elective Offer (Election:)

<table>
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<tr>
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<td>Incentives in Organizations</td>
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<td>T-WIWI-111913</td>
<td>Advanced Topics in Human Resource Management</td>
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<td>Behavioral Lab Exercise</td>
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<td>Nieken, Scheibehenne</td>
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<td>Designing Interactive Systems: Human-AI Interaction</td>
<td>4,5</td>
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<td>KD²Lab Hands-On Research Course: New Ways and Tools in Experimental Economics</td>
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### Competence Certificate

The assessment is carried out as partial exams of the courses in this module. The assessment procedures are described for each course in the module separately.

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

### Prerequisites

Please refer to the course descriptions for potential restrictions regarding an individual course.

### Competence Goal

The student

- understands and analyses challenges and objectives within organizations
- applies economic models and empirical methods to analyze and solve challenges with a focus on the workplace and future of work
- understands the impact of digitalization and new information and communication technology on the work life and management decisions
- knows how to apply scientific research methods and understands the underlying problems

### Content

The module „Incentives, Interactivity & Decisions in Organizations“ offers an interdisciplinary approach to study incentive structures, the role of interactivity in information systems, and decision making in organizations. The module specifically focuses on topics related to the workplace and the future of work in organizations. The topics range from designing incentive systems and interactive systems to leadership, decision making, as well as understanding human behavior. All courses in the module foster active participation and allow students to learn state-of-the-art research methods and apply them to real-world challenges.

### Workload

Total workload for 9 credits: approx. 270 hours.

### Recommendation

Knowledge of Human Resource Management, microeconomics, game theory, and statistics is recommended.
Module: Industrial Production II [M-WIWI-101471]

**Responsible:** Prof. Dr. Frank Schultmann

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

**Part of:** Economics and Management (Business Administration)

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<td>Planning and Management of Industrial Plants</td>
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**Supplementary Courses (Election: at most 1 item)**

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<td>Supply Chain Management with Advanced Planning Systems</td>
<td>3.5 CR</td>
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<td>T-WIWI-102826</td>
<td>Risk Management in Industrial Supply Networks</td>
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<tr>
<td>T-WIWI-102828</td>
<td>Supply Chain Management in the Automotive Industry</td>
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<tr>
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<td>3.5 CR</td>
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<td>Global Manufacturing</td>
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<td>Life Cycle Assessment – Basics and Application Possibilities in an Industrial Context</td>
<td>3.5 CR</td>
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**Competence Certificate**

The assessment is carried out as partial exams (according to section 4 (2), 1 SPO) of the core course Planning and Managing of Industrial Plants [2581952] and one further single course 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.

**Prerequisites**

The course Planning and Managing of Industrial Plants [2581952] and at least one additional activity are compulsory and must be examined.

**Competence Goal**

- Students shall be able to describe the tasks of tactical production management with special attention drawn upon industrial plants.
- Students shall understand the relevant tasks in plant management (projection, realisation and supervising tools for industrial plants).
- Students shall be able to describe the special need of a techno-economic approach to solve problems in the field of tactical production management.
- Students shall be proficient in using selected techno-economic methods like investment and cost estimates, plant layout, capacity planning, evaluation principles of production techniques, production systems as well as methods to design and optimize production systems.
- Students shall be able to evaluate techno-economical approaches in planning tactical production management with respect to their efficiency, accuracy and relevance for industrial use.

**Content**

- Planning and Management of Industrial Plants: Basics, circulation flow starting from projecting to techno-economic evaluation, construction and operating up to plant dismantling.

**Annotation**

Apart from the core course the courses offered are recommendations and can be replaced by courses from the Module Industrial Production III.
Workload
Total effort will account to 270 hours (9 credit points) and can be allocated according to the credit point rating. Therefore, a course with 3.5 credits requires an effort of approximately 105h and a course with 5.5 credits 165h.

The total effort for each course consists of attending lectures and tutorials, examination times and the time an average student needs to prepare himself in order to pass the exam with an average grade.
5 MODULES
Module: Industrial Production III [M-WIWI-101412]

5.89 Module: Industrial Production III [M-WIWI-101412]

Responsible: Prof. Dr. Frank Schultmann
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Business Administration)

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**Supplementary Courses from Module Industrial Production II (Election: at most 1 item)**

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<td>Life Cycle Assessment – Basics and Application Possibilities in an Industrial Context</td>
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**Supplementary Courses (Election: at most 1 item)**

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<td>Risk Management in Industrial Supply Networks</td>
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<td>Schultmann</td>
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**Competence Certificate**
The assessment is carried out as partial exams (according to section 4 (2), 1 SPO) of the core course Production and Logistics Management [2581954] 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.

**Prerequisites**
The course Production and Logistics Management [2581954] and at least one additional activity are compulsory and must be examined.

**Competence Goal**
- Students describe the tasks concerning general problems of an operative production and logistics management.
- Students describe the planning tasks of supply chain management.
- Students use proficiently approaches to solve general planning problems.
- Students explain the existing interdependencies between planning tasks and applied methods.
- Students describe the mail goals and set-up of software supporting tools in production and logistics management (i.e. APS, PPS-, ERP- and SCM Systems).
- Students discuss the scope of these software tools and their general disadvantages.

**Content**
- Planning tasks and exemplary methods of production planning and control in supply chain management.
- Supporting software tools in production and logistics management (APS, PPS- and ERP Systems).
- Project management in the field of production and supply chain management.

**Annotation**
Apart from the core course the courses offered are recommendations and can be replaced by courses from the Module Industrial Production II.
Workload
The total amount of work for this module is approx. 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 results from the effort required to attend the 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.
### 5.90 Module: Information Processing in Sensor Networks [M-INFO-100895]

**Responsible:** Prof. Dr.-Ing. Uwe Hanebeck  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics  

<table>
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<th>Credits</th>
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<td>Information Processing in Sensor Networks</td>
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5.91 Module: Information Systems in Organizations [M-WIWI-104068]

Responsible: Prof. Dr. Alexander Mädche
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Business Administration)

Compulsory Elective Courses (Elect: at least 9 credits)

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T-WIWI-105777 Business Intelligence Systems 4,5 CR Mädche
T-WIWI-113465 Designing Interactive Systems: Human-AI Interaction 4,5 CR Mädche
T-WIWI-113459 Practical Seminar: Human-Centered Systems 4,5 CR Mädche

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.

Prerequisites

None

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

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.

**Responsible:** Prof. Dr.-Ing. Klemens Böhm
Prof. Dr. Alexander Mädche

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

**Part of:** Information Systems

<table>
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**Compulsory Elective Area (Election: )**

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<td>T-WIWI-111219</td>
<td>Artificial Intelligence in Service Systems - Applications in Computer Vision</td>
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<td>T-WIWI-109863</td>
<td>Business Data Analytics: Application and Tools</td>
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<td>T-INFO-113124</td>
<td>Data Science</td>
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<td>T-INFO-1101317</td>
<td>Deployment of Database Systems</td>
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<td>Database as a Service</td>
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<td>Recommender Systems</td>
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<td>T-INFO-101326</td>
<td>Ubiquitous Computing</td>
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**Competence Certificate**
The module examination takes place in the form of partial examinations in accordance with § 4 Para. 2 No. 1 - No. 3 SPO via courses of the module amounting to a total of at least 9 LP.
The overall score of the module is formed from the credit-weighted scores of the partial examinations and truncated after the first decimal place.

**Competence Goal**
The students

- are familiar with design principles of selected classes of modern analytical and interactive information systems and associated technologies
- know modern database concepts and application scenarios of modern database systems, understand the necessity of concepts for data analysis and can assess and compare approaches for the administration and analysis of large databases with regard to their effectiveness and applicability.
- know methods and techniques for designing analytical systems in the specific area of customer relationship management
- have knowledge of the basics and advanced methods and techniques of interactive information systems, especially context-sensitive and ubiquitous systems.

**Content**
In the module "Information Systems: Analytical and Interactive Systems" students learn about central design principles of selected classes of modern information systems and associated technologies. The module focuses on analytical and interactive information systems.

**Workload**
Total effort for 9 credit points: approx. 270 hours. The distribution is based on the credit points of the courses of the module (120-135h for courses with 4.5 credit points). 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: Information Systems: Engineering and Transformation [M-WIWI-104812]

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

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

**Part of:** Information Systems

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<td>Access Control Systems: Models and Technology</td>
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<td>Business Data Analytics: Application and Tools</td>
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<td>Engineering Interactive Systems: Al &amp; Wearables</td>
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<td>T-WIWI-109270</td>
<td>Human Factors in Security and Privacy</td>
<td>4,5 CR</td>
<td>Volkamer</td>
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<td>T-INFO-101337</td>
<td>Internet of Everything</td>
<td>4 CR</td>
<td>Zitterbart</td>
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<td>Web Applications and Service-Oriented Architectures (II)</td>
<td>4 CR</td>
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**Competence Certificate**
The module examination takes place in the form of partial examinations in accordance with § 4 Para. 2 No. 1 - No. 3 SPO via courses of the module amounting to a total of at least 9 LP.

The overall score of the module is formed from the credit-weighted scores of the partial examinations and truncated after the first decimal place.

**Competence Goal**
The student

- learns techniques and procedures for the systematic development of high-quality software.
- can apply software quality assessment methods, evaluate results, and compare certification models.
- can reflect the content of the key concepts and technologies required to develop service-oriented Web applications and model appropriate architectures, implement Web applications and assess their service characteristics.
- knows proven and novel concepts for the evaluation and analysis of (critical) IT infrastructures.
- knows methods and tools to successfully shape the digital transformation of companies under pursuit of a socio-technical paradigm.

**Content**
The module “Information Systems: Engineering and Transformation” deals with the systematic development and management of software, information systems/infrastructures and Internet-based services.

**Workload**
Total effort for 9 credit points: approx. 270 hours. The distribution is based on the credit points of the courses of the module (120-135h for courses with 4.5 credit points). 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.
5.94 Module: Information Systems: Internet-Based Markets and Services [M-WIWI-104813]

Responsible: Prof. Dr. Christof Weinhardt
Organisation: KIT Department of Economics and Management
Part of: Information Systems

<table>
<thead>
<tr>
<th>Credits</th>
<th>Grading scale</th>
<th>Recurrence</th>
<th>Duration</th>
<th>Language</th>
<th>Level</th>
<th>Version</th>
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<td>Each term</td>
<td>2 terms</td>
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Compulsory Elective Area (Election: )

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Lecturer</th>
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<tbody>
<tr>
<td>T-WIWI-109246</td>
<td>Digital Health</td>
<td>4.5 CR</td>
<td>Sunyaev</td>
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<tr>
<td>T-WIWI-112757</td>
<td>Digital Services: Innovation &amp; Business Models</td>
<td>4.5 CR</td>
<td>Satzger</td>
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<tr>
<td>T-WIWI-107501</td>
<td>Energy Market Engineering</td>
<td>4.5 CR</td>
<td>Weinhardt</td>
</tr>
<tr>
<td>T-WIWI-113460</td>
<td>Engineering Interactive Systems: AI &amp; Wearables</td>
<td>4.5 CR</td>
<td>Mädche</td>
</tr>
<tr>
<td>T-WIWI-112823</td>
<td>Platform &amp; Market Engineering: Commerce, Media, and Digital Democracy</td>
<td>4.5 CR</td>
<td>Weinhardt</td>
</tr>
</tbody>
</table>

Competence Certificate
The module examination takes place in the form of partial examinations in accordance with § 4 Para. 2 No. 1 - No. 3 SPO via courses of the module amounting to a total of at least 9 LP. The overall score of the module is formed from the credit-weighted scores of the partial examinations and truncated after the first decimal place.

Competence Goal
The student
- understands the importance and potential of digitizing products and services
- can design digital markets and services with the associated business models.
- knows methods and tools to successfully design the digital transformation of products and services.
- acquires specific competencies for the digitization of domain-specific services, including healthcare and energy.

Content
The module "Information Systems: Internet-based Markets and Services" focuses on the design of Internet-based services and markets from an economic and technical point of view.

Annotation
From summer semester 2023, the course Service Innovation will be offered with a revised course concept and content. The focus will be on the closer integration of the topics of service innovation and digitalization. Current foundational content (e.g., on service innovation challenges or human-centered innovation methods) will remain. New content will cover topics such as digital platforms and ecosystems, IoT and smart service innovation, and business models.

Workload
Total effort for 9 credit points: approx. 270 hours. The distribution is based on the credit points of the courses of the module (120-135h for courses with 4.5 credit points). 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.
5.95 Module: Innovation and Growth [M-WIWI-101478]

Responsible: Prof. Dr. Ingrid Ott
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Economics)

<table>
<thead>
<tr>
<th>Credits</th>
<th>Grading scale</th>
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<th>Language</th>
<th>Level</th>
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<td>Each term</td>
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Compulsory Elective Courses (Election: between 9 and 10 credits)

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Grading Scale</th>
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<tr>
<td>T-WIWI-109194</td>
<td>Dynamic Macroeconomics</td>
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<td>T-WIWI-112822</td>
<td>Economics of Innovation</td>
<td>4,5</td>
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<td>Ott</td>
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<tr>
<td>T-WIWI-112816</td>
<td>Growth and Development</td>
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</table>

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.

Prerequisites

None

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

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.

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.

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.
### 5.96 Module: Innovation Economics [M-WIWI-101514]

**Responsible:** Prof. Dr. Ingrid Ott  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Economics and Management (Economics)

<table>
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<th>Duration</th>
<th>Language</th>
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#### Compulsory Elective Courses (Election: between 9 and 10 credits)

<table>
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<tr>
<th>Code</th>
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<th>Credits</th>
<th>Lecturer</th>
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<tr>
<td>T-WIWI-112822</td>
<td>Economics of Innovation</td>
<td>4.5 CR</td>
<td>Ott</td>
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<tr>
<td>T-WIWI-102906</td>
<td>Methods in Economic Dynamics</td>
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<td>T-WIWI-109864</td>
<td>Product and Innovation Management</td>
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<td>Klarmann</td>
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<td>Seminar in Economic Policy</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.

#### Prerequisites

None

#### Competence Goal

Students shall be given the ability to

- understand the important role of innovation for economic growth and welfare  
- understand the relevance of alternative incentive mechanisms for the emergence and dissemination of innovations  
- know basic terms of product and innovation concepts  
- know fundamental concepts of innovation management  
- work with fundamental theoretical innovation models and to implement them in appropriate computer algebra systems  
- query appropriate data sources and to analyse and visualise them using statistical methods

#### Content

The module provides students with knowledge about implications of technological and organizational changes. Addressed economic issues are incentives for developing innovations, diffusion processes, and associated effects. In this context the module analyses appropriate policies in the presence of market failures to take corrective action on the market process and thus to increase the dynamic efficiency of economies.

Furthermore, the module offers the possibility to learn about different aspects of theoretical modelling of innovation-based growth as a part of the seminar and the methods-workshop. This includes the implementation of formal models in computer algebra systems as well as recording, processing and econometric analysis of related data from relational databases (concerning for example patents or trademarks). Moreover, methods of network theory are applied.

Finally, the module emphasises the business perspective: Issues of all stages of innovation processes will be discussed, from innovation strategies up to the market commercialisation.

#### Workload

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

#### Recommendation

Basic knowledge of micro- and macroeconomics is assumed, as taught in the courses Economics I [2600012] and Economics II [2600014]. Further, it is assumed that students have interest in using quantitative-mathematical methods.
## 5.97 Module: Innovation Management [M-WIWI-101507]

**Responsible:** Prof. Dr. Marion Weissenberger-Eibl  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Economics and Management (Business Administration)

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<th>Credits</th>
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### Mandatory

- T-WIWI-102893 **Innovation Management: Concepts, Strategies and Methods** 3 CR Weissenberger-Eibl

### Compulsory Elective Courses (Election: 1 item)

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<th>Instructor</th>
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<tr>
<td>T-WIWI-108875</td>
<td>Digital Transformation and Business Models</td>
<td>3 CR</td>
<td>Koch</td>
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<tr>
<td>T-WIWI-112143</td>
<td>Development of Sustainable Business Models</td>
<td>3 CR</td>
<td>Weissenberger-Eibl</td>
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<tr>
<td>T-WIWI-111823</td>
<td>Successful Transformation Through Innovation</td>
<td>3 CR</td>
<td>Busch</td>
</tr>
<tr>
<td>T-WIWI-102852</td>
<td>Case Studies Seminar: Innovation Management</td>
<td>3 CR</td>
<td>Weissenberger-Eibl</td>
</tr>
<tr>
<td>T-WIWI-110263</td>
<td>Methods in Innovation Management</td>
<td>3 CR</td>
<td>Koch</td>
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<tr>
<td>T-WIWI-102853</td>
<td>Roadmapping</td>
<td>3 CR</td>
<td>Koch</td>
</tr>
<tr>
<td>T-WIWI-102858</td>
<td>Technology Assessment</td>
<td>3 CR</td>
<td>Koch</td>
</tr>
<tr>
<td>T-WIWI-102854</td>
<td>Technologies for Innovation Management</td>
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### Supplementary Courses (Election: 1 item)

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<td>T-WIWI-108875</td>
<td>Digital Transformation and Business Models</td>
<td>3 CR</td>
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<td>T-WIWI-102864</td>
<td>Entrepreneurship</td>
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<td>3 CR</td>
<td>Busch</td>
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<tr>
<td>T-WIWI-102852</td>
<td>Case Studies Seminar: Innovation Management</td>
<td>3 CR</td>
<td>Weissenberger-Eibl</td>
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<td>Methods in Innovation Management</td>
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<td>Roadmapping</td>
<td>3 CR</td>
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<td>T-WIWI-102858</td>
<td>Technology Assessment</td>
<td>3 CR</td>
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</table>

### Competence Certificate

See German version.

### Prerequisites

The lecture "Innovation Management: Concepts, Strategies and Methods" and one of the seminars of the chair for Innovation and Technology Management are compulsory. The third course can be chosen from the courses of the module.

### Competence Goal

Students develop a comprehensive understanding of the innovation process and its conditionality. There is an additional focus on the concepts and processes which are of particular relevance with regard to shaping the entire process. Various strategies and methods are then taught based on this.

After completing the module, students should have developed a systemic understanding of the innovation process and be able to shape this by developing and applying suitable methods.

### Content

The Innovation Management: Concepts, Strategies and Methods lecture course teaches concepts, strategies and methods which help students to form a systemic understanding of the innovation process and how to shape it. Building on this holistic understanding, the seminar courses then go into the subjects in greater depth and address specific processes and methods which are central to innovation management.

### Annotation

Seminars offered by Prof. Terzidis (or the members of his research group) are not eligible for crediting in a seminar module of the WiWi degree programs. Exception: Seminar "Entrepreneurship Research".
Workload
The total workload for this module is approximately 270 hours. For further information see German version.

Recommendation
None
### 5.98 Module: Innovative Concepts for Programming Industrial Robots [M-INFO-100791]

**Responsible:** Prof. Dr.-Ing. Björn Hein  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

<table>
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**Mandatory**

| T-INFO-101328 | Innovative Concepts for Programming Industrial Robots | 4 CR | Hein |

**Responsible:** N.N.

**Organisation:** KIT Department of Informatics

**Part of:** Law

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Intellectual Property Law (Election: at least 1 item as well as at least 9 credits)

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<tr>
<td>T-INFO-101313</td>
<td>Trademark and Unfair Competition Law</td>
<td>3 CR</td>
<td>Matz</td>
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<tr>
<td>T-INFO-101307</td>
<td>Internet Law</td>
<td>3 CR</td>
<td>N.N.</td>
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<tr>
<td>T-INFO-108462</td>
<td>Selected Legal Issues of Internet Law</td>
<td>3 CR</td>
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<tr>
<td>T-INFO-101310</td>
<td>Patent Law</td>
<td>3 CR</td>
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</tbody>
</table>

**Prerequisites**
None
5.100 Module: Intelligent Systems and Services [M-WIWI-101456]

Responsible: Dr.-Ing. Michael Färber
Organisation: KIT Department of Economics and Management
Part of: Informatics

<table>
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<td>Each term</td>
<td>1 term</td>
<td>German/English</td>
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Compulsory Elective Courses (Election: between 9 and 10 credits)

<table>
<thead>
<tr>
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<tr>
<td>T-WIWI-102661</td>
<td>Database Systems and XML</td>
<td>4,5 CR</td>
<td>Oberweis</td>
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<tr>
<td>T-WIWI-106423</td>
<td>Information Service Engineering</td>
<td>4,5 CR</td>
<td>Sack</td>
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<td>T-WIWI-112685</td>
<td>Modeling and Simulation</td>
<td>4,5 CR</td>
<td>Lazarova-Molnar</td>
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<tr>
<td>T-WIWI-110548</td>
<td>Advanced Lab Informatics (Master)</td>
<td>4,5 CR</td>
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<tr>
<td>T-WIWI-102666</td>
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<td>4,5 CR</td>
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<td>Semantic Web Technologies</td>
<td>4,5 CR</td>
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</table>

Competence Certificate
The assessment mix of each course of this module is defined for each course separately. The final mark for the module is the average of the marks for each course weighted by the credits and truncated after the first decimal.

Algorithms for Internet Applications [T-WIWI-102658]: The examination will be offered latest until summer term 2017 (repeaters only).

Prerequisites
None

Competence Goal
Students
- know the different machine learning procedures for the supervised as well as the unsupervised learning,
- identify the pros and cons of the different learning methods,
- apply the discussed network learning methods in specific scenarios,
- compare the practicality of methods and algorithms with alternative approaches.

Content
In the broader sense learning systems are understood as biological organisms and artificial systems which are able to change their behavior by processing outside influences. Network learning methods based on symbolic, statistic and neuronal approaches are the focus of Computer Sciences.

In this module the most important network learning methods are introduced and their applicability is discussed with regard to different information sources such as data texts and images considering especially procedures for knowledge acquirement via data and text mining, natural analogue procedures as well as the application of organic learning procedures within the finance sector.

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

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<th>Responsible</th>
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<th>5 CR</th>
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<tr>
<td>T-INFO-101269</td>
<td>Interactive Computer Graphics</td>
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### 5.102 Module: Internet of Everything [M-INFO-100800]

**Responsible:** Prof. Dr. Martina Zitterbart  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

<table>
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### 5.103 Module: Introduction to Bioinformatics for Computer Scientists [M-INFO-100749]

**Responsible:** Prof. Dr. Alexandros Stamatakis  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics  
**Credits:** 3  
**Grading scale:** Grade to a tenth  
**Recurrence:** Each winter term  
**Duration:** 1 term  
**Language:** German  
**Level:** 4  
**Version:** 1

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Information Systems M.Sc.  
Module Handbook as of 11/04/2024
### 5.104 Module: Introduction to Quantum Computing (IQC) [M-INFO-106101]

**Responsible:** Prof. Dr. Bernhard Beckert  
Prof. Dr.-Ing. Ina Schaefer  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Mandatory**

| T/INFO-112344 | Introduction to Quantum Computing (IQC) | 3 CR | Beckert, Schaefer |
### M 5.105 Module: Introduction to Video Analysis [M-INFO-100736]

**Responsible:** Prof. Dr.-Ing. Jürgen Beyerer  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics  

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5.106 Module: IT Security [M-INFO-106315]

**Responsible:**
- Prof. Dr. Hannes Hartenstein
- Prof. Dr. Jörn Müller-Quade
- Prof. Dr. Thorsten Strufe
- TT-Prof. Dr. Christian Wressnegger

**Organisation:**
KIT Department of Informatics

**Part of:** Informatics

**Credits:** 6

**Grading scale:** Grade to a tenth

**Recurrence:** Each winter term

**Duration:** 1 term

**Language:** German/English

**Level:** 4

**Version:** 2

**Mandatory**

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<td>Hartenstein, Müller-Quade, Strufe, Wressnegger</td>
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**Competence Certificate**
See partial achievements (Teilleistung)

**Prerequisites**
See partial achievements (Teilleistung)

**Competence Goal**

Students
- have in-depth knowledge of cryptography and IT security
- know and understands sophisticated techniques and security primitives to achieve the protection goals
- know and understand scientific evaluation and analysis methods of IT security (game-based formalization of confidentiality and integrity, security and anonymity notions)
- have a good understanding of types of data, personal data, legal and technical fundamentals of privacy protection
- know and understand the fundamentals of system security (buffer overflow, return-oriented programming, ...)  
- know different mechanisms for anonymous communication (TOR, Nym, ANON) and can assess their effectivity

**Content**

This advanced mandatory module deepens different topics of IT security. These include in particular:
- Elliptic curve cryptography
- Threshold cryptography
- Zero-knowledge proofs
- Secret sharing
- Secure multi-party computation and homomorphic encryption
- Methods of IT security (game-based analysis and the UC model)
- Crypto-currencies and consensus through proof-of-work/stake
- Anonymity on the Internet, anonymity with online payments
- Privacy-preserving machine learning
- Security of machine learning
- System security and exploits
- Threat modeling and quantification of IT security

**Workload**

Course workload:
1. Attendance time: 56 h
2. Self-study: 56 h
3. Preparation for the exam: 68 h

**Recommendation**

Attendance of the lecture Information Security is recommended.
## Literature

- Katz/Lindell: Introduction to Modern Cryptography (Chapman & Hall)
- Schäfer/Roßberg: Netzsicherheit (dpunkt)
- Anderson: Security Engineering (Wiley, and online)
- Stallings/Brown: Computer Security (Pearson)
- Pfleeger, Pfleeger, Margulies: Security in Computing (Prentice Hall)

**Responsible:** Prof. Dr. Hannes Hartenstein

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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**Mandatory**

| T-INFO-101323 | IT-Security Management for Networked Systems | 5 CR | Hartenstein |
### 5.108 Module: Lab Course Heterogeneous Computing [M-INFO-104072]

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**Mandatory**

| T-INFO-108447 | Lab Course Heterogeneous Computing | 6 CR | Karl |

**Prerequisites**

None
5.109 Module: Lab Project: Speech Translation [M-INFO-105997]

**Responsible:** Prof. Dr. Jan Niehues

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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5.110 Module: Lab: Efficient Parallel C++ [M-INFO-103506]

**Responsible:** Prof. Dr. Peter Sanders

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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**Mandatory**

| T-INFO-106992 | Lab: Efficient Parallel C++ | 6 CR | Sanders |

**Competence Certificate**

See partial achievement.

**Prerequisites**

See partial achievement.

**Competence Goal**

The students
- can use the methods of algorithm engineering in order to implement and evaluate given algorithmic problems and data structures in C++.
- recognize factors that lead to inefficient code and can, if possible, replace them with more efficient constructions.
- understand how to use the presented techniques for parallelization and to generate thread-safe codes with the given means.
- know the features of the standard library and are able to use them selectively.
- can test the codes generated by them for correctness and performance, furthermore they can represent and analyze the obtained results.

**Content**

In this practical course students solve multiple programming tasks in C++. The main focus is on the efficient implementation and their evaluation through extensive experiments. The programming tasks are motivated by scientific work in the field of algorithm engineering. They cover complex algorithms as well as advanced data structures, furthermore advanced programming techniques and parallelization (thread management capabilities of the standard library).

**Workload**

~ 10h attendance time
~ 10h discussion/assessment of the regular solutions (with preparation)
~ 15h designing the individual final assignment
~ 25h presentation of the individual final task
~ 120h working on the tasks (implementation and evaluation)
5.111 Module: Lab: Graph Visualization in Practice [M-INFO-103302]

Responsible: Dr. rer. nat. Torsten Ueckerdt
Organisation: KIT Department of Informatics
Part of: Informatics

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| T-INFO-106580 | Lab: Graph Visualization in Practice | 5 CR | Ueckerdt |
5.112 Module: Lab: Internet of Things (IoT) [M-INFO-103706]

**Responsible:**  Prof. Dr.-Ing. Jürg Henkel

**Organisation:**  KIT Department of Informatics

**Part of:**  Informatics

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**Mandatory**

| T-INFO-107493 | Lab: Internet of Things (IoT) | 4 CR | Henkel |

**Prerequisites**

None
# 5.113 Module: Lab: Low Power Design and Embedded Systems [M-INFO-104031]

**Responsible:** Prof. Dr.-Ing. Jörg Henkel  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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### 5.114 Module: Laboratory Course Algorithm Engineering [M-INFO-102072]

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**Mandatory**

| T-INFO-104374 | Laboratory Course Algorithm Engineering | 6 CR | Bläsius, Ueckerdt |
### 5.115 Module: Laboratory in Cryptoanalysis [M-INFO-101559]

**Responsible:** Prof. Dr. Dennis Hofheinz  
Prof. Dr. Jörn Müller-Quade

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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### 5.116 Module: Laboratory in Cryptography [M-INFO-101558]

**Responsible:** Prof. Dr. Jörn Müller-Quade

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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### Module: Laboratory in Security [M-INFO-101560]

**Responsible:** Prof. Dr. Jörn Müller-Quade  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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Module: Introduction to Quantum Machine Learning [M-INFO-106742]

**Mandatory**

| T-INFO-113556 | Introduction to Quantum Machine Learning | 3 CR | Fischer, Kühn |

## Competence Certificate

see partial achievement

### Competence Goal

Students have a systematic understanding of the issues surrounding the use of currently available quantum computers and of solution approaches from the field of hybrid quantum machine learning. They will be able to transfer these findings to other problems and, in particular, evaluate the efficiency and feasibility for different data sets in practice. In addition, they will be able to interpret and understand current research results in quantum machine learning with the knowledge you have acquired.

After successfully completing the course, students will be able to:

- Explain the basic concepts, motivation and challenges of quantum computing and quantum machine learning as well as current hybrid approaches;
- Analyze problems, select suitable approaches, describe them mathematically and convert them into circuit notation and apply them;
- Design their own solutions based on the concepts learned in the lecture and evaluate their efficiency.

### Content

This module aims to familiarize students with the theoretical and practical aspects of the hybrid use of quantum circuits in classical machine learning algorithms. In the first part of the lecture, the necessary mathematical foundations of quantum systems and their representation by qubits and quantum circuits are summarized before the advantages and possibilities of quantum computing are demonstrated on the basis of known quantum algorithms. Finally, an overview of current hybrid approaches in the field of quantum machine learning (QML) and their possible applications and limitations is provided:

- **Fundamentals and basic concepts**
  - Theoretical and practical basics of quantum computing
  - Taxonomy of quantum machine learning
- **Overview of QML algorithms, e.g.**
  - Variational Quantum Eigensolver
  - Quantum Approximat Optimization Algorithm
  - Quantum Autoencoder
  - Quantum Convolutional Neural Networks
  - Quantum Generative Adversarial Neural Networks
  - Quantum Kernels
- **Current challenges, e.g.**
  - Noise
  - Barren Plateaus

The module focuses in particular on the applicability to today's quantum computers and the scalability of the approaches presented.

### Workload

- Lecture attendance: 23h (2 SWS x 15)
- Preparation and follow-up: 45h (2 x 2 SWS x 15)
- Exam preparation: 22h
- Total: 90h / 30 = 3 credits

### Recommendation

- Attendance of the lecture "Machine Learning 1 - Basic Methods" is recommended
- Attendance of the lecture "Introduction to Quantum Computing" is recommended
- Knowledge of linear algebra is recommended
- Programming skills in Python are helpful

Information Systems M.Sc.
Module Handbook as of 11/04/2024
Module: Localization of Mobile Agents [M-INFO-100840]

Responsible: Prof. Dr.-Ing. Uwe Hanebeck
Organisation: KIT Department of Informatics
Part of: Informatics

Credits: 6
Grading scale: Grade to a tenth
Recurrence: Each summer term
Duration: 1 term
Language: German
Level: 4
Version: 1

Mandatory
T-INFO-101377 Localization of Mobile Agents 6 CR Hanebeck
5.120 Module: Logical Foundations of Cyber-Physical Systems [M-INFO-106102]

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<th>Responsible:</th>
<th>Prof. Dr. André Platzer</th>
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**Mandatory**

| T-INFO-112360 | Logical Foundations of Cyber-Physical Systems | 6 CR | Platzer |

**Competence Certificate**
See partial achievements (Teilleistung)

**Prerequisites**
See partial achievements (Teilleistung)

**Competence Goal**

In **modeling and control**, successful students will
- understand core principles behind CPS. A solid understanding of these principles is important for anyone who wants to integrate cyber and physical components to solve problems that no part could solve alone.
- develop models and controls. In order to understand, design, and analyze CPS, it is important to be able to develop models for the relevant aspects of a CPS design and to design controllers for the intended functionalities based on appropriate specifications, including modeling with differential equations.
- identify relevant dynamical aspects. It is important to be able to identify which types of phenomena influence a property of a system. These allow us to judge, for example, where it is important to manage adversarial effects, or where a nondeterministic model is sufficient.

In **computational thinking**, successful students should be able to
- identify safety specifications and critical properties. In order to develop correct CPS designs, it is important to identify what "correctness" means, how a design may fail to be correct, and how to make it correct.
- understand abstraction in system designs. The power of abstraction is essential for the modular organization of CPS, and the ability to reason about separate parts of a system independently.
- express pre- and post-conditions and invariants for CPS models. Pre- and post-conditions allow us to capture under which circumstance it is safe to run a CPS or a part of a CPS design, and what safety entails. They allow us to achieve what abstraction and hierarchies achieve at the system level: decompose correctness of a full CPS into correctness of smaller pieces. Invariants achieve a similar decomposition by establishing which relations of variables remain true no matter how long and how often the CPS runs.
- reason rigorously about CPS models. Reasoning is required to ensure correctness and find flaws in CPS designs. Both informal and formal reasoning in a logic are important objectives for being able to establish correctness, which includes rigorous reasoning about differential equations.

In **CPS skills**, successful students will be able to
- understand the semantics of a CPS model. What may be easy in a classical isolated program becomes very demanding when that program interfaces with effects in the physical world.
- develop an intuition for operational effects. Intuition for the joint operational effect of a CPS is crucial, e.g., about what the effect of a particular discrete computer control algorithm on a continuous plant will be.
- understand opportunities and challenges in CPS and verification. While the beneficial prospects of CPS for society are substantial, it is crucial to also develop an understanding of their inherent challenges and of approaches for minimizing the impact of potential safety hazards. Likewise, it is important to understand the ways in which formal verification can best help improve the safety of system designs.
Cyber-physical systems (CPSs) combine cyber capabilities (computation and/or communication) with physical capabilities (motion or other physical processes). Cars, aircraft, and robots are prime examples, because they move physically in space in a way that is determined by discrete computerized control algorithms. Designing these algorithms to control CPSs is challenging due to their tight coupling with physical behavior. At the same time, it is vital that these algorithms be correct, since we rely on CPSs for safety-critical tasks like keeping aircraft from colliding. In this course we will strive to answer the fundamental question posed by Jeannette Wing:

“How can we provide people with cyber-physical systems they can bet their lives on?”

The cornerstone of this course design are hybrid programs (HPs), which capture relevant dynamical aspects of CPSs in a simple programming language with a simple semantics. One important aspect of HPs is that they directly allow the programmer to refer to real-valued variables representing real quantities and specify their dynamics as part of the HP.

This course will give you the required skills to formally analyze the CPSs that are all around us—from power plants to pacemakers and everything in between—so that when you contribute to the design of a CPS, you are able to understand important safety-critical aspects and feel confident designing and analyzing system models. It will provide an excellent foundation for students who seek industry positions and for students interested in pursuing research.

Annotation
Course web page: https://lfcps.org/course/lfcps.html

Workload
6 ECTS from 180h of coursework consisting of
- 22.5h = 15 * 1.5h from 3 SWS lectures
- 12h = 8 * 1.5h from 1 SWS exercises
- 90h preparation, reading textbook, studying - 40h solving exercises
- 15h exam preparation

Recommendation
The course assumes prior exposure to basic computer programming and mathematical reasoning. This course covers the basic required mathematical and logical background of cyber-physical systems. You will be expected to follow the textbook as needed: André Platzer. Logical Foundations of Cyber-Physical Systems. Springer 2018. DOI:10.1007/978-3-319-63588-0
5.121 Module: Low Power Design [M-INFO-100807]

**Responsible:** Prof. Dr.-Ing. Jörg Henkel

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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**Mandatory**

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<tr>
<th>T-INFO-101344</th>
<th>Low Power Design</th>
<th>3 CR</th>
<th>Henkel</th>
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5.122 Module: Machine Learning [M-WIWI-103356]

Responsible: Prof. Dr.-Ing. Johann Marius Zöllner
Organisation: KIT Department of Economics and Management
Part of: Informatics

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Compulsory Elective Courses (Election: )

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<tbody>
<tr>
<td>T-WIWI-106340</td>
<td>Machine Learning 1 - Basic Methods</td>
<td>4.5 CR</td>
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<tr>
<td>T-WIWI-106341</td>
<td>Machine Learning 2 – Advanced Methods</td>
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<td>Zöllner</td>
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<tr>
<td>T-WIWI-109985</td>
<td>Project Lab Cognitive Automobiles and Robots</td>
<td>5 CR</td>
<td>Zöllner</td>
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<td>T-WIWI-109983</td>
<td>Project Lab Machine Learning</td>
<td>5 CR</td>
<td>Zöllner</td>
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</tbody>
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Competence Certificate

The module examination is carried out in the form of partial examinations on the selected courses of the module, with which the minimum requirement at creditpoints is fulfilled. The learning control is described in each course. The overall score of the module is made up of the sub-scores weighted with creditpoints and is cut off after the first comma point.

Prerequisites

None

Competence Goal

Students

- Gain knowledge of basic methods in the field of machine learning.
- Understand advanced machine learning concepts and their possible applications.
- Can classify, formally describe and evaluate machine learning methods.
- Can apply their knowledge for the selection of suitable models and methods for selected problems in the field of machine learning.

Content

The topic of machine learning considering real-world challenges of complex application domains is a rapidly expanding field of knowledge and the subject of numerous research and development projects. Large parts of modern AI methods are based on machine-learned models.

The Machine Learning 1 course introduces students to the rapidly evolving field of machine learning by providing a solid foundation that covers the major concepts and techniques in the field. Students will explore various methods of supervised, unsupervised, and reinforcement learning, as well as associated model types ranging from simple linear classifiers to more complex models, such as Deep Neural Networks.

The lecture "Machine Learning 2" covers advanced and modern machine learning methods. Modern learning methods like Self-Supervised-Learning and Contrastive Learning as well as model architectures like Diffusion Models, Transformers, Graph Neural Networks, are introduced.

In the practical courses, scientific tasks in the field of autonomous driving or robotics are solved with modern machine learning methods. There, the techniques of machine learning are practically oriented.

Workload

The total workload for this module is approximately 270 hours.

**Mandatory**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Grading scale</th>
<th>Recurrence</th>
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<td>T-INFO-111558</td>
<td>Machine Learning - Foundations and Algorithms</td>
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**Responsible:** Prof. Dr. Gerhard Neumann

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

**Level:** 4

**Version:** 2

**Competence Certificate**

See partial achievements (Teilleistung)

**Prerequisites**

See partial achievements (Teilleistung)

**Competence Goal**

- Students acquire knowledge of the basic methods of Machine Learning
- Students acquire the mathematical knowledge to understand the theoretical foundations of Machine Learning
- Students can categorize, formally describe and evaluate methods of Machine Learning
- Students can apply their knowledge to select appropriate models and methods for selected problems in the field of Machine Learning.

**Content**

The field of Machine Learning has made enormous progress in recent years and good knowledge of Machine Learning is becoming increasingly in demand on the job market. Machine Learning describes the acquisition of knowledge by an artificial system based on experience or data. Rules or certain calculations no longer have to be manually coded but can be extracted from data by intelligent systems.

This lecture provides an overview of essential and current methods of Machine Learning. After reviewing the necessary mathematical background, the lecture primarily deals with algorithms for classification, regression, and density estimation, with a focus on the mathematical understanding of probabilistic methods and neural networks.

Examples of topics include:
- Basics in Linear Algebra, Probability Theory, Optimization and Constraint Optimization
- Linear Regression
- Linear Classification
- Model Selection, Overfitting, and Regularization
- Support Vector Machines
- Kernel Methods
- Bayesian Learning and Gaussian Processes
- Neural Networks
- Dimensionality Reduction
- Density estimation
- Clustering
- Expectation Maximization
- Graphical Models

**Workload**

180h, aufgeteilt in:
- ca 45h Vorlesungsbesuch
- ca 15h Übungsbesuch
- ca 90h Nachbearbeitung und Bearbeitung der Übungsblätter
- ca 30h Prüfungsvorbereitung

**Recommendation**

See partial achievements (Teilleistung)
# Module: Machine Translation [M-INFO-100848]

**Responsible:** Prof. Dr. Jan Niehues  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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Module: Management Accounting [M-WIWI-101498]

Responsible: Prof. Dr. Marcus Wouters
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Business Administration)

<table>
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<td>Management Accounting 2</td>
<td>4,5</td>
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Competence Certificate

The assessment is carried out as partial exams (according to Section 4 (2), 13 SPO) of the courses 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 familiar with various management accounting methods,
- can apply these methods for cost estimation, profitability analysis, and product costing,
- are able to analyze short-term and long-decisions with these methods,
- have the capacity to devise instruments for organizational control.

Content

The module consists of two courses "Management Accounting 1" and "Management Accounting 2". The emphasis is on structured learning of management accounting techniques.

Annotation

The following courses are part of this module:
- The course Management Accounting 1, which is offered in every summer semester
- The course Management Accounting 2, which is offered in every winter semester

Workload

The total workload for this module is approximately 270 hours. For further information see German version.
Module: Market Engineering [M-WIWI-101446]

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

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

**Part of:** Economics and Management (Business Administration)

<table>
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<td>T-WIWI-112823</td>
<td>Platform &amp; Market Engineering: Commerce, Media, and Digital Democracy</td>
<td>4,5 CR</td>
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**Supplementary Courses (Election: 4,5 credits)**

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<td>T-WIWI-113160</td>
<td>Digital Democracy</td>
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<td>T-WIWI-110797</td>
<td>eFinance: Information Systems for Securities Trading</td>
<td>4,5 CR</td>
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<td>Energy Market Engineering</td>
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<td>Energy Networks and Regulation</td>
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<td>Experimental Economics</td>
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<td>T-WIWI-111109</td>
<td>KD²Lab Hands-On Research Course: New Ways and Tools in 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**

The students

- know the design criterias of market mechanisms and the systematic approach to create new markets,
- understand the basics of the mechanism design and auction theory,
- analyze and evaluate existing markets regarding the missing incentives and the optimal solution of a given market mechanism, respectively,
- develop solutions in teams.

**Content**

This module explains the dependencies between the design von markets and their success. Markets are complex interaction of different institution and participants in a market behave strategically according to the market rules. The development and the design of markets or market mechanisms has a strong influence on the behavior of the participants. A systematic approach and a thorough analysis of existing markets is inevitable to design, create and operate a market place successfully. The approaches for a systematic analysis are explained in the mandatory course Market Engineering [2540460] by discussing theories about mechanism design and institutional economics. The student can deepen his knowledge about markets in a second course.

**Workload**

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

**Recommendation**

None
Module: Marketing and Sales Management [M-WIWI-105312]

Responsible: Prof. Dr. Martin Klarmann
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Business Administration)

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<th>Credits</th>
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Compulsory Elective Courses (Election: )

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<td>T-WIWI-112693</td>
<td>Digital Marketing</td>
<td>4,5 CR</td>
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<tr>
<td>T-WIWI-106981</td>
<td>Digital Marketing and Sales in B2B</td>
<td>1,5 CR</td>
<td>Klarmann, Konhäuser</td>
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<tr>
<td>T-WIWI-110985</td>
<td>International Business Development and Sales</td>
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<td>T-WIWI-111099</td>
<td>Judgement and Decision Making</td>
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<td>Market Research</td>
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<td>T-WIWI-111848</td>
<td>Online Concepts for Karlsruhe City Retailers</td>
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<td>T-WIWI-102883</td>
<td>Pricing</td>
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<td>Product and Innovation Management</td>
<td>3 CR</td>
<td>Klarmann</td>
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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.

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.

Prerequisites

None

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

Content

The aim of this module is to deepen central marketing contents in different areas.

Workload

The total workload for this module is approximately 270 hours.
5.128 Module: Mathematical Programming [M-WIWI-101473]

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

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

**Part of:** Economics and Management (Operations Research)

<table>
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**Compulsory Elective Courses (Election: at most 2 items)**

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<tr>
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<td>Global Optimization I</td>
<td>4,5</td>
<td>CR</td>
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<td>Parametric Optimization</td>
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**Supplementary Courses (Election: at most 2 items)**

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<td>Advanced Stochastic Optimization</td>
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<td>Topics in Stochastic Optimization</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.

**Prerequisites**

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

**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.
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.
## 5.129 Module: Meshes and Point Clouds [M-INFO-100812]

### Responsible:
Prof. Dr. Hartmut Prautzsch

### Organisation:
KIT Department of Informatics

### Part of:
Informatics

<table>
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<td>Each term</td>
<td>1 term</td>
<td>English</td>
<td>4</td>
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</table>

### Mandatory

| T-INFO-101349 | Meshes and Point Clouds | 3 CR | Prautzsch |

### Competence Certificate
See partial achievement.

### Prerequisites
See partial achievement.

### Competence Goal
Students of this course will have a basic understanding about discrete surface representations and are able to handle basic geometry processing problems for shape design.

### Content
Thanks to various imaging techniques, discrete, i.e. piecewise constant or linear, representations of surfaces and solids are commonly used to represent surfaces and solids alongside established representations of higher degree and smoothness.

In this course, methods are presented:
1. to represent surfaces by point clouds, octrees, hierarchical sphere clouds, triangle fans, Delaunay meshes, and meshes of planar quadrilaterals,
2. to obtain triangle meshes from point clouds and distance functions,
3. to simplify or compress meshes,
4. to smooth meshes and remove noise,
5. to segment meshes according to different criteria,
6. to subdivide and refine meshes,
7. to complete shape by neuronal nets,
8. to animate and deform meshes,
and others.

### Workload
90h of which about
30h for attending the lecture
30h for post-processing
30h for exam preparation
Module: Microeconomic Theory [M-WIWI-101500]

Responsible: Prof. Dr. Clemens Puppe
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Economics)

<table>
<thead>
<tr>
<th>Credits</th>
<th>Grading scale</th>
<th>Recurrence</th>
<th>Duration</th>
<th>Language</th>
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Compulsory Elective Courses (Election: at least 9 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
<td>T-WIWI-102609</td>
<td>Advanced Topics in Economic Theory</td>
<td>4,5 CR</td>
<td>Mitusch</td>
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<tr>
<td>T-WIWI-102861</td>
<td>Advanced Game Theory</td>
<td>4,5 CR</td>
<td>Ehrhart, Puppe, Reiß</td>
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<tr>
<td>T-WIWI-102613</td>
<td>Auction Theory</td>
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<tr>
<td>T-WIWI-105781</td>
<td>Incentives in Organizations</td>
<td>4,5 CR</td>
<td>Nieken</td>
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<tr>
<td>T-WIWI-113264</td>
<td>Matching Theory</td>
<td>4,5 CR</td>
<td>Puppe</td>
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<tr>
<td>T-WIWI-102859</td>
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<td>4,5 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 the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Prerequisites
None

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.

Here is an example of a positive question: what firm decisions does a specific regulatory policy result in under imperfect competition? An example of a normative question would be: which voting rule has appealing properties?

Content
The module teaches advanced concepts and content in microeconomic theory. Thematically, it offers a formally rigorous treatment of game theory and exemplary applications, such as strategic interaction on markets and non-/cooperative bargaining ("Advanced Game Theory"), as well as specialized courses dedicated to auctions ("Auktionstheorie") and incentive systems in organizations ("Incentives in Organizations"). Moreover, it offers the opportunity to delve deeper into the mathematical theory of voting and collective decision making, i.e. the systematic aggregation of preferences and judgments ("Social Choice Theory").

Workload
The total workload for this module is approximately 270 hours. For further information see German version.
5.131 Module: Mobile Communication [M-INFO-100785]

**Responsible:** Prof. Dr. Oliver Waldhorst  
Prof. Dr. Martina Zitterbart

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

<table>
<thead>
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<th>Credits</th>
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**Mandatory**

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<td>T-INFO-101322</td>
<td>Mobile Communication</td>
<td>4 CR</td>
<td>Waldhorst, Zitterbart</td>
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</table>
5.132 Module: Model-Driven Software Development [M-INFO-100741]

**Responsible:** Prof. Dr. Ralf Reussner

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

<table>
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**Mandatory**

| T-INFO-101278 | Model Driven Software Development | 3 CR | Reussner |

**Prerequisites**

None
Module: Modeling the Dynamics of Financial Markets [M-WIWI-106660]

Responsible: Prof. Dr. Maxim Ulrich
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Business Administration)

Mandatory

<table>
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<td>Each summer term</td>
<td>1 term</td>
<td>English</td>
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Competence Certificate
The module examination takes the form of a one-hour written comprehensive examination on the two courses "Dynamic Capital Market Theory" and "Essentials for Dynamic Financial Machine Learning".

Competence Goal
Dynamic Capital Market Theory:
Professional competence:
- Understanding of the principles of Dynamic Asset Pricing Theory
- Mastery of concepts such as stochastic calculus and dynamic modeling in discrete and continuous time
- Application of dynamic programming theory to portfolio and investment decisions
- Knowledge of pricing bonds, stocks, futures and options markets.

Interdisciplinary skills:
- Develop analytical skills for working on and solving complex problems in finance
- Ability to apply theoretical models to real financial market scenarios.

Essentials for Dynamic Financial Machine Learning:
Professional Competence:
- Competencies in Multivariate Time Series Modeling and Dynamic Volatility Modeling.
- Skills in dealing with big financial data.
- Knowledge in the estimation of risk premia and the application of Kalman Filtering.

Interdisciplinary skills:
- Analytical skills in applying machine learning algorithms to dynamic financial market data.
- Development of problem-solving skills through the practical application of Python in financial data analysis.
Content
Dynamic Capital Market Theory:
The course "Dynamic Capital Market Theory" offers an introduction to the modeling of dynamic capital markets. Portfolio holdings and asset prices move dynamically across time and states. This course teaches basic financial economic thinking to help understand why this is the case and how to optimally act in such environments.
Next to the asset pricing focus, the second focus of the course is on optimal portfolio choice (robo advisory). For that, this course develops the theory of dynamic programming in discrete and continuous time and applies it to solve portfolio choice and corporate investment decisions. These concepts are key for financial engineering and the machine learning branch of Reinforcement Learning.
Students obtain proficiency in the following topics:

- Dynamic Valuation and Optimal Dynamic Asset Allocation
- Dynamic modeling in discrete time and continuous time
- Stochastic Calculus
- Markov Decision Processes and Dynamic Programming in discrete time and continuous time
- Pricing of bonds, equity, futures and options

Lectures (2 SWS) develop all concepts on the whiteboard, while exercises are solved during weekly tutorials (2 SWS).

Essentials for Dynamic Financial Machine Learning:
The course "Essentials for Dynamic Financial Machine Learning" teaches students to work with financial data, algorithms and statistical concepts.
Students are exposed to algorithms to learn key quantities of dynamic capital markets, such as time-varying risk premia, time-varying volatility and unobserved realizations of random states. The course covers the following concepts:

- Multivariate time series modeling
- Dynamic volatility modeling
- Handling big financial data
- Estimating risk premia
- Kalman Filtering

Weekly lectures (2 SWS) develop all algorithmic material on the whiteboard. Weekly tutorials (2 SWS) solve and discuss Python solutions to selected problems.

Workload
Total workload for 9 credit points: approx. 270 hours. The exact distribution is based on the credit points of the courses in the module:

- Dynamic Capital Market Theory: 4.5 CP
- Essentials for Dynamic Financial Machine Learning: 4.5 CP

Recommendation

Learning type
The module consists of two weekly lectures and respective tutorials:

1. Dynamic Capital Market Theory and
5.134 Module: Module Master's Thesis [M-WIWI-104833]

**Responsible:** Studiendekan der KIT-Fakultät für Informatik
Studiendekan des KIT-Studienganges

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

**Part of:** Master's Thesis

<table>
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<th>Credits</th>
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<td>1 term</td>
<td>German</td>
<td>3</td>
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</table>

**Competence Certificate**
At least one of the examiners must be a member of one of the two KIT faculties of Economics or Computer Science. The examiner must be involved in the degree program. The persons involved in the degree program are those who coordinate modules and/or are responsible for courses for the degree program.

If the Master’s thesis is to be completed outside the KIT departments Economics and Management or Informatics, this requires the approval of the Examination Board.

If the thesis is not passed, it may be repeated once. A new topic must be issued. The same topic may not be repeated. This also applies to comparable topics. In case of doubt, the examination board will decide. The new topic may again be supervised by the examiners of the first thesis.

This regulation also applies analogously after an official withdrawal from a registered topic.

**Prerequisites**
Regulated in §14 of the examination regulation.

**Competence Goal**
The student can independently handle a complex and unfamiliar subject based on scientific criteria and the current state of research.

He/she is in a position to critically analyze and structure the researched information as well as derive principles and regularities. He/she knows how to apply the thereby achieved results to solve the task at hand. Taking into account this knowledge and his/her interdisciplinary knowledge, he/she can draw own conclusions, derive improvement potentials, propose and implement science-based decisions.

This is basically also done under consideration of social and/or ethical aspects.
He/she can interpret, evaluate and if required, graphically present the obtained results.

He/she is in a position to sensibly structure a research paper, document results and clearly communicate the results in scientific form.
Content

- The Master's thesis should demonstrate that the candidate is able to work independently on a problem from their subject within the specified time frame using scientific methods that correspond to the current state of research.
- The Master's thesis can also be written in English.
- The Master's thesis can be assigned by any examiner (within the meaning of the SPO). If the Master's thesis is to be written outside the two participating faculties (Computer Science or Economics), this requires the approval of the Examination Board. The candidate must be given the opportunity to make suggestions for the topic.
- The Master's thesis may also be approved in the form of a group thesis if the contribution of the individual candidate to be assessed as an examination achievement is clearly distinguishable on the basis of objective criteria that enable a clear distinction to be made and fulfills the requirements for a Master's thesis.
- At the candidate's request, the Chair of the Examination Board shall, by way of exception, ensure that the candidate receives a topic for the Master's thesis from a supervisor within four weeks of submitting the request. In this case, the topic is issued by the Chair of the Examination Board.
- The topic, task and scope of the Master's thesis must be limited by the supervisor in such a way that the Master's thesis can be completed with the specified workload of 30 CPs.
- When submitting the Master's thesis, the student must declare in writing that he/she has written the thesis independently and has not used any sources and aids other than those specified by him/her, has marked the passages taken verbatim or in terms of content as such and has observed the statutes of the University of Karlsruhe (TH) to ensure good scientific practice in the currently valid version. If this declaration is not included, the thesis will not be accepted. If an untrue declaration is submitted, the Master's thesis will be assessed as "insufficient" (5.0).
- The date on which the topic of the Master's thesis is issued and the date on which the Master's thesis is submitted must be recorded with the Examination Board. The candidate may only return the topic of the Master's thesis once, and only within the first two months of the completion period. Upon justified request by the candidate, the Examination Board may extend the completion period stipulated in the SPO by a maximum of three months. If the Master's thesis is not submitted on time, it will be graded as "insufficient"; unless the candidate is not responsible for this failure (e.g. maternity leave).
- The Master's thesis is assessed and evaluated by a supervisor and, as a rule, by a further examiner from the other faculty of the two participating departments (Department of Informatics, Department of Economics and Management). One of the two must be a junior professor or professor. If the two examiners do not agree in their assessment, the Examination Board will determine the grade of the Master's thesis based on the assessment of the two examiners.
- The assessment period should not exceed 8 weeks.

Workload

A total of approx. 900 hours is expected for the preparation and presentation of the Master's thesis. In addition to writing the thesis, this figure includes all necessary activities such as literature research, familiarization with the topic, familiarization with any necessary tools, conducting studies/experiments, supervision meetings, etc.
### 5.135 Module: Natural Language Dialog Systems [M-INFO-102414]

**Responsible:** Prof. Dr. Jan Niehues  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics  

<table>
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<th>Credits</th>
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<th>Practical Course Natural Language Dialog Systems</th>
<th>6 CR</th>
<th>Niehues</th>
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## 5.136 Module: Natural Language Processing [M-INFO-105999]

<table>
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<th>Responsible</th>
<th>Prof. Dr. Jan Niehues</th>
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<td>Credits</td>
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<td>Recurrence</td>
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<td>Duration</td>
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<td>Language</td>
<td>German/English</td>
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<tr>
<td>T-INFO-112177</td>
<td>Natural Language Processing</td>
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### 5.137 Module: Natural Language Processing and Software Engineering [M-INFO-100735]

**Responsible:** Prof. Dr.-Ing. Anne Koziolek  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

<table>
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<td>T-INFO-101272</td>
<td>Natural Language Processing and Software Engineering</td>
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Koziolek
5.138 Module: Network Economics [M-WIWI-101406]

**Responsible:** Prof. Dr. Kay Mitusch  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Economics and Management (Economics)

<table>
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<th>Credits</th>
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**Compulsory Elective Courses (Election: 9 credits)**

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<td>Competition in Networks</td>
<td>4,5 CR</td>
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<td>T-WIWI-100007</td>
<td>Transport Economics</td>
<td>4,5 CR</td>
<td>Mitusch, Szimba</td>
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<td>T-WIWI-102609</td>
<td>Advanced Topics in Economic Theory</td>
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<td>T-WIWI-102712</td>
<td>Regulation Theory and Practice</td>
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<td>Telecommunications and Internet – Economics and Policy</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.

**Prerequisites**

None

**Competence Goal**

The students

- have acquired the basic knowledge for a future job in a network company or in a regulatory agency, ministry etc.
- recognize the specific characterizations of network sectors, know fundamental methods for an economic analysis of network sectors and recognize the interfaces for an interdisciplinary cooperation of economists, engineers and lawyers
- understand the interactions between infrastructures, control systems, and the users of networks, especially concerning their implications on investments, price setting and competitive behavior, and they can model or simulate exemplary applications
- can assess the necessity of regulation of natural monopolies and identify regulatory measures that are important for networks.

**Content**

The module is concerned with network or infrastructure industries in the economy, e.g. telecommunication, traffic and energy sectors. These sectors are characterized by close interdependencies of operators and users of infrastructure as well as on states. States intervene in various forms, by the public and regulation authorities, due to the importance of network industries and due to limited abilities of markets to work properly in these industries. The students are supposed to develop a broad knowledge of these sectors and of the political options available.

**Workload**

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

**Recommendation**

Basics of microeconomics obtained within the undergraduate programme (B.Sc) of economics are required.
### 5.139 Module: Network Security: Architectures and Protocols [M-INFO-100782]

<table>
<thead>
<tr>
<th>Responsible:</th>
<th>Prof. Dr. Martina Zitterbart</th>
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#### Mandatory

|---------------|-----------------------------------------------|------|------------|
Module: Next Generation Internet [M/INFO-100784]

**Responsible:** Dr.-Ing. Roland Bless  
Prof. Dr. Martina Zitterbart

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

<table>
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</table>

Bless, Zitterbart

Responsible: Prof. Dr. Stefan Nickel
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Operations Research)

Election notes
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. Students who choose the module in the field "compulsory elective modules" may select any two courses of the module.

Compulsory Elective Courses (Election: between 1 and 2 items)

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<td>Modeling and OR-Software: Advanced Topics</td>
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Supplementary Courses (Election: at most 1 item)

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<td>Applied material flow simulation</td>
<td>4,5 CR</td>
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<td>Discrete-Event Simulation in Production and Logistics</td>
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<td>Mixed Integer Programming I</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.

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.

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.
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.

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

Recommendation
Basic knowledge as conveyed in the module *Introduction to Operations Research* is assumed.
## Module: Optimization and Synthesis of Embedded Systems (ES1) [M-INFO-100830]

<table>
<thead>
<tr>
<th>Responsible:</th>
<th>Prof. Dr.-Ing. Jörg Henkel</th>
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**Mandatory**

| T-INFO-101367 | Optimization and Synthesis of Embedded Systems (ES1) | 3 CR | Henkel |
### Module: Parallel Algorithms [M-INFO-100796]

**Responsible:** Prof. Dr. Peter Sanders  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

<table>
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**Competence Certificate**

See partial achievement.

**Prerequisites**

See partial achievement.

**Competence Goal**

The students acquire a systematic understanding for algorithmic problems and their solutions in the field of parallel algorithms, building on existing knowledge in algorithmics. Additionally, they are able to apply learned techniques to related problems and to interpret and comprehend current research topics.

After successful attendance of the course, the students are able to:

- explain terms, structures, basic problem definitions and algorithms from the lecture;
- decide which algorithms and data structures are suitable for solving a given problem and, if necessary, adapt them to the requirements of a specific problem;
- execute algorithms and data structures, conduct a mathematically precise analysis, and prove their algorithmic properties;
- explain machine models from the lecture and analyze algorithms and data structures in them;
- analyze new problems from application contexts, reduce them to their algorithmic core and design an abstract model; design own solutions in this model using concepts and techniques from the lecture, analyze them and prove the algorithmic properties.

**Content**

- Models and their relation to real machines:
  - shared memory - PRAM
  - message passing - BSP
  - circuits
- Analysis: speedup, efficiency, scalability
- Basic techniques:
  - SPMD
  - parallel divide-and-conquer
  - collective communication
  - load balancing
- Concrete algorithms (examples):
  - collective communication (including large data volumes): broadcast,
  - reduce, prefix sums, all-to-all exchange
  - matrix computations
  - sorting
  - list ranking
  - minimum spanning trees
  - load balancing: master worker with adaptive problem size, random
  - polling, random distribution

**Workload**

Lecture and exercise with 3 semester hours per week, 5 ECTS correspond to approx. 150 working hours, consisting of:

- approx. 30 h attendance of the lecture and exercise session / block seminar
- approx. 60 h preparation and follow-up work
- approx. 30 h working on exercise sheets / preparation of seminar presentation
- approx. 30 h exam preparation
Recommendation
The partial achievement Parallel Algorithms Exercise must be started before.
5.144 Module: Parallel Computer Systems and Parallel Programming [M-INFO-100808]

Responsible: Prof. Dr. Achim Streit
Organisation: KIT Department of Informatics
Part of: Informatics

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T-INFO-101345 Parallel Computer Systems and Parallel Programming 4 CR Streit
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### 5.146 Module: Penetration Testing Lab [M-INFO-104895]

**Responsible:** Dr.-Ing. Ingmar Baumgart  
Prof. Dr. Jörn Müller-Quade  

**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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### M.147 Module: Photorealistic Rendering [M-INFO-100731]

**Responsible:** Prof. Dr.-Ing. Carsten Dachsbacher  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

<table>
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5.148 Module: Practical Course Applied Telematics [M-INFO-101889]

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| T-INFO-103585 | Practical Course Applied Telematics | 3 CR | Zitterbart |
5.149 Module: Practical Course Automatic Speech Recognition [M-INFO-102411]

**Responsible:** Prof. Dr. Alexander Waibel

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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## 5.150 Module: Practical Course Computer Vision for Human-Computer Interaction [M-INFO-102966]

- **Responsible:** Prof. Dr.-Ing. Rainer Stiefelhagen
- **Organisation:** KIT Department of Informatics
- **Part of:** Informatics

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Module: Practical Course Decentralized Systems and Network Services [M-INFO-103047]

Responsible: Prof. Dr. Hannes Hartenstein
Organisation: KIT Department of Informatics
Part of: Informatics

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| T-INFO-106063 | Practical Course Decentralized Systems and Network Services | 4 CR | Hartenstein |
5.152 Module: Practical Course FPGA Programming [M-INFO-102661]

**Responsible:** Prof. Dr. Mehdi Baradaran Tahoori

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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**Competence Certificate**

See partial achievements (Teilleistung)

**Prerequisites**

See partial achievements (Teilleistung)

**Competence Goal**

Students will learn to design and to simulate digital circuits with FPGA.

**Content**

This lab emphasizes on the practical aspects of Field Programmable Gate Arrays (FPGAs). In the beginning, a short background introduction on FPGAs is given, followed by a tutorial on the workflow of configuring and programming an FPGA. This lab includes FPGA design using schematic layouts as well as several example of VHDL/Verilog programming to implement some sample digital circuits. Students will learn to design and to simulate digital circuits with FPGA. The design will be compiled on run a FPGA. The lab is designed around the DE2-115 prototyping board, which provides a programmer, program memory, and array of switches, buttons, LEDs, an LCD, and several I/O ports.

**Workload**

4 SWS / 3 CP = 90 h/week

**Recommendation**

Knowledge of “Dependable Computing” and “Fault Tolerant Computing” and Computer Architecture is helpful.
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### 5.154 Module: Practical Course on Network Security Research [M-INFO-105413]

**Responsible:** Prof. Dr. Martina Zitterbart  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

<table>
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5.155 Module: Practical Course Protocol Engineering [M-INFO-102092]

**Responsible:** Prof. Dr. Martina Zitterbart

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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### 5.156 Module: Practical Course Software Defined Networking [M-INFO-101891]

**Responsible:** Prof. Dr. Martina Zitterbart  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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Zitterbart
5.157 Module: Practical Course: Advanced Topics in High Performance Computing, Data Management and Analytics [M-INFO-105870]

**Responsible:** Prof. Dr. Achim Streit  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Mandatory**

| T-INFO-111803 | Practical Course: Advanced Topics in High Performance Computing, Data Management and Analytics | 6 CR | Streit |

**Competence Certificate**

See partial achievements (Teilleitung)

**Competence Goal**

Students know and can apply tools and techniques in the fields of high-performance computing, data management and data analysis. They acquire the possibility to analyze complex scenarios and develop solutions for this. Besides working on the content, students improve their competences in communication and presentation.

**Content**

Participants will have the chance to deepen their knowledge of high-performance computing, data management and data analysis and to apply it in a practical way. The tasks to be worked on come from the subfields:

- HPC simulations (e.g., parallelization, MPI, performance engineering)
- HPC systems and operating environment (e.g., On Demand File Systems, Infiniband Networks, Job Scheduling)
- Machine Learning and Data Mining (e.g., RapidMiner, scikit)
- Data-Intensive Computing (e.g., Hadoop, Spark).
- HPC and data analysis with Python (e.g., Numpy, Scipy, Pandas, Dask, Parsl)
- Distributed & Parallel File Systems (e.g., glusterFS, BeeGFS)
- Object Storage (e.g., S3, CEPH)
- Data Management System (e.g., dCache, iRods)
- Databases (e.g., SQL, NoSQL)
- Workflow management systems for HPC and data analysis (e.g., FireWorks, AiiDA, SimStack)
- Opportunistic resource integration and utilization (e.g., using COBaID/TARDIS)
- Authentication and authorization infrastructure (e.g., OpenID, SAML)

Students are individually supervised by scientific staff of the Scientific Centre for Computing and can apply their skills in a practical and research-oriented way by being involved in current research tasks (e.g., Helmholtz program, BMBF and EU projects).

**Workload**

3 SWS = 150 h per semester

- 12 h in meetings during the semester (kick-off, regular meetings with the supervisor, final meeting including presentation)
- 18 h preparation of meetings
- 120 h working on the topic and preparation of the exam

**Recommendation**

Knowledge in the area of databases, data management, data analytics, parallel computing is helpful.
5.158 Module: Practical Course: Biologically Inspired Robots [M-INFO-105495]

**Responsible:** Prof. Dr.-Ing. Rüdiger Dillmann  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics  

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**Mandatory**

| T-INFO-111039 | Practical Course: Biologically Inspired Robots | 6 CR | Rönnau |
### Module: Practical Course: Current Topics of Quantum Computing [M-INFO-106286]

| Responsible          | Prof. Dr.-Ing. Ina Schaefer  
|                      | Prof. Dr. Achim Streit        |
| Organisation         | KIT Department of Informatics |
| Part of              | Informatics                   |

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**Mandatory**

| T-INFO-112741 | Practical Course: Current Topics of Quantum Computing | 6 CR | Schaefer, Streit |

**Competence Certificate**
See partial achievements (Teilleistung)

**Prerequisites**
See partial achievements (Teilleistung)

**Competence Goal**
Students can understand scientifically motivated problems and process relevant literature to address the problem and possible solutions in cooperation with their supervisors. Using current quantum software frameworks, students can implement and evaluate practical solutions. Using the acquired knowledge and referring to current research results, students are able to interpret and comprehend their results. At regular meetings, progress is presented and possible obstacles are explained. Students can document the theory behind the solutions they have developed and present them in a comprehensible way.

**Content**
This practical course focuses on the theoretical analysis and practical implementation of current topics in quantum computing. The introduction covers necessary mathematical foundations of quantum systems and their representation by qubits and quantum circuits before delving into the specifics of the topics offered. Possible topics include quantum algorithms, optimization of quantum systems, quantum software engineering, or quantum machine learning.

There are fixed dates for topic assignment and lectures to introduce the topic of quantum computing. Additional face-to-face meetings to discuss individual progress are coordinated individually between the participants and supervisors. Participants work on separate tasks that are defined on the basis of current research work and thus offer realistic problems from practice and research. Assignments are graded individually, group work is possible. Prior knowledge and areas of interest of the participants are taken into account when assigning the topics.

**Workload**
- Attendance time 20h (Kick-off, introduction to theoretical aspects and topical areas, supervision meetings, closing event)
- Familiarization 20h
- Preparation of report and presentation 20h
- Independent work on the topic 120h
- Total 180h / 30 = 6 ECTS

**Recommendation**
- Knowledge of linear algebra is recommended
- Programming experience is helpful.
### 5.160 Module: Practical Course: Customized Embedded Processor Design [M-INFO-105740]

**Responsible:** Prof. Dr.-Ing. Jörg Henkel  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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### 5.161 Module: Practical Course: Data Science [M-INFO-105632]

- **Responsible:** Prof. Dr.-Ing. Klemens Böhm  
- **Organisation:** KIT Department of Informatics  
- **Part of:** Informatics

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Information Systems M.Sc.  
Module Handbook as of 11/04/2024
5.162 Module: Practical Course: Data Science for Scientific Data [M-INFO-106329]

**Responsible:** Prof. Dr.-Ing. Klemens Böhm

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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5.163 Module: Practical Course: Database Systems [M-INFO-101662]

Responsible: Prof. Dr.-Ing. Klemens Böhm
Organisation: KIT Department of Informatics
Part of: Informatics

Credits 4
Grading scale pass/fail
Recurrence Each winter term
Duration 1 term
Language German
Level 4
Version 1

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5.164 Module: Practical Course: Digital Design & Test Automation Flow [M-INFO-102570]

Responsible: Prof. Dr. Mehdi Baradaran Tahoori
Organisation: KIT Department of Informatics
Part of: Informatics

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T-INFO-105565 Practical Course Digital Design & Test Automation Flow 3 CR Tahoori

Competence Certificate
See partial achievements (Teilleistung)

Prerequisites
See partial achievements (Teilleistung)

Competence Goal
The objective of this lab is to have a hands-on practice on major steps in digital design and test automation flow, from system-level specification to physical design and verification.

Content
Electronic Design Automation (EDA) is used to develop nearly all novel electronic systems that we use in our daily lives, such as smartphones or laptops. In order to manage the high complexity of these systems, all steps in the design and verification phases are done automatically with the help of EDA tools.

The objective of this lab is to have a hands-on practice on major steps in digital design and test automation flow, from system-level specification to physical design and verification, using industrial EDA toolsets which are predominantly used in the industry and academia.

The students will work on some sample designs and go through all major design and test steps, one by one, in different sessions of the lab. So, by the end of this lab, they become familiar with the steps and tool chain in the digital design and test automation flow.

The topics include system-level specification and simulation; high-level synthesis; logic-level synthesis and simulation; design for testability; test pattern generation and fault simulation; physical design and verification; timing analysis and closure; area, delay, and power estimation and analysis.

Workload
4 SWS / 3 CP = 90 h/week

Recommendation
Knowledge of "Dependable Computing" and "Fault Tolerant Computing" and Computer Architecture is helpful.
5.165 Module: Practical Course: Discrete Freeform Surfaces [M-INFO-101667]

**Responsible:** Prof. Dr. Hartmut Prautzsch

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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**Competence Certificate**

See partial achievement.

**Prerequisites**

See partial achievement.

**Competence Goal**

The students of this course understand selected geometry processing problems with discrete representations (meshes and point clouds) and are able to develop and implement algorithms for their solutions.

**Content**

Current techniques to design, analyze and handle shapes given by point clouds and meshes for various applications.

**Workload**

180 h
5.166 Module: Practical Course: General-Purpose Computation on Graphics Processing Units [M-INFO-100724]

**Responsible:** Prof. Dr.-Ing. Carsten Dachsbacher  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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5.167 Module: Practical Course: Geometric Modeling [M-INFO-101666]

**Responsible:** Prof. Dr. Hartmut Prautzsch

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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**Mandatory**

| T-INFO-103207 | Practical Course: Geometric Modeling | 3 CR | Prautzsch |

**Competence Certificate**

See partial achievement.

**Prerequisites**

See partial achievement.

**Competence Goal**

The students of this course understand selected geometry modelling problems and are able to develop and implement algorithms for their solutions.

**Content**

Current CAD-techniques to design, represent, modify and analyze shapes given as solids or by their boundary surfaces.

**Workload**

90 h
5.168 Module: Practical Course: Graphics and Game Development [M-INFO-105384]

Responsible: Prof. Dr.-Ing. Carsten Dachsbacher
Organisation: KIT Department of Informatics
Part of: Informatics

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Module: Practical Course: Hot Research Topics in Computer Graphics [M-INFO-104699]

Responsible: Prof. Dr.-Ing. Carsten Dachsbacher
Organisation: KIT Department of Informatics
Part of: Informatics

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T-INFO-109577 Practical Course: Hot Research Topics in Computer Graphics 6 CR Dachsbacher

Competence Goal
Students study scientific publications on currently hot topics of computer graphics, implement and evaluate state of the art methods, and compare them to newly developed approaches. The results of the practical course will be documented in the form of a scientific paper.

Content
Students in this practical course are introduced to theoretical and practical aspects of current research topics at the chair of computer graphics.
Module: Practical Course: Machine Learning and Intelligent Systems [M-INFO-105958]

**Responsible:** Prof. Dr.-Ing. Uwe Hanebeck  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Mandatory**

| T-INFO-112104 | Practical Course: Machine Learning and Intelligent Systems | 8 CR | Fennel, Hanebeck |
# 5.171 Module: Practical Course: Neural Network Exercises [M-INFO-103143]

**Responsible:** Prof. Dr. Alexander Waibel  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Mandatory**

| T-INFO-106259 | Practical Course: Neural Network Exercises | 3 CR | Waibel |

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Information Systems M.Sc.  
Module Handbook as of 11/04/2024
### Module: Practical Course: Programme Verification [M-INFO-101537]

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<tr>
<th>Responsible</th>
<th>Prof. Dr. Bernhard Beckert</th>
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### 5.173 Module: Practical Course: Scientific Data Management [M-INFO-106312]

**Responsible:** Prof. Dr.-Ing. Klemens Böhm  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Mandatory**

| T-INFO-112810 | Practical Course: Scientific Data Management | 4 CR | Böhm |

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Information Systems M.Sc.  
Module Handbook as of 11/04/2024
# Module: Practical Course: Smart Data Analytics [M-INFO-103235]

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<tr>
<th>Responsible</th>
<th>Prof. Dr.-Ing. Michael Beigl</th>
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**Credits** 6  
**Grading scale** Grade to a tenth  
**Recurrence** Each summer term  
**Duration** 1 term  
**Language** German  
**Level** 4  
**Version** 1

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## 5.175 Module: Practical Course: Smart Energy System Lab [M-INFO-105955]

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<th>Responsible</th>
<th>Prof. Dr. Veit Hagenmeyer</th>
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| T-INFO-103000 | Practical Course: Visual Computing | 6 CR | Dachsbacher |

**Module: Practical Course: Visual Computing [M/INFO-101567]**

- **Responsible:** Prof. Dr.-Ing. Carsten Dachsbacher
- **Organisation:** KIT Department of Informatics
- **Part of:** Informatics
- **Credits:** 6
- **Grading scale:** Grade to a tenth
- **Recurrence:** Each term
- **Duration:** 1 term
- **Language:** German
- **Level:** 4
- **Version:** 1
5.177 Module: Practical Course: Web Applications and Service-Oriented Architectures (II) [M-INFO-101635]

**Responsible:** Prof. Dr. Sebastian Abeck  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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<td>1 term</td>
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**Mandatory**

| T-INFO-103121 | Practical Course: Web Applications and Service-Oriented Architectures (II) | 5 CR | Abeck |
5.178 Module: Practical Introduction to Hardware Security [M-INFO-104357]

**Responsible:** Prof. Dr. Mehdi Baradaran Tahoori

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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**Mandatory**

| T-INFO-108920 | Practical Introduction to Hardware Security | 6 CR | Tahoori |

**Competence Certificate**

See partial achievements (Teilleistung)

**Prerequisites**

See partial achievements (Teilleistung)

**Competence Goal**

The goal of this course, which is a combination of lectures and lab assignments, is to have a hands-on experience on basic concepts and new developments in hardware security, by combining both theory and practice in a coherent course. The theoretical concepts for each topic will be presented to the students in form of lectures, followed by a set of lab assignments on both hardware and software platforms to be performed by the students for each topic.

**Content**

1. Hardware security primitives (PUF, TRNG)
2. Hardware Implementation of encryption modules (AES)
3. Passive Attack with side channel (on AES)
4. Active fault attack (on AES)

**Workload**

4 SWS / 6 ECTS = 180h

2 SWS lecture (1.5h) + 2 SWS practical course (1.5h) / week

**Recommendation**

Knowledge of Digital Design (lecture TI)

Practical Course “FPGA Programming”
## 5.179 Module: Practical Project Robotics and Automation I (Software) [M-INFO-102224]

**Responsible:** Prof. Dr.-Ing. Björn Hein  
Prof. Dr.-Ing. Thomas Längle  

**Organisation:** KIT Department of Informatics  

**Part of:** Informatics

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Module: Practical Project Robotics and Automation II (Hardware) [M/INFO-102230]

**M. 5.180 Module: Practical Project Robotics and Automation II (Hardware) [M/INFO-102230]**

**Responsible:** Prof. Dr.-Ing. Björn Hein  
Prof. Dr.-Ing. Thomas Längle

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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**Mandatory**

| T/INFO-104552 | Practical Project Robotics and Automation II (Hardware) | 6 CR | Hein, Längle |
5.181 Module: Practical SAT Solving [M-INFO-102825]

- **Responsible:** Prof. Dr. Peter Sanders
- **Organisation:** KIT Department of Informatics
- **Part of:** Informatics

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<td>T-INFO-105798</td>
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**Competence Certificate**
See partial achievement.

**Prerequisites**
See partial achievement.

**Competence Goal**
Students are able to evaluate combinatorial problems, assess their complexity, and solve them using computers.

Students learn how to solve combinatorial problems efficiently using SAT Solving. Students are able to assess the practical complexity of decision and optimization problems, encode problems as SAT problems, and implement efficient solution procedures for combinatorial problems.

Students gain insight into state-of-the-art solution methods for SAT and related problems and their implementations in SAT solvers.

**Content**
The problem of propositional satisfiability (SAT) is an outstanding problem of computer science from a theoretical as well as practical perspective. Being the first problem proven to be NP-complete, it serves as a fundamental tool for research in complexity theory. Moreover, SAT solving has been established as one of the most important fundamental methods in hardware and software verification, and is used to solve hard combinatorial problems in industrial practice as well. This module aims to provide students with the theoretical and practical aspects of SAT-Solving. Covered are:

1. basics, historical development
2. encodings, e.g. cardinality constraints
3. phase transitions in random problems
4. local search (GSAT, WalkSAT, ..., ProbSAT)
5. resolution, Davis-Putnam algorithm, DPLL algorithm, look-ahead algorithm
6. efficient implementations, data structures
7. heuristics in the DPLL algorithm
8. CDCL algorithm, clause learning, implication graphs
9. restarts and heuristics in the CDCL algorithm
10. preprocessing, inprocessing
11. generation of proofs and their checking
12. parallel SAT solving (guiding paths, portfolios, cube-and-conquer)
13. related problems: MaxSAT, MUS, #SAT, QBF
14. advanced applications: Bounded model checking, planning, satisfiability-modulo-theories

**Workload**
Lecture (2 SWS) + exercise (1 SWS)

(Preparation and follow-up: 4h/week, exercises: 2h/week, preparation for exam: 15h)

Total workload: (2 SWS + 1 SWS + 4 SWS + 2 SWS) x 15 h + 15h preparation = 9x15h + 15h = 150h = 5 ECTS
### 5.182 Module: Practical: Course Engineering Approaches to Software Development [M-INFO-104254]

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**Mandatory**

| T-INFO-108791 | Practical Course Engineering Approaches to Software Development | 6 CR | Reussner |

**Responsible:** Prof. Dr. Ralf Reussner

**Organisation:** KIT Department of Informatics

**Part of:** Informatics
5.183 Module: Private Business Law [M-INFO-101216]

**Responsible:** N.N.

**Organisation:** KIT Department of Informatics

**Part of:** Law

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**Private Business Law (Election: at least 1 item as well as at least 9 credits)**

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<td>Seminar: Commercial and Corporate Law in the IT Industry</td>
<td>3 CR</td>
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<tr>
<td>T-INFO-101288</td>
<td>Corporate Compliance</td>
<td>3 CR</td>
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<td>T-INFO-102036</td>
<td>Computer Contract Law</td>
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<td>T-INFO-111436</td>
<td>Employment Law</td>
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<td>T-INFO-111437</td>
<td>Tax Law</td>
<td>3 CR</td>
<td>Dietrich</td>
</tr>
</tbody>
</table>

**Prerequisites**
None

**Competence Goal**
The student

- has gained in-depth knowledge of German company law, commercial law and civil law;
- is able to analyze, evaluate and solve complex legal and economic relations and problems;
- is well grounded in individual labour law, collective labour law and commercial constitutional law, evaluates and critically assesses clauses in labour contracts;
- recognizes the significance of the parties to collective labour agreements within the economic system and has differentiated knowledge of labour disputes law and the law governing the supply of temporary workers and of social law;
- possesses detailed knowledge of national earnings and corporate tax law and is able to deal with provisions of tax law in a scientific manner and assesses the effect of these provisions on corporate decision-making.

**Content**
The module provides the student with knowledge in special matters in business law, like employment law, tax law and business law, which are essential for managerial decisions.
5.184 Module: Probability and Computing [M-INFO-106469]

**Responsible:** TT-Prof. Dr. Thomas Bläsius
Prof. Dr. Peter Sanders

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

<table>
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</table>
Module: Project Lab Applied Machine Learning [M-WIWI-106491]

**5.185 Module: Project Lab Applied Machine Learning [M-WIWI-106491]**

**Responsible:** Prof. Dr.-Ing. Johann Marius Zöllner  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Informatics

<table>
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**Compulsory Elective Courses (Election:)

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<td>Project Lab Cognitive Automobiles and Robots</td>
<td>5 CR</td>
</tr>
<tr>
<td>T-WIWI-109983</td>
<td>Project Lab Machine Learning</td>
<td>5 CR</td>
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</table>

**Election regulations**
Elections in this module must be complete. Election is only possible until the lower bounds are reached.

**Compulsory Elective Courses (Election:)

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<th>Course Code</th>
<th>Course Title</th>
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<td>Project Lab Cognitive Automobiles and Robots</td>
<td>5 CR</td>
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<tr>
<td>T-WIWI-109983</td>
<td>Project Lab Machine Learning</td>
<td>5 CR</td>
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</table>

**Competence Certificate**
The module examination takes the form of an examination on the selected project lab. The control of success is described for each project lab.

**Competence Goal**
Students
- Are able to solve real-world scientific problems using modern machine learning approaches.
- Are able to specify, adapt, and implement learning-based models to problems.
- Know advantages of learning-based algorithms over traditional solution strategies.

**Content**
The module is to be regarded as a practice-oriented supplement to theoretical lectures on machine learning.

In the practical course, groups of two to four students each are given scientific tasks in the field of autonomous driving or robotics to be solved using modern ML-based methods. The tasks are of applied nature and mostly additionally require an integrating of the learned methods into existing systems provided by the chair and scientific partners. Due to the application reference, additional conditions are imposed on the learned procedures.

Students analyze the task, research the current state of the art, specify, implement and evaluate their own learning-based methods and present their results in a lecture and final report.

**Annotation**
The main difference of the internships within the module differ by the rotation in which they are held.
- Project Lab Cognitive Automobile every winter semester.
- Project Lab Machine Learning every summer semester.

**Workload**
The workload of 5 credit points consists of attendance time at the experimental site for the practical implementation of the selected solution, as well as time for literature research and planning/specification of the selected solution. In addition, a short report and presentation of the work carried out will be prepared.

**Recommendation**
Theoretical knowledge about machine learning methods is necessary. This can be acquired e.g. by lectures "Machine Learning 1: Basic Methods", or "Machine Learning 2: Advanced Methods". Also lectures of other research groups like "Machine Learning - Basics and Algorithms", "Deep Learning for Computer Vision 1/2" or "Deep Learning and Neural Networks" lay good theoretical foundations for the project lab.

First experiences with deep learning frameworks in Python like PyTorch/Jax/Tensorflow are an advantage.
## 5.186 Module: Project Lab: Image Analysis and Fusion [M-INFO-102383]

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<tr>
<th>Responsible</th>
<th>Prof. Dr.-Ing. Jürgen Beyerer</th>
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<tr>
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### Mandatory

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### Module: Public Business Law [M-INFO-101217]

**Responsible:** N.N.  
**Organisation:** KIT Department of Informatics  
**Part of:** Law

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**Public Business Law (Election: at least 1 item as well as at least 9 credits)**

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<td>T-INFO-101312</td>
<td>European and International Law</td>
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<td>T-INFO-111404</td>
<td>Seminar: IT- Security Law</td>
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<td>T-INFO-113381</td>
<td>Public International Law</td>
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**Competence Certificate**

see course description.
# 5.188 Module: Rationale Splines [M-INFO-101857]

**Responsible:** Prof. Dr. Hartmut Prautzsch  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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### 5.189 Module: Rationale Splines [M-INFO-101853]

**Responsible:** Prof. Dr. Hartmut Prautzsch  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Prerequisites**

one
### 5.190 Module: Real-Time Systems [M-INFO-100803]

**Responsible:** Prof. Dr.-Ing. Thomas Längle  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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</table>
5.191 Module: Reliable Computing I [M-INFO-100850]

**Responsible:** Prof. Dr. Mehdi Baradaran Tahoori

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

**Credits** 3

**Grading scale** Grade to a tenth

**Recurrence** Each winter term

**Duration** 1 term

**Language** English

**Level** 4

**Version** 1

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</table>
| T-INFO-101387 | Reliable Computing I | 3 CR | Tahoori

**Competence Certificate**
See partial achievements (Teilleistung)

**Prerequisites**
See partial achievements (Teilleistung)

**Competence Goal**
The objective of this course is to become familiar with general and state of the art techniques used in design and analysis of fault-tolerant digital systems.

**Content**
The objective of this course is to become familiar with general and state of the art techniques used in design and analysis of fault-tolerant digital systems. The students will study and investigate existing fault-tolerant systems. Both Hardware and software methods will be studied and new research topics will be investigated.

This course overviews reliable (fault-tolerant) computing and the design and evaluation of dependable systems, and provides a base for research in reliable systems. Models and methods are used in the analysis and design of fault-tolerant and highly reliable computer systems will be taught in this course. Topics include faults and their manifestations, fault/error modeling, reliability, availability and maintainability analysis, system evaluation, performance-reliability trade-offs, system level fault diagnosis, hardware and software redundancy techniques, and fault-tolerant system design methods.

**Workload**
2 SWS (2 SWS + 1.5 x 2 SWS) x 15 + 15 h preparation for the exam = 90 h = 3 ECTS
5.192 Module: Research Focus Class: Blockchain & Cryptocurrencies [M/INFO-106654]

**Responsible:** Prof. Dr. Hannes Hartenstein

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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Module: Research Practical Course: Interactive Learning [M-INFO-106300]

**Responsible:** TT-Prof. Dr. Rudolf Lioutikov  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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</table>

**Mandatory**

| T-INFO-112772 | Research Practical Course: Interactive Learning | 6 CR | Lioutikov |

**Competence Certificate**
See Partial achievements (Teilleistung).

**Prerequisites**
See Partial achievements (Teilleistung).

**Competence Goal**
Die Studenten lernen komplexe wissenschaftliche Themengebiete zu verstehen, zu hinterfragen und veröffentlichte Resultate zu reproduzieren und zu überprüfen. Die Studenten erlangen ein vertieftes Wissen im Bereich des Interaktiven Lernens und Erfahrung mit dem Einsatz von neuartigen Lernverfahren.

**Content**
Each student will select a topic in the field of Interactive Learning and/or Explainable Artificial Intelligence. The organizers will suggest topics but the students are welcome to suggest relevant topics. The students will then implement and evaluate several algorithms corresponding to the chosen topic. The experimental evaluation will be documented in a report and presented to their peers.

It is highly recommended to take this research project in combination with the "Interactive Learning" Seminar, where the students get the chance to acquire the required background on the literature.

**Workload**
Arbeitsaufwand = 180h = 6 ECTS  
- Präsenzzeit: 15h  
- Projektarbeit: 135h  
- Scientific Report schreiben + Päsentation vorbereiten: 30h

**Recommendation**
We highly recommend to take this research project in combination with the “Interactive Learning” seminar. It is highly recommended to attend the “Explainable Artificial Intelligence” lecture in parallel or prior to this project.

- Experience in Machine Learning is recommended, e.g. through prior coursework.  
- The Computer Science Department offers several great lectures e.g., “Maschinelles Lernen - Grundlagen und Algorithmen” and “Deep Learning”  
- A good mathematical background will be beneficial  
- Python experience is recommended  
- We might use the PyTorch deep learning library in the exercises. Some prior knowledge in this is helpful but not necessary.
5.194 Module: Research Project (Project, 1st Semester) [M-INFO-105037]

**Responsible:** Prof. Dr. Bernhard Beckert  
Prof. Dr.-Ing. Michael Beigl  
Prof. Dr. Ralf Reussner

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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</table>
## Module: Research Project (Project, 2nd Semester) [M-INFO-105038]

### Responsible:
- Prof. Dr. Bernhard Beckert
- Prof. Dr.-Ing. Michael Beigl
- Prof. Dr. Ralf Reussner

### Organisation:
- KIT Department of Informatics
- Part of: Informatics

### Credits
- 10

### Grading scale
- Grade to a tenth

### Recurrence
- Each term

### Duration
- 2 terms

### Language
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### Level
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### Version
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### Mandatory

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Module: Robotics - Practical Course [M-INFO-102522]

**Responsible:** Prof. Dr.-Ing. Tamim Asfour

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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**Mandatory**

| T-INFO-105107 | Robotics - Practical Course | 6 CR | Asfour |

**Competence Certificate**

See partial achievements (Teilleistung)

**Prerequisites**

See partial achievements (Teilleistung)

**Competence Goal**

The student knows concrete solutions for different problems in robotics. He/she uses methods of inverse kinematics, grasp and motion planning, and visual perception. The student can implement solutions in the programming languages C++ and Python with the help of suitable software frameworks.

**Content**

The practical course is offered as an accompanying course to the lectures Robotics I-III. Every week, a small team of students will work on solving a given robotics problem. The list of topics includes robot modeling and simulation, inverse kinematics, robot programming via state charts, collision-free motion planning, grasp planning, robot vision and robot learning.

**Workload**

Practical course with 4 SWS, 6 LP
6 LP corresponds to 180 hours, including
2 hours introductory event
18 hours initial familiarization with the software framework
120 hours group work
40 hours attendance time

**Recommendation**

Module: Robotics I - Introduction to Robotics [M-INFO-100893]

**Mandatory**

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<td>Robotics I - Introduction to Robotics</td>
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</table>

**Competence Certificate**

See partial achievements (Teilleistung)

**Prerequisites**

See partial achievements (Teilleistung)

**Competence Goal**

The student is able to apply the presented concepts to simple and realistic tasks from robotics. This includes mastering and deriving the mathematical concepts relevant for robot modeling. Furthermore, the student masters the kinematic and dynamic modeling of robot systems, as well as the modeling and design of simple controllers. The student knows the algorithmic basics of motion and grasp planning and can apply these algorithms to problems in robotics. He/she knows algorithms from the field of image processing and is able to apply them to problems in robotics. He/she masters the kinematic and dynamic modeling of robot systems, as well as the modeling and design of simple controllers. The student knows the algorithmic basics of motion and grasp planning and can apply these algorithms to problems in robotics. He/she knows algorithms from the field of image processing and is able to apply them to problems in robotics. He/she masters the kinematic and dynamic modeling of robot systems, as well as the modeling and design of simple controllers. The student knows the algorithmic basics of motion and grasp planning and can apply these algorithms to problems in robotics. He/she knows algorithms from the field of image processing and is able to apply them to problems in robotics.

**Content**

The lecture provides an overview of the fundamentals of robotics using the examples of industrial robots, service robots and autonomous humanoid robots. An insight into all relevant topics is given. This includes methods and algorithms for robot modeling, control and motion planning, image processing and robot programming. First, mathematical basics and methods for kinematic and dynamic robot modeling, trajectory planning and control as well as algorithms for collision-free motion planning and grasp planning are covered. Subsequently, basics of image processing, intuitive robot programming especially by human demonstration and symbolic planning are presented.

In the exercise, the theoretical contents of the lecture are further illustrated with examples. Students deepen their knowledge of the methods and algorithms by independently working on problems and discussing them in the exercise. In particular, students can gain practical programming experience with tools and software libraries commonly used in robotics.

**Workload**

Lecture with 3 SWS + 1 SWS Tutorial, 6 LP

6 LP corresponds to 180 hours, including

- 15 * 3 = 45 hours attendance time (lecture)
- 15 * 1 = 15 hours attendance time (tutorial)
- 15 * 6 = 90 hours self-study and exercise sheets
- 30 hours preparation for the exam
**Module: Robotics II - Humanoid Robotics [M-INFO-102756]**

**Responsible:** Prof. Dr.-Ing. Tamim Asfour  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Mandatory**

| T-INFO-105723 | Robotics II - Humanoid Robotics | 3 CR | Asfour |

**Competence Certificate**  
See partial achievements (Teilleistung)

**Prerequisites**  
See partial achievements (Teilleistung)

**Competence Goal**

The students have an overview of current research topics in autonomous learning robot systems using the example of humanoid robotics. They are able to classify and evaluate current developments in the field of cognitive humanoid robotics.

The students know the essential problems of humanoid robotics and are able to develop solutions on the basis of existing research.

**Content**

The lecture presents current work in the field of humanoid robotics that deals with the implementation of complex sensorimotor and cognitive abilities. In the individual topics different methods and algorithms, their advantages and disadvantages, as well as the current state of research are discussed.

The topics addressed are: Applications and real world examples of humanoid robots; biomechanical models of the human body, biologically inspired and data-driven methods of grasping, imitation learning and programming by demonstration; semantic representations of sensorimotor experience as well as cognitive software architectures of humanoid robots.

**Workload**

Lecture with 2 SWS, 3 CP.  
3 LP corresponds to approx. 90 hours, thereof:  
approx. 15 * 2h = 30 Std. Attendance time  
approx. 15 * 2h = 30 Std. Self-study prior/after the lecture  
approx. 30 Std. Preparation for the exam and exam itself

**Recommendation**

Having visited the lectures on Robotics I - Introduction to Robotics and Mechano-Informatics and Robotics is recommended.
### Module: Robotics III - Sensors and Perception in Robotics [M-INFO-104897]

**Responsible:** Prof. Dr.-Ing. Tamim Asfour  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Mandatory**
| T-INFO-109931 | Robotics III - Sensors and Perception in Robotics | 3 CR | Asfour |

**Competence Certificate**
See partial achievements (Teilleistung)

**Prerequisites**
See partial achievements (Teilleistung)

**Competence Goal**
Students can name the main sensor principles used in robotics.  
Students can explain the data flow from physical measurement through digitization to the use of the recorded data for feature extraction, state estimation and semantic scene understanding.  
Students are able to propose and justify suitable sensor concepts for common tasks in robotics.

**Content**
The lecture supplements the lecture Robotics I with a broad overview of sensors used in robotics. The lecture focuses on visual perception, object recognition, semantic scene interpretation, and (inter-)active perception. The lecture is divided into two parts:

In the first part a comprehensive overview of current sensor technologies is given. A basic distinction is made between sensors for the perception of the environment (exteroceptive) and sensors for the perception of the internal state (proprioceptive).

The second part of the lecture concentrates on the use of exteroceptive sensors in robotics. The topics covered include tactile exploration and visual data processing, including advanced topics such as feature extraction, object localization, semantic scene interpretation, and (inter-)active perception.

**Workload**
Lecture with 2 SWS, 3 LP  
3 LP corresponds to 90 hours, including  
15 * 2 = 30 hours attendance time  
15 * 2 = 30 hours self-study  
30 hours preparation for the exam

**Recommendation**
Attending the lecture Robotics I – Introduction to Robotics is recommended.
5.201 Module: Scientific Methods to Design and Analyze Secure Decentralized Systems [M-INFO-105780]

**Responsible:** Prof. Dr. Hannes Hartenstein  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Mandatory**

| T-INFO-111568 | Scientific Methods to Design and Analyze Secure Decentralized Systems | 5 CR | Hartenstein |

**Competence Certificate**

See partial achievements (Teilleistung)

**Prerequisites**

See partial achievements (Teilleistung)

**Competence Goal**

1. Philosophy of Science: The student understands epistemological principles like the scientific and mathematical process, within the context of networked and decentralized systems. The student knows about the current limits of scientific research, especially in regards to the security of a given decentralized system.
2. Empirical Methods: Observation / Monitoring: The student is able to construct setups to monitor system properties related to performance or security. The student knows how to observe a decentralized system like an overlay network without interference, i.e., without impact on the behavior to measure as well as the overall system functionality.
3. Combined Empirical / Formal Methods: The student has a fundamental understanding of Discrete Event Simulations, as well as stochastic modelling and random number generation. The student is able to conduct a simulation study consisting of observation, modelling, simulation, validation, and result analysis.
4. Formal Methods: The student knows how to apply formal methods like formal verification / model checking and model comparison / simulation-based proofs to decentralized systems. The student understands tradeoffs between empirical and formal methods, and can choose suitable methods for given research tasks.
5. Applications in Research: The student understands how the methods of this lecture are applied to practical examples, and knows how to apply the methods on problems of a researcher’s everyday life.

**Content**

Decentralized Systems (like peer-to-peer- or blockchain-based systems) are systems controlled by multiple parties who make their own independent decisions to reach a common goal. However, not knowing which parties are trustworthy and which are betrayers requires a radically different way of thinking. Based on the lecture “Decentralized Systems: Fundamentals, Modeling, and Applications”, in this lecture, we cover the necessary scientific methods to analyze existing and to create new decentralized systems. We treat both, selected empirical and formal methods and their tradeoffs, as well as the overarching philosophy of science behind the research process. Together with its practical parts, this lecture provides the foundational scientific toolbox to work on the decentralized systems of the future.

**Workload**

1. Attendance time (Course, exercise): 3 SWS: 15 x 3h = 45h
2. Self-study (e.g. independent review of course material, work on homework assignments):  
   Weekly preparation and follow-up of the lecture/exercise: 15 x 3 SWS x 1,5h = 67,5hh
3. Preparation for the exam: 37,5h
   \[ \Sigma = 150h = 5 \text{ECTS} \]

**Recommendation**

Prior knowledge on the abstract concepts as well as concrete use cases of decentralized systems is strongly recommended. The “Decentralized Systems: Fundamentals, Modeling, and Applications” lecture covers all necessary aspects, but equivalent lectures and/or self-study can also be sufficient.
5.202 Module: Seminar Information Systems [M-WIWI-104815]

 Responsible: Studiendekan der KIT-Fakultät für Informatik
 Studiendekan des KIT-Studienganges

 Organisation: KIT Department of Economics and Management
 Part of: Seminars

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Mandatory

| T-WIWI-109827 | Seminar in Information Systems (Master) | 3 CR |

Competence Certificate

The assessment is done by a seminar with at least 3 CP.

The assessment of the seminar (following §4(2), 3 ER) is described at the course description.

Prerequisites

None.

Competence Goal

- Students are able to independently deal with a defined problem in a specialized field based on scientific criteria.
- They are able to research, analyze the information, abstract and derive basic principles and regularities from unstructured information.
- They can solve the problems in a structured manner using their interdisciplinary know-how.
- They know how to validate the obtained results.
- Finally, they are able to logically and systematically present the 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.

Content

The module consists of a seminar, that is related to the research field of economic sciences. A complete list of available seminars is published in the internet.

Annotation

The mentioned seminars in this module handbook are place holders. For each semester, a complete list of seminars are published in the Vorlesungsverzeichnis or at the web pages of the participating institutes. Often, the seminar topics for a given semester are published at the end of the preceding semester. Some seminars require an early sign-in deadline at the end of the of the preceding semester.

Workload

The total workload for this module is approximately 90 hours.
### 5.203 Module: Seminar Laboratory: Machine Learning and Intelligent Systems [M-INFO-105959]

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<th>Responsible</th>
<th>Prof. Dr.-Ing. Uwe Hanebeck</th>
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**Mandatory**

| T-INFO-112105 | Seminar Laboratory: Machine Learning and Intelligent Systems | 3 CR | Fennel, Hanebeck |
5.204 Module: Seminar Module Economic Sciences [M-WIWI-102736]

Responsible: Studiendekan des KIT-Studienganges
Organisation: KIT Department of Economics and Management
Part of: Seminars

Compulsory Elective Courses (Election: 1 item)

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T-WIWI-103474  Seminar in Business Administration A (Master)  3 CR  Professorenschaft des Fachbereichs Betriebswirtschaftslehre
T-WIWI-103478  Seminar in Economics A (Master)  3 CR  Professorenschaft des Fachbereichs Volkswirtschaftslehre
T-WIWI-103481  Seminar in Operations Research A (Master)  3 CR  Nickel, Rebennack, Stein
T-WIWI-103483  Seminar in Statistics A (Master)  3 CR  Grothe, Schienle

Competence Certificate
The assessment is done by a seminar with at least 3 CP.
The assessment of the seminar (following §4(2), 3 ER) is described at the course description.

Prerequisites
None.

Competence Goal
- Students are able to independently deal with a defined problem in a specialized field based on scientific criteria.
- They are able to research, analyze the information, abstract and derive basic principles and regularities from unstructured information.
- They can solve the problems in a structured manner using their interdisciplinary know-how.
- They know how to validate the obtained results.
- Finally, they are able to logically and systematically present the 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.
- Students are familiar with the DFG’s Code of Conduct “Guidelines for Safeguarding Good Research Practice” and base their scientific work on it.

Content
The module consists of a seminar, that is related to the research field of economic sciences. A complete list of available seminars is published in the internet.
The teaching of the DFG Code “Guidelines for Safeguarding Good Research Practice” takes place within the online course “Good Scientific Practice” of the KIT Library, which can be completed in self-study.

Annotation
The mentioned seminars in this module handbook are place holders. For each semester, a complete list of seminars are published in the Vorlesungsverzeichnis or at the web pages of the participating institutes. Often, the seminar topics for a given semester are published at the end of the preceding semester. Some seminars require an early sign-in deadline at the end of the of the preceding semester.

Workload
The total workload for this module is approximately 90 hours.
5.205 Module: Seminar Module Informatics [M-INFO-102822]

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

Part of:  
Seminars

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Compulsory Elective Seminar in Informatics (Election: 1 item)

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## 5.206 Module: Seminar Module Law [M-INFO-101218]

**Responsible:** N.N.  
**Organisation:** KIT Department of Informatics  
**Part of:** Seminars

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**Mandatory**

| T-INFO-101997 | Seminar: Legal Studies I | 3 CR | N.N. |
Module: Service Analytics [M-WIWI-101506]

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

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

**Part of:** Economics and Management (Business Administration)

<table>
<thead>
<tr>
<th>Credits</th>
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<th>Duration</th>
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**Compulsory Elective Courses (Election: 9 credits)**

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<th>Course Code</th>
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<tr>
<td>T-WIWI-108715</td>
<td>Artificial Intelligence in Service Systems</td>
<td>4.5</td>
<td>Satzger</td>
</tr>
<tr>
<td>T-WIWI-111219</td>
<td>Artificial Intelligence in Service Systems - Applications in Computer Vision</td>
<td>4.5</td>
<td>Satzger</td>
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<td>T-WIWI-105777</td>
<td>Business Intelligence Systems</td>
<td>4.5</td>
<td>Mädche</td>
</tr>
<tr>
<td>T-WIWI-112152</td>
<td>Practical Seminar: Artificial Intelligence in Service Systems</td>
<td>4.5</td>
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<tr>
<td>T-WIWI-109940</td>
<td>Special Topics in Information Systems</td>
<td>4.5</td>
<td>Weinhardt</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.

**Prerequisites**

None

**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

**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.

**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](http://www.ksri.kit.edu/teaching).

**Workload**

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

**Recommendation**

The course Service Analytics A [2595501] should be taken.
5.208 Module: Service Design Thinking [M-WIWI-101503]

Responsible: Prof. Dr. Gerhard Satzger  
Prof. Dr. Orestis Terzidis

Organisation: KIT Department of Economics and Management

Part of: Economics and Management (Business Administration)

<table>
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Mandatory

T-WIWI-102849 Service Design Thinking 12 CR Satzger, Terzidis

Competence Certificate

The assessment is carried out as a general exam (according to Section 4(2), 3 of the examination regulation). The overall grade of the module is the grade of the examination (according to Section 4(2), 3 of the examination regulation).

Prerequisites

None

Competence Goal

- Deep knowledge of the innovation method Design Thinking, as introduced and promoted by Stanford University
- Development of new, creative solutions through extensive observation of oneself and one's environment, in particular with regard to the relevant service users
- Know how to use prototyping and experimentation to visualize one's ideas, to test and iteratively develop them, and to converge on a solution
- Learn to apply the method to a real innovation projects issued by industry partners.

Content

- Paper Bike: Learning about the basic method elements by building a paper bike that has to fulfill a given set of challenges. The bikes will be tested in a race during an international Kick-Off event with other universities of the SUGAR network (international Design Thinking network).
- Design Space Exploration: Exploring the problem space through customer and user observation as well as desk research.
- Critical Function Prototype: Identification of critical features from the customer's perspective that can contribute to the solution of the overarching problem. Building and testing prototypes that integrate these functionalities.
- Dark Horse Prototype: Inverting earlier assumptions and experiences, which leads to the inclusion of new features and solutions. Developing radically new ideas are in the focus of this phase.
- Funky Prototype: Integration of the individually tested and successful functions to several complete solution scenarios, which are further tested and developed.
- Functional Prototype: Selection of successful scenarios from the previous phase and building a higher resolution prototype. The final solution to the challenge is laid out in detail and tested with users.
- Final Prototype: Implementing the functional prototype and presenting it to the customer.

Annotation

Due to practical project work as a component of the program, access is limited. The module (as well as the module component) spans two semesters. It starts in September every year and runs until end of June in the subsequent year. Entering the program is only possible at its beginning - after prior application in May/June. For more information on the application process and the program itself are provided in the module component description and the program's website (http://sdt-karlsruhe.de). Furthermore, the KSRI conducts an information event for applicants every year in May. This module is part of the KSRI Teaching Program „Digital Service Systems“. For more information see the KSRI Teaching website: www.ksri.kit.edu/teaching.

Workload

The total amount of work for this module is approx. 270 hours (9 credits). The workload for this course is comparably high as the course runs in cooperation with partner universities from around the world as well as partner companies. This causes overhead.
**Recommendation**
This course is held in English – proficiency in writing and communication is required.
Our past students recommend to take this course at the beginning of the masters program.
5.209 Module: Service Economics and Management [M-WIWI-102754]

Responsibility: Prof. Dr. Gerhard Satzger
Prof. Dr. Christof Weinhardt

Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Business Administration)

<table>
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Compulsory Elective Courses (Elective: 9 credits)

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<th>Instructor</th>
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<tr>
<td>T-WIWI-112757</td>
<td>Digital Services: Innovation &amp; Business Models</td>
<td>4.5 CR</td>
<td>Satzger</td>
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<tr>
<td>T-WIWI-112823</td>
<td>Platform &amp; Market Engineering: Commerce, Media, and Digital Democracy</td>
<td>4.5 CR</td>
<td>Weinhardt</td>
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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.

Prerequisites
None

Competence Goal
Students

- understand the scientific basics of the management of digital services and corresponding systems
- gain a comprehensive insight in the importance and the most important features of information systems as an central component of the digitalization of business processes, products and services
- know the most relevant concepts and theories to shape the digital transformation process of service systems successfully
- understand the OR methods in the sector of service management and apply them adequately
- are able to use large amounts of available data systematically for the planning, operation and improvement of complex service offers and to design and control information systems
- are able to develop market-oriented coordination mechanisms and apply service systems.

Content
This module provides the foundation for the management of digital services and corresponding systems. The courses in this module cover the major concepts for a successful management of service systems and their digital transformation. Current examples from the research and practice enhance the relevance of the discussed topics.

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.

From summer semester 2023, the course Service Innovation will be offered with a revised course concept and content. The focus will be on the closer integration of the topics of service innovation and digitalization. Current foundational content (e.g., on service innovation challenges or human-centered innovation methods) will remain. New content will cover topics such as digital platforms and ecosystems, IoT and smart service innovation, and business models.

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

Recommendation
None
5.210 Module: Service Innovation, Design & Engineering [M-WIWI-102806]

**Responsible:** Prof. Dr. Alexander Mädche  
Prof. Dr. Gerhard Satzger

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

**Part of:** Economics and Management (Business Administration)

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<th>Duration</th>
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**Compulsory Elective Courses** (Election: 9 credits)

- **T-WIWI-112757** Digital Services: Innovation & Business Models  
  4.5 CR Satzger
- **T-WIWI-113460** Engineering Interactive Systems: AI & Wearables  
  4.5 CR Mädche
- **T-WIWI-102639** Business Models in the Internet: Planning and Implementation  
  4.5 CR Weinhardt
- **T-WIWI-113459** Practical Seminar: Human-Centered Systems  
  4.5 CR Mädche
- **T-WIWI-110887** Practical Seminar: Service Innovation  
  4.5 CR Satzger

**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.

**Prerequisites**

**Dependencies between courses:**

The course Practical Seminar Service Innovation cannot be applied in combination with the course Practical Seminar Digital Service Design.

**Competence Goal**

**Students**

- know about the challenges, concepts, methods and tools of service innovation management and are able to use them successfully.
- have a profound comprehension of the development and design of innovative services and are able to apply suitable methods and tools on concrete and specific issues.
- are able to embed the concepts of innovation management, development and design of services into organisations
- are aware of the strategic importance of services, are able to present value creation in the context of services systems and to strategically exploit the possibilities of their digital transformation
- elaborate concrete and problem-solving solutions for practical tasks in teams.

**Content**

This module is designed to constitute the basis for the development of successful ICT supported innovations thus including the methods and tools for innovation management, for the design and the development of digital services and the implementation of new business models. Current examples from science and practice enhance the relevance of the topics addressed.

**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](http://www.ksri.kit.edu/teaching).

From summer semester 2023, the course Service Innovation will be offered with a revised course concept and content. The focus will be on the closer integration of the topics of service innovation and digitalization. Current foundational content (e.g., on service innovation challenges or human-centered innovation methods) will remain. New content will cover topics such as digital platforms and ecosystems, IoT and smart service innovation, and business models.

**Workload**

The total workload for this module is approximately 270 hours. For further information see German version.
**Recommendation**
Attending the course Practical Seminar Service Innovation [2595477] is recommended in combination with the course Service Innovation [2595468].

Attending the course Practical Seminar Digital Service Design [new] is recommended in combination with the course Digital Service Design [new].
Module: Service Management [M-WIWI-101448]

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

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

**Part of:** Economics and Management (Business Administration)

<table>
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<th>Credits</th>
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### Compulsory Elective Courses (Election: 9 credits)

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<td>T-WIWI-108715</td>
<td>Artificial Intelligence in Service Systems</td>
<td>4,5 CR</td>
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<td>T-WIWI-111219</td>
<td>Artificial Intelligence in Service Systems - Applications in Computer Vision</td>
<td>4,5 CR</td>
<td>Satzger</td>
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<td>T-WIWI-112757</td>
<td>Digital Services: Innovation &amp; Business Models</td>
<td>4,5 CR</td>
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### Competence Certificate

The assessment is carried out as partial exams, 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 students

- understand the basics of developing and managing IT-based services,
- understand and apply OR methods in service management,
- systematically use vast amounts of available data for planning, operation, personalization and improvement of complex service offerings, and
- understand and analyze innovation processes in corporations.

### Content

The module service management addresses the basics of developing and managing IT-based services. The lectures contained in this module teach the basics of developing and managing IT-based services and the application of OR methods in the field of service management. Moreover, students learn to systematically analyze vast amounts of data for planning, operation and improvement for complex service offerings. These tools enhance operational and strategic decision support and help to analyze and understand the overall innovation processes in corporations. Current examples from research and industry demonstrate the relevance of the topics discussed in this module.

### Annotation

From summer semester 2023, the course Service Innovation will be offered with a revised course concept and content. The focus will be on the closer integration of the topics of service innovation and digitalization. Current foundational content (e.g., on service innovation challenges or human-centered innovation methods) will remain. New content will cover topics such as digital platforms and ecosystems, IoT and smart service innovation, and business models.

### Workload

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

### Recommendation

None
5.212 Module: Service Operations [M-WIWI-102805]

**Responsible:** Prof. Dr. Stefan Nickel  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Economics and Management (Operations Research)

**Credits** 9  
**Grading scale** Grade to a tenth  
**Recurrence** Each term  
**Duration** 1 term  
**Language** German  
**Level** 4  
**Version** 7

**Compulsory Elective Courses (Election: at most 2 items)**

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<tr>
<td>T-WIWI-102718</td>
<td>Discrete-Event Simulation in Production and Logistics</td>
<td>4.5 CR</td>
<td>Spieckermann</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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**Supplementary Courses (Election: at most 1 item)**

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<th>Course Title</th>
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<tr>
<td>T-MACH-112213</td>
<td>Applied material flow simulation</td>
<td>4.5 CR</td>
<td>Baumann</td>
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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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<td>T-WIWI-110971</td>
<td>Demand-Driven Supply Chain Planning</td>
<td>4.5 CR</td>
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**Compentence 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.

**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.

**Compentence Goal**

Students

- know the theoretical bases and the key components of Business Intelligence systems,
- acquire 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

**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.
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.

Recommendation
The course Practical Seminar Health Care should be combined with the course OR in Health Care Management.
5.213 Module: Signals and Codes [M-INFO-100823]

**Responsible:** Prof. Dr. Jörn Müller-Quade  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

<table>
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**Mandatory**

<p>| T-INFO-101360 | Signals and Codes | 3 CR | Müller-Quade |</p>
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<tr>
<td>T-INFO-101381</td>
<td>Software Architecture and Quality</td>
<td>3 CR</td>
<td>Reussner</td>
</tr>
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</table>
### 5.215 Module: Software Engineering II [M-INFO-100833]

**Responsible:** Prof. Dr.-Ing. Anne Koziolek  
Prof. Dr. Ralf Reussner  

**Organisation:** KIT Department of Informatics  
**Part of:** Informatics  

<table>
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</table>

**Mandatory**

| T-INFO-101370 | Software Engineering II | 6 CR | Koziolek, Reussner |

**Content**

Requirements engineering, software development processes, software quality, software architectures, MDD, Enterprise Software Patterns software maintainability, software security, dependability, embedded software, middleware, domain-driven design.
### 5.216 Module: Software Lab Parallel Numerics [M-INFO-102998]

- **Responsible:** Prof. Dr. Wolfgang Karl
- **Organisation:** KIT Department of Informatics
- **Part of:** Informatics

<table>
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### 5.217 Module: Software Product Line Engineering [M-INFO-105471]

**Responsible:** Prof. Dr.-Ing. Ina Schaefer  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

<table>
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<td>T-INFO-111017</td>
<td>Software Product Line Engineering</td>
<td>3 CR Schaefer</td>
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## 5.218 Module: Software Security Engineering [M-INFO-106344]

**Responsible:** Prof. Dr. Ralf Reussner  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics  
**Credits:** 3  
**Grading scale:** Grade to a tenth  
**Recurrence:** Each summer term  
**Duration:** 1 term  
**Language:** German/English  
**Level:** 4  
**Version:** 1

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<tbody>
<tr>
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<td>Software Security Engineering</td>
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Information Systems M.Sc.  
Module Handbook as of 11/04/2024
### 5.219 Module: Software-Evolution [M-INFO-100719]

**Responsible:** Prof. Dr. Ralf Reussner  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

<table>
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**Mandatory**

| T-INFO-101256 | Software-Evolution | 3 CR | Reussner |

**Prerequisites**

None
Module: Statistics and Econometrics II [M-WIWI-105414]

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<tr>
<th>Responsible</th>
<th>Prof. Dr. Melanie Schienle</th>
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### Compulsory Elective Courses (Election: )

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<td>Statistical Modeling of Generalized Regression Models</td>
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### Competence Certificate
The assessment is carried out as partial exams 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 overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

### Prerequisites
None.

### Competence Goal
The student

- shows an advanced understanding of Econometric techniques and statistical model building.
- is able to develop advanced Econometric models for applied problems based on available data
- is able to apply techniques and models efficiently with statistical software, to interpret results and to judge on different approaches with appropriate statistical criteria.

### Content
The courses provide foundations of advanced Econometric and statistical techniques for regression, time series and multivariate analysis.

### Workload
The total workload for this module is approximately 270 hours.
### 5.221 Module: Stochastic Information Processing [M-INFO-100829]

- **Responsible:** Prof. Dr.-Ing. Uwe Hanebeck
- **Organisation:** KIT Department of Informatics
- **Part of:** Informatics

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Hanebeck
5.222 Module: Stochastic Optimization [M-WIWI-103289]

Responsible: Prof. Dr. Steffen Rebennack
Organisation: KIT Department of Economics and Management
Part of: Economics and Management (Operations Research)

Compulsory Elective Courses (Election: between 1 and 2 items)

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Supplementary Courses (Election: at most 1 item)

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<td>Topics in Stochastic Optimization</td>
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<td>Each term</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.

Prerequisites
At least one of the courses “Advanced Stochastic Optimization”, “Large-scale Optimization” or “Introduction to Stochastic Optimization” has to be taken.

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.

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.

Annotation
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.

Recommendation
It is recommended to listen to the lecture "Introduction to Stochastic Optimization" before the lecture "Advanced Stochastic Optimization" is visited.
### Module: Subdivision Algorithms [M-INFO-101863]

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<th>Duration</th>
<th>Language</th>
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</table>

**Competence Certificate**

See partial achievements (Teilleistung)

**Prerequisites**

See partial achievements (Teilleistung)

**Competence Goal**

Students of this course are knowledgeable about subdivision algorithms and are able to analyze the smoothness of subdivision algorithms.

**Content**

Chaikin algorithm, Lane-Riesenfeld algorithm, stationary subdivision for curves, regular quadrilateral, triangular and hexagonal meshes, the subdivision symbol, stencils, difference and derivative schemes, convergence theorems, four-point scheme, box spline subdivision, half box spline subdivision, stationary subdivision of arbitrary meshes with extraordinary points, the midpoints scheme, subdivision matrix, characteristic map, differentiability at extraordinary points, the simplest subdivision scheme, Doo-Sabin algorithm, Catmull-Clark algorithm, WAVE schemes including Loop's scheme, butterfly scheme, sqrt 3 scheme, 4-8 scheme, Ck subdivision algorithms, corner cutting and similar topics.

**Workload**

90h of which about

30h for attending the lecture

30h for post-processing

30h for exam preparation

Responsible: Prof. Dr. Hartmut Prautzsch

Organisation: KIT Department of Informatics

Part of: Informatics
5.224 Module: Telematics [M-INFO-100801]

**Responsible:** Prof. Dr. Martina Zitterbart  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

<table>
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</table>

**Mandatory**

| T-INFO-101338 | Telematics | 6 CR | Zitterbart |

**Competence Certificate**  
See partial achievement.

**Prerequisites**  
See partial achievement.

**Competence Goal**

**Students**

- master protocols, architectures, and methods and algorithms that are used on the Internet for routing and for establishing a reliable end-to-end connection, as well as various media allocation procedures in local networks.
- have an understanding of the systems and the problems that appear in a global, dynamic network as well as the mechanisms used to remedy them.
- are familiar with current developments such as SDN and data center networking.
- know methods to manage and administrate networks.

Students master the basic protocol mechanisms for establishing reliable end-to-end communication. Students have detailed knowledge of the mechanisms used in TCP for congestion and flow control and can discuss the issue of fairness with multiple parallel transport streams. Students can analytically determine the performance of transport protocols and know methods that fulfill special requirements of TCP, such as high data rates and short latencies. Students are familiar with current topics such as problems introduced by utilization of middle boxes in the Internet, the use of TCP in data centers and multipath TCP. Students can use transport protocols in practice.

Students know the functions of routers in the Internet and can reproduce and apply common routing algorithms. Students can reproduce the architecture of a router and know different approaches to buffer placement as well as their advantages and disadvantages.

Students understand the distinction of routing protocols into interior and exterior gateway protocols and have detailed knowledge of the functionality and properties of common protocols such as RIP, OSPF and BGP. The students are familiar with current topics such as SDN.

Students know the function of media allocation and can classify and analytically evaluate media allocation processes. Students have in-depth knowledge of Ethernet and are familiar with various Ethernet forms and their differences, especially current developments such as real-time Ethernet and data center Ethernet. Students can reproduce and apply the spanning tree protocol. Students can reproduce the technical characteristics of DSL. Students are familiar with the concept of label switching and can compare existing approaches such as MPLS.

**Content**

- Introduction
- End-to-end data transport
- Routing protocols and architectures
- Media allocation
- Bridges
- Data transmission
- Further selected examples
- Network management

**Workload**

180 hrs.
### 5.225 Module: Testing Digital Systems I [M-INFO-100851]

**Responsible:** Prof. Dr. Mehdi Baradaran Tahoori  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics

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**Competence Certificate**
See partial achievements (Teilleistung)

**Prerequisites**
See partial achievements (Teilleistung)

**Competence Goal**
The course provides the basic techniques for testing digital circuits

**Content**
Testing of digital circuits plays a critical role during the design and manufacturing cycles. It also ensures the quality of parts shipped to the customers. Test generation and design for testability are integral parts of automated design flow of all electronics products. The objective of this course is to provide the foundations for developing test methods for digital systems and provides the techniques necessary to practice design for testability.

This course encompasses the theoretical and practical aspects of digital systems testing and the design of easily testable circuits. Topics include Introduction to Testing (testing definition, types of test, automatic test equipment, test economics, and quality models), Failures and Errors (definitions, failure modes, failure mechanisms, reliability defects), Faults (fault models, stuck-at faults, bridging faults, timing faults, transistor-level faults, functional-level faults, effectiveness of different fault models based on real data), Logic and Fault Simulation (fault equivalence and fault collapsing, true-value simulation, fault simulation algorithms, statistical methods), Test Generation for Combinational Circuits (algebraic methods, path-tracing (D-alg, PODEM, FAN), testability metrics, test file compression), Digital Design-For-Testability and Internal Scan Design (ad-hoc methods, scan architectures, scan-based test methodology).

**Workload**
2 SWS \[2 \text{ SWS } + 1.5 \times 2 \text{ SWS}\] x 15 + 15 h preparation for the exam = 90 h = 3 ECTS
Module: Testing Digital Systems II [M-INFO-102962]

**Responsible:** Prof. Dr. Mehdi Baradaran Tahoori

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

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**Competence Certificate**
See partial achievements (Teilleistung)

**Prerequisites**
See partial achievements (Teilleistung)

**Competence Goal**
The objective of this course is to provide more advanced topics on testing of digital systems and complement the foundation covered in Testing Digital Systems I.

**Content**
Testing of digital circuits plays a critical role during the design and manufacturing cycles. It also ensures the quality of parts shipped to the customers. Test generation and design for testability are integral parts of automated design flow of all electronic products. The objective of this course is to provide more advanced topics on testing of digital systems and complement the foundation covered in Testing Digital Systems I.

Topics include Functional and Structural Testing (design verification vectors, exhaustive test, pseudo-exhaustive test, pseudo-random testing), Essentials of Test Generation for Sequential Circuits (state-machine initialization, time-frame expansion method), Built-in Self Test (test economics of BIST, test pattern generation, output response analysis, BIST architectures), Boundary Scan (Boundary scan architectures, BS test methodology), Delay Testing (path delay test, hazard-free, robust, and non-robust delay tests), transition faults, delay test schemes), Current-Based Testing (motivation, test vectors for IDDQ, variations of IDDQ), Memory Test (memory test algorithm, memory BIST, memory repair), and DFT for System-on-Chip.

**Workload**
2 SWS: (2 SWS + 1.5 x 2 SWS) x 15 + 15 h Klausurvorbereitung = 90 h = 3 ECTS

**Recommendation**
Knowledge of Digital Design and Computer Architecture is helpful.
### Module: Theoretical Foundations of Cryptography [M-INF-105584]

**Responsible:** Prof. Dr. Jörn Müller-Quade

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

<table>
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**5.228 Module: Transport Infrastructure Policy and Regional Development [M-WIWI-101485]**

**Responsible:** Prof. Dr. Kay Mitusch  
**Organisation:** KIT Department of Economics and Management  
**Part of:** Economics and Management (Economics)

<table>
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**Compulsory Elective Courses (Election: 2 items)**

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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.

**Prerequisites**

None

**Competence Goal**

The students

- understand the economic issues related to transport and regional development with a main focus on economic policy issues generated by the relationship of transport and regional development with the public sector
- are able to compare different considerations of politics, regulation and the private sector and to analyse and assess the respective decision problems both qualitatively and by applying appropriate methods from economic theory
- are prepared for careers in the public sector, particularly for public companies, politics, regulatory agencies, related consultancies, mayor construction companies or infrastructure project corporations

**Content**

The development infrastructure (e.g. transport, energy, telecommunications) has always been one of the most relevant factors for economic development and particularly influences the development of the regional economy. From the repertoire of state actions, investments into transport infrastructure are often regarded the most important measure to foster regional economic growth. Besides the direct effects of transport policy on passenger and freight transport, a variety of individual economic activities is significantly dependent on the available or potential transport options. Decisions on the planning, financing and realization of major infrastructure projects require a solid and far-reaching consideration of direct and indirect growth effects with the occurring costs.

Through its combination of lectures the module reflects the complex interdependencies between infrastructure policy, transport industry and regional policy and provides its participants with a comprehensive understanding of the functionalities of one of the most important sectors of the economy and its relevance for economic policy.

**Annotation**

The courses Assessment of Public Policies and Projects I (winter term) and Assessment of Public Policies and Projects II (summer term) will no longer be part of this module. Student who have already had exams in these courses can integrate these exams in this module.

**Workload**

The total workload for this module is approximately 270 hours. For further information see German version.
Module: Ubiquitous Computing [M-WIWI-101458]

M Mandatory
T-INFO-101326 Ubiquitous Computing 5 CR Beigl

Supplementary Courses (Election: between 4 and 5 credits)
T-WIWI-102761 Advanced Lab in Ubiquitous Computing 4 CR Beigl, Schmeck
T-INFO-101323 IT-Security Management for Networked Systems 5 CR Hartenstein

Competence Certificate
The assessment mix of each course of this module is defined for each course separately. The final mark for the module is the average of the marks for each course weighted by the credits and truncated after the first decimal.

Prerequisites
See German version

Competence Goal
The student

- gets comprehensive knowledge about topics in the area of Ubiquitous Computing
- can design and evaluate ubiquitous systems in different application areas
- acquires appropriate knowledge for addressing specialized aspects in the area of ubiquitous computing

Content
Ubiquitous information technology (Ubiquitous Computing) addresses the ubiquitous (or pervasive) availability of information processing. The availability of these systems has the objective to facilitate the operational environment in technical scenarios or in daily life of humans and to enrich it with new capabilities. This module provides fundamentals of ubiquitous computing and further topics like network and Internet technologies, security aspects, the analysis of autonomously operating systems in Organic Computing and also the utilisation of information and communication technologies in highly decentralized energy systems.

Workload
The total workload for this module is approximately 270 hours. For further information see German version.
5.230 Module: Ubiquitous Computing [M-INFO-100789]

<table>
<thead>
<tr>
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<th>Duration</th>
<th>Language</th>
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</table>

**Mandatory**

| T-INFO-101326 | Ubiquitous Computing | 5 CR | Beigl |

**Responsible:** Prof. Dr.-Ing. Michael Beigl  
**Organisation:** KIT Department of Informatics  
**Part of:** Informatics
<table>
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<th>Credits</th>
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**Mandatory**

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<tr>
<td>T-INFO-101275</td>
<td>Visualization</td>
<td>5 CR</td>
<td>Dachsbacher</td>
</tr>
</tbody>
</table>
Module: Wearable Robotic Technologies [M-INFO-103294]

**Responsible:** Prof. Dr.-Ing. Tamim Asfour  
Prof. Dr.-Ing. Michael Beigl

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

**Credits:** 4  
**Grading scale:** Grade to a tenth  
**Recurrence:** Each summer term  
**Duration:** 1 term  
**Language:** English  
**Level:** 4  
**Version:** 3

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**Mandatory**

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<tr>
<td>T-INFO-106557</td>
<td>Wearable Robotic Technologies</td>
<td>4 CR</td>
<td>Asfour, Beigl</td>
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</table>

**Competence Certificate**  
See partial achievements (Teilleistung)

**Prerequisites**  
See partial achievements (Teilleistung)

**Competence Goal**  
The student has received fundamental knowledge about wearable robotic technologies and understands the requirements for the design, the interface to the human body and the control of wearable robots. He/she is able to describe methods for modelling the human neuromusculoskeletal system, the mechatronic design, fabrication and composition of interfaces to the human body. The student understands the symbiotic human–machine interaction as a core topic of Anthropomatics and has knowledge of state-of-the-art examples of exoskeletons, orthoses and prostheses.

**Content**  
The lecture provides an overview of wearable robot technologies (exoskeletons, prostheses and orthoses) and their potentials. It starts with the basics of wearable robotics and introduces different approaches to the design of wearable robots and their related actuator and sensor technology. The lecture focuses on modeling the neuromusculoskeletal system of the human body, the interfaces of wearable robots to the human body and the physical and cognitive human-robot interaction for tightly-coupled hybrid human-robot systems. Examples of current research and various applications of lower, upper and full body exoskeletons as well as prostheses are presented.

**Workload**  
Lecture with 2 SWS, 4 LP  
4 LP corresponds to 120 hours, including  
15 * 2 = 30 hours attendance time  
15 * 3 = 45 self-study  
45 hours preparation for the exam

**Recommendation**  
Attendance of the lecture Mechano-Informatics in Robotics is recommended.
5.233 Module: Web and Data Science [M-WIWI-105368]

**Responsible:** Dr.-Ing. Michael Färber

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

**Part of:** Informatics

<table>
<thead>
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<th>Credits</th>
<th>Grading scale</th>
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<th>Language</th>
<th>Level</th>
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<td>Each term</td>
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**Compulsory Elective Courses (Election: at least 2 items)**

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<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>T-WIWI-102666</td>
<td>Knowledge Discovery</td>
<td>4.5 CR</td>
<td>Färber</td>
</tr>
<tr>
<td>T-WIWI-110548</td>
<td>Advanced Lab Informatics (Master)</td>
<td>4.5 CR</td>
<td>Professorenschaft des Instituts AIFB</td>
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</table>

**Competence Certificate**
The assessment mix of each course of this module is defined for each course separately. The final mark for the module is the average of the marks for each course weighted by the credits and truncated after the first decimal.

**Prerequisites**
None

**Competence Goal**
The student

- know the basics of machine learning, data mining and knowledge discovery
- can design, train and evaluate systems that are capable of learning
- carry out knowledge discovery projects, taking into account algorithms, representations and applications.
- will look at current research topics in the field of Web Science and
- learn about the topics Small World Problem, Network Theory, Social Network Analysis, Bibliometrics, Link Analysis and Search,
- apply interdisciplinary thinking and
- apply technological approaches to social science problems.

**Content**
The module focuses on machine learning and data mining methods for knowledge acquisition from large databases as well as web phenomena and the available technologies.

The lecture Knowledge Discovery gives an overview of approaches of machine learning and data mining for knowledge acquisition from large data sets. These are examined especially with respect to algorithms, applicability to different data representations and the use in real application scenarios.

Knowledge Discovery is an established research area with a large community that investigates methods for discovering patterns and regularities in large amounts of data, including unstructured text. A variety of methods exist to extract patterns and provide previously unknown insights. This information can be predictive or descriptive.

The lecture gives an overview of Knowledge Discovery. Specific techniques and methods, challenges and current and future research topics in this research area will be taught.

Contents of the lecture cover the entire machine learning and data mining process with topics on supervised and unsupervised learning and empirical evaluation. Covered learning methods range from classical approaches like decision trees, support vector machines and neural networks to selected approaches from current research. Learning problems considered include feature vector-based learning and text mining.

The lecture “Web Science” offers an insight into the analysis of social networks and the metrics used in this context. Thereby especially web phenomena and the available technologies.

Web Science is the emerging study of the people and technologies, applications, processes and practices that make the world Wide Web and are shaped and embossed. Web Science aims to develop theories, methods and findings from the entire academic disciplines and work with industry, business, politics and civil society to create an understanding of the Web: The largest socio-technical infrastructure in the history of mankind.

The lecture gives an introduction to the basic concepts of Web Science. Essential theoretical foundations, Phenomena and methods are presented and explained. This lecture aims to give students a basic knowledge and understanding of the structure and analysis of selected web phenomena and technologies. The topics include the small world problem, Network theory, social network analysis, graph-based search and technologies / standards / architectures.

**Workload**
The total workload for this module is approximately 270 hours.
5.234 Module: Web Applications and Service-Oriented Architectures (II) [M-INFO-100734]

**Responsible:** Prof. Dr. Sebastian Abeck

**Organisation:** KIT Department of Informatics

**Part of:** Informatics

<table>
<thead>
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<th>Credits</th>
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<td>German</td>
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**Mandatory**

| T-INFO-101271 | Web Applications and Service-Oriented Architectures (II) | 4 CR | Abeck |

**Competence Certificate**

Siehe Teilleistung
5.235 Module: Web Data Management [M-WIWI-101455]

**Responsible:** Dr.-Ing. Michael Färber

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

**Part of:** Informatics

<table>
<thead>
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<th>Credits</th>
<th>Grading scale</th>
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**Compulsory Elective Courses (Selection: 2 items)**

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<tr>
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<td>Semantic Web Technologies</td>
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<tr>
<td>T-WIWI-110548</td>
<td>Advanced Lab Informatics (Master)</td>
<td>4.5 CR</td>
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</table>

**Competence Certificate**
The assessment mix of each course of this module is defined for each course separately. The final mark for the module is the average of the marks for each course weighted by the credits and truncated after the first decimal.

**Competence Goal**
Students

- develop ontologies for semantic web technologies and choose suitable representation languages,
- are able to provide data and applications via a cloud-based infrastructure,
- transfer the methods and technologies of semantic web technologies and cloud computing to new application sectors,
- evaluate the potential of semantic web technologies and the cloud computing approaches for new application sectors.

**Content**
The module Web Data Management covers the basic principles, methods and applications for intelligent systems in the World Wide Web. Cloud Services are essential for the decentralized, scalable provision of data and applications as well as the methods of semantic web based on the description of data and services via metadata in form of so called ontologies.

Formal principles and practical aspects such as knowledge modeling and available representation language tools for ontologies are covered in detail. Methods for the realization of intelligent systems within the World Wide Web are treated and applications as in Web 2.0 or Service Science are discussed and evaluated.

Furthermore the application of modern Cloud technologies for the use of software and hardware as a service via internet is introduced. Cloud technologies allow the efficient implementation of applications on distributed computer clusters and permit a high scalability as well as new business models in the internet.

**Workload**
The total workload for this module is approximately 270 hours (9 credits). The allocation is based on the credits of the courses of the module. The workload for courses with 4.5 credits is about 135 hours.

The total number of hours per course results from the effort required to attend the 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.
6 Courses

6.1 Course: Access Control Systems: Models and Technology [T-INFO-112775]

- **Responsible:** Prof. Dr. Hannes Hartenstein
- **Organisation:** KIT Department of Informatics
- **Part of:** M-INFO-106303 - Access Control Systems: Models and Technology
  M-WIWI-104812 - Information Systems: Engineering and Transformation

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**Events**

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<td>ST 2024</td>
<td>3 SWS</td>
<td>Access Control Systems: Models and Technology</td>
<td>Each summer term</td>
<td>Hartenstein, Leinweber</td>
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**Exams**

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<th>Credits</th>
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<tr>
<td>WT 23/24</td>
<td>3 SWS</td>
<td>Access Control Systems: Models and Technology</td>
<td>Hartenstein</td>
</tr>
<tr>
<td>ST 2024</td>
<td>3 SWS</td>
<td>Access Control Systems: Models and Technology</td>
<td>Hartenstein</td>
</tr>
</tbody>
</table>

Legend: 🖥️ Online, 🧩 Blended (On-Site/Online), 🗣️ On-Site, ✗ Cancelled

**Competence Certificate**
The assessment is carried out as a written examination (§ 4 Abs. 2 Nr. 1 SPO) lasting 60 minutes.
Depending on the number of participants, it will be announced six weeks before the examination (§ 6 Abs. 3 SPO) whether the examination takes place:
- in the form of an oral examination lasting 20 minutes pursuant to § 4 Abs. 2 Nr. 2 SPO or
- in the form of a written examination lasting 60 minutes in accordance with § 4 Abs. 2 Nr. 1 SPO.

**Prerequisites**
None.

**Recommendation**
Basics according to the lectures "IT Security Management for Networked Systems" and "Telematics" are recommended.

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

- **Access Control Systems: Models and Technology**
  2400147, SS 2024, 3 SWS, Language: English, [Open in study portal](#)

Lecture / Practice (VÜ)
On-Site
Content

Access control systems are everywhere and the backbone of secure services as they incorporate who is and who is not authorized: think of operating systems, information systems, banking, vehicles, robotics, cryptocurrencies, or decentralized applications as examples. The course starts with current challenges of access control in the era of hyperconnectivity, i.e., in cyber-physical or decentralized systems. Based on the derived needs for next generation access control, we first study how to specify access control and analyze strengths and weaknesses of various approaches. We then focus on up-to-date proposals, like IoT and AI access control. We look at current cryptographic access control aspects, blockchains and cryptocurrencies, and trusted execution environments. We also discuss the ethical dimension of access management. Students prepare for lecture and exercise sessions by studying previously announced literature and by preparation of exercises that are jointly discussed in the sessions.

Competency Goals:
- The student understands the challenges of access control in the era of hyperconnectivity.
- The student understands that an information security model defines access rights that express for a given system which subjects are allowed to perform which actions on which objects. The student understands that a system is said to be secure with respect to a given information security model, if it enforces the corresponding access rights.
- The student is able to derive suitable access control models from scenario requirements and is able to specify concrete access control systems. The student is able to decide which concrete architectures and protocols are technically suited for realizing a given access control model.
- The student knows access control protocols using cryptographic methods and is able to compare protocol realizations based on different cryptographic building blocks.
- The student is aware of the limits of access control models and systems with respect to their analyzability and performance and security characteristics. The student is able to identify the resulting tradeoffs.
- The student knows the state of the art with respect to current research endeavors, e.g., access control in the context of decentralized and distributed systems, Trusted Execution Environments, AI, robotics, or hash-chain based systems.

Workload:
1. Attendance time
   Lecture: 2 SWS: 2,0h × 15 = 30h
   Exercises: 1 SWS: 1,0h × 15 = 15h
2. Self-study (e.g., independent review of course material, work on homework assignments)
   Weekly preparation and follow-up of the lecture: 15 × 1h × 3 = 45h
   Weekly preparation and follow-up of the exercise: 15 × 2h = 30h
3. Preparation for the exam: 30h
   Σ = 150h = 5 ECTS

Competency certificate:
Depending on the number of participants, it will be announced six weeks before the examination (§ 6 Abs. 3 SPO) whether the examination takes place
- in the form of an oral examination lasting 20 minutes pursuant to § 4 Abs. 2 Nr. 2 SPO or
- in the form of a written examination lasting 60 minutes in accordance with § 4 Abs. 2 Nr. 1 SPO.

Recommendations:
Basics according to the lectures "IT Security Management for Networked Systems" and "Telematics" are recommended.
Duration: One terms
6.2 Course: Advanced Artificial Intelligence [T-INFO-112768]

**Responsible:** Prof. Dr. Jan Niehues

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-106299 - Advanced Artificial Intelligence

<table>
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**Events**

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<th>Grading</th>
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<td>ST 2024</td>
<td>2400141</td>
<td>Advanced Artificial Intelligence</td>
<td>4 SWS</td>
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<td></td>
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<td>Niehues, Asfour</td>
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**Exams**

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<th>Type</th>
<th>Credits</th>
<th>Grading</th>
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<tr>
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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled

**Competence Certificate**

The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 60 minutes.

**Prerequisites**

None.

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

**Advanced Artificial Intelligence**

2400141, SS 2024, 4 SWS, Language: English, [Open in study portal](#)
Content
AI systems are increasingly integrated into our everyday lives. These are, for example, systems that can understand and generate language or analyze images and videos. In addition, AI systems are essential in robotics in order to be able to develop the next generation of intelligent robots.

Based on the knowledge of the lecture “Einführung in der KI”, the students learn to understand, develop and evaluate these systems. In order to bring this knowledge closer to the students, the lecture is divided into 4 parts. First, the methods of perception using different modalities are treated. The second part deals with advanced methods of learning that go beyond supervised learning. Then methods are discussed that are required for the representation of knowledge in AI systems. Finally, methods are presented that enable AI systems to generate content.

Requirements:
None

Recommendations:
- “Einführung in der KI”
- Good basic knowledge of mathematics

Workload:
approx. 180 hours, of which
approx. 45 hours lecture attendance
approx. 15 hours exercise visit
approx. 90 hours post-processing and processing of the exercise sheets
approx. 30 hours exam preparation

Learning goals:
- The students know the relevant elements of a technical cognitive system and their tasks.
- The students understand the algorithms and methods of AI to model technically cognitive systems.
- The students are able to understand the different sub-components to develop and analyze a system.
- The students can transfer this knowledge to new applications, as well as analyze and compare different methods.

Success control:
See the module manual!
The course covers the foundational principles of advanced topics of corporate finance, such as corporate governance, executive compensation, strategy & finance, mergers & acquisitions (M&A), and sustainable finance. Additionally, the course explores the respective institutional aspects within these areas of corporate finance. The approach is holistic, including both theoretical-conceptional aspects (e.g., moral hazard and the influence of asymmetric information) and empirical insights (e.g., the effects of financial decisions on firm value). Throughout, the course will emphasize both fundamental and current research findings.

**Learning outcomes:**

Upon successful completion of the course, students will possess profound knowledge and skills in advanced areas of corporate finance. These areas include topics such as corporate governance, executive compensation, strategy and finance, mergers and acquisitions (M&A), as well as key aspects of sustainable finance. Participants of this course will be able to describe and analyze the theoretical and conceptual foundations of the effects of information asymmetries and moral hazard on corporate financing behavior and assess their impact in corporate practice. Furthermore, upon completion of the course, participants will be familiar with the fundamental institutional elements in these areas and be able to discuss and solve advanced problems in corporate finance from both a theoretical and an empirical perspective. Moreover, students will acquire an advanced understanding of the central scientific findings in these topic areas, which will enable them to critically apply them in scientific and practical contexts.

**Literature**


Various source of literature, among others Brealey/Myers/Allen/Edmans: Principles of Corporate Finance; Thomson/Conyon: Corporate Governance: Mechanisms and Systems; Larcker/Tayan: Corporate Governance Matters. Additional reading materials will be introduced during the course.
6.4 Course: Advanced Data Structures [T-INFO-105687]

Responsible: Prof. Dr. Peter Sanders
Organisation: KIT Department of Informatics
Part of: M-INFO-102731 - Advanced Data Structures

<table>
<thead>
<tr>
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<th>Credits</th>
<th>Grading scale</th>
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<tbody>
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<td>Each summer term</td>
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Events

| ST 2024 | 2400164 Advanced Data Structures | 3 SWS Lecture / | Kurpicz, Sanders |

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Competence Certificate

The assessment is carried out as an oral examination (§ 4 Abs. 2 Nr. 2 SPO) lasting 20 minutes.

*The examination takes place in the form of an oral examination and a project/experiment as an examination of success of a different kind*

Weighting: 80% oral examination, 20% project/experiment.

Prerequisites

none.

Recommendation

The lecture builds on parts of the contents of the lectures Algorithms I and Algorithms II. Corresponding knowledge is therefore helpful.
6.5 Course: Advanced Data Structures Project/Experiment [T-INFO-111849]

**Responsible:** Prof. Dr. Peter Sanders

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-102731 - Advanced Data Structures

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<thead>
<tr>
<th>Type</th>
<th>Credits</th>
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<td>1</td>
<td>Grade to a third</td>
<td>Each summer term</td>
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</table>

**Events**

| ST 2024 | 2400164 | Advanced Data Structures | 3 SWS | Lecture / 🗣 | Kurpicz, Sanders |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 120 minutes.

*The examination takes place in the form of an oral examination and a project/experiment as an examination of success of a different kind*

Weighting: 80% oral examination, 20% project/experiment.

**Prerequisites**

None.

**Recommendation**

The lecture builds on parts of the contents of the lectures Algorithms I and Algorithms II. Corresponding knowledge is therefore helpful.
6.6 Course: Advanced Empirical Asset Pricing [T-WIWI-110513]

Responsible: TT-Prof. Dr. Julian Thimme
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101483 - Finance 2

<table>
<thead>
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Events

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<th>WT 23/24</th>
<th>2530601</th>
<th>Übung zu Advanced Empirical Asset Pricing</th>
<th>1 SWS</th>
<th>Practice / 🌐</th>
<th>Thimme</th>
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<td>WT 23/24</td>
<td>2530602</td>
<td>Advanced Empirical Asset Pricing</td>
<td>2 SWS</td>
<td>Lecture / 🌐</td>
<td>Thimme</td>
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<td>Thimme</td>
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Legend: 🌐 Online, 🍀 Blended (On-Site/Online), 🌐 On-Site, 🍀 Cancelled

Competence Certificate

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

A bonus can be acquired by submitting exercise solutions to 80% of the assigned exercise tasks. 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
2530602, WS 23/24, 2 SWS, Language: English, Open in study portal

Lecture (V)
Blended (On-Site/Online)

Content

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.

Organizational issues

Die Veranstaltung findet mittwochs um 8:00-09:30 im Raum 001 im Geb. 40.28) statt und endet nach ersten Semesterhälfte.
Literatur

Basisliteratur


zur Vertiefung/Wiederholung

6.7 Course: Advanced Game Theory [T-WIWI-102861]

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

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

**Part of:**  
M-WIWI-101453 - Applied Strategic Decisions  
M-WIWI-101500 - Microeconomic Theory  
M-WIWI-101502 - Economic Theory and its Application in Finance

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<th>Advanced Game Theory</th>
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<th>Reiß</th>
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<td>WT 23/24</td>
<td>2521534</td>
<td>Übung zu Advanced Game Theory</td>
<td>1 SWS</td>
<td>Practice / 🗣</td>
<td>Reiß, Peters</td>
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**Exams**

| WT 23/24 | 7910001 | Advanced Game Theory | Reiß |

**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 23/24, 2 SWS, Language: English, [Open in study portal](#)
6.8 Course: Advanced Lab Blockchain Hackathon (Master) [T-WIWI-111126]

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

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

**Part of:** M-WIWI-104403 - Critical Digital Infrastructures

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**Events**

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<td>WT 23/24</td>
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<td>Advanced Lab Blockchain Hackathon (Bachelor)</td>
<td>Sunyaev, Kannengießer, Sturm, Beyene</td>
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**Exams**

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<tr>
<th>Event</th>
<th>Code</th>
<th>Description</th>
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<tr>
<td>WT 23/24</td>
<td>7900141</td>
<td>Advanced Lab Blockchain Hackathon (Master)</td>
<td>Sunyaev</td>
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<tr>
<td>ST 2024</td>
<td>7900172</td>
<td>Lab Blockchain Hackathon (Master)</td>
<td>Sunyaev</td>
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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

The alternative exam assessment 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
6.9 Course: Advanced Lab in Ubiquitous Computing [T-WIWI-102761]

**Responsible:** Prof. Dr.-Ing. Michael Beigl
Prof. Dr. Hartmut Schmeck

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

**Part of:** M-WIWI-101458 - Ubiquitous Computing

<table>
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</table>

**Competence Certificate**
See German version

**Prerequisites**
None

**Annotation**
See German Version
### 6.10 Course: Advanced Lab Informatics (Master) [T-WIWI-110548]

**Responsible:** Professorenschaft des Instituts AIFB  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101455 - Web Data Management  
- M-WIWI-101456 - Intelligent Systems and Services  
- M-WIWI-101477 - Development of Business Information Systems  
- M-WIWI-105366 - Artificial Intelligence  
- M-WIWI-105368 - Web and Data Science

<table>
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#### Events

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<td>2512205</td>
<td>Lab Realisation of innovative services (Master)</td>
<td>3</td>
<td>Practical course / 🧩</td>
<td>Oberweis, Toussaint, Schiefer, Schüler</td>
</tr>
<tr>
<td>WT 23/24</td>
<td>2512401</td>
<td>Practical Course Sociotechnical Information Systems Development (Master)</td>
<td>3</td>
<td>Practical course / 🧩</td>
<td>Sunyaev, Goram, Leiser</td>
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<tr>
<td>WT 23/24</td>
<td>2512403</td>
<td>Advanced Lab Blockchain Hackathon (Bachelor)</td>
<td>3</td>
<td>Practical course / 🧩</td>
<td>Sunyaev, Kannengießer, Sturm, Beyene</td>
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<tr>
<td>WT 23/24</td>
<td>2512501</td>
<td>Practical Course Cognitive automobiles and robots (Master)</td>
<td>3</td>
<td>Practical course / 🧩</td>
<td>Zöllner, Daaboul</td>
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<td>WT 23/24</td>
<td>2512600</td>
<td>Project lab Information Service Engineering (Master)</td>
<td>3</td>
<td>Practical course / 🧩</td>
<td>Sack</td>
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<td>3</td>
<td>Practical course / 🧩</td>
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<td>Lab Automation in Everyday Life (Master)</td>
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<td>Practical course / 🧩</td>
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<td>3</td>
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<td>Daaboul, Zöllner, Schneider</td>
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<td>ST 2024</td>
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<td>Praktikum Security, Usability and Society (Master)</td>
<td>3</td>
<td>Practical course / 🧩</td>
<td>Volkamer, Strufe, Mayer, Berens, Mossano, Hennig, Veit, Länge</td>
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#### Exams

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<td>Advanced Lab Development of Sociotechnical Information Systems (Master)</td>
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<td>Seminar Linked Data and the Semantic Web (Master)</td>
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ST 2024 7900173 Advanced Lab Development of Sociotechnical Information Systems (Master) Sunyaev
ST 2024 7900178 Practical Lab Security, Usability and Society (Master) Volkamer

Competence Certificate
The alternative exam assessment 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:

Lab Realisation of innovative services (Master)
2512205, WS 23/24, 3 SWS, Language: German, Open in study portal
Practical course (P)
Blended (On-Site/Online)

Content
As part of the lab, the participants should work together in small groups to realize innovative services (mainly for students).

Further information can be found on the ILIAS page of the lab.

Organizational issues
Die genauen Termine und Informationen zur Anmeldung werden auf der Veranstaltungsseite bekannt gegeben.

Practical Course Cognitive automobiles and robots (Master)
2512501, WS 23/24, 3 SWS, Language: German/English, Open in study portal
Practical course (P)
Blended (On-Site/Online)

Content
The lab is intended as a practical supplement to courses such as "Machine Learning 1/2". Scientific topics, mostly in the area of autonomous driving and robotics, will be addressed in joint work with ML/KI methods. The goal of the internship is for participants to design, develop, and evaluate ML Software system.

In addition to the scientific goals, such as the study and application of methods, the aspects of project-specific teamwork in research (from specification to presentation of results) are also worked on in this internship.

The individual projects require the analysis of the set task, selection of appropriate methods, specification and implementation and evaluation of the solution approach. Finally, the selected solution is to be documented and presented in a short lecture.

Learning Objectives:

- Students will be able to practically apply theoretical knowledge from lectures on machine learning to a selected area of current research.
- Students will be proficient in analyzing and solving thematic problems.
- Students will be able to evaluate, document, and present their concepts and results.

Recommendations:

- Theoretical knowledge of machine learning and/or AI.
- Python knowledge
- Initial experience with deep learning frameworks such as PyTorch/Jax/Tensorflow may be beneficial.

Workload:
The workload of 5 credit points consists of practical implementation of the selected solution, as well as time for literature research and planning/specification of the selected solution. In addition, a short report and presentation of the work performed will be prepared.
Organizational issues
Anmeldung und weitere Informationen sind im WiWi-Portal zu finden.
Registration and further information can be found in the WiWi-portal.

Project lab Information Service Engineering (Master)
2512600, WS 23/24, 3 SWS, Language: English, [Open in study portal]

Content
The ISE project lab is based on the summer semester lecture "Information Service Engineering". Goal of the course is to work on a given 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 lab can also be credited as a seminar (if necessary).

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

Participation will be restricted to 16 students.

Participation in the lecture "Information Service Engineering" (summer semester) is required. There are video recordings on our youtube channel.

ISE Tutor Team:

- Dr. Genet Asefa Gesese
- M. Sc. Mirza Mohtasim Alam
- M. Sc. Oleksandra Bruns
- M. Sc. Ebrahim Norouzi
- M. Sc. Mary Ann Tan
- B. Sc. Tabea Tietz
- M. Sc. Mahsa Vafae

WS 2023/24 Tasks List:

- **Task 1: Zero-shot Ultrafine Typing of Named Entities.** Use Pre-trained Language Models to assign predefined labels to entity mentions in a given context. Evaluate approaches which require no training data on a standard benchmark, i.e. UFET
- **Task 2: Object Detection on Historical Theatre Photographs.** Use Pre-trained DL models to detect and identify objects in historical theatre photographs and integrate the results into an existing Knowledge Graph.
- **Task 3: Automatically Generate Ontologies from Competency Questions using Language Models.** Competency questions (CQs) define the scope of knowledge represented in an ontology and are used to evaluate an ontology based on its ability to answer each question. In this task, we are investigating the benefit of Large Language Models to generate and evaluate ontologies from a set of competency questions.
- **Task 4: Boosting the Performance of Large Language Models for Question Answering with Knowledge Graph Integration.** Often, large language models hallucinate users with wrong or confusing answers. In order to generate relevant answers, knowledge graphs can help in many ways. The goal of this task is to utilize a knowledge graph to provide context and factual information to a language model, thereby improving the relevance and accuracy of its responses.
- **Task 5: Information Extraction and Knowledge Graph Engineering on the Use Case of Historical Political Flyers.** Information extraction and Knowledge Graph construction from digitized political leaflets of the Weimar Republic.
- **Task 6: Sentiment Analysis on Multilingual Wikipedia.** Analyse how different language Versions of Wikipedia differ in terms of Sentiment Bias.
- From a Knowledge Graph from 1.3 Mio Archival Objects from the German Digital Library

Literature
ISE video channel on youtube: [https://www.youtube.com/channel/UCjkkhNSNuXrJpMYZoeSBw6Q/](https://www.youtube.com/channel/UCjkkhNSNuXrJpMYZoeSBw6Q/)

Lab Realisation of innovative services (Master)
2512205, SS 2024, 3 SWS, Language: German, [Open in study portal]
Content
As part of the lab, the participants should work together in small groups to realize innovative services (mainly for students). Further information can be found on the ILIAS page of the lab.

Organizational issues
Die genauen Termine und Informationen zur Anmeldung werden auf der Veranstaltungsseite bekannt gegeben.

Lab Automation in Everyday Life (Master)
2512207, SS 2024, 3 SWS, Language: German, Open in study portal

Content
As part of the lab, various topics on everyday automation are offered. During the lab, the participants will gain an insight into problem-solving oriented project work and work on a project together in small groups. Further information can be found on the ILIAS page of the lab.

Organizational issues
Die genauen Termine und Informationen zur Anmeldung werden auf der Veranstaltungsseite bekannt gegeben.

Advanced Lab Development of Sociotechnical Information Systems (Master)
2512401, SS 2024, 3 SWS, Language: German/English, Open in study portal

Content
The aim of the lab is to get to know the development of socio-technical information systems in different application areas. In the event framework, you should develop a suitable solution strategy for your problem alone or in group work, collect requirements, and implement a software artifact based on it (for example, web platform, mobile apps, desktop application). Another focus of the lab is on the subsequent quality assurance and documentation of the implemented software artifact.

Registration information will be announced on the course page.

Project Lab Machine Learning
2512500, SS 2024, 3 SWS, Language: German/English, Open in study portal

Content
The lab is intended as a practical supplement to lectures such as "Machine Learning". The theoretical basics are applied in the lab course. The aim of the lab course is that the participants work together to design, develop and evaluate a subsystem from the field of robotics and cognitive systems using one or more procedures from the field of AI/ML.

In addition to the scientific objectives involved in the investigation and application of the methods, aspects of project-specific teamwork in research (from specification to presentation of the results) are also developed in this practical course.

The individual projects require the analysis of the task at hand, selection of suitable procedures, specification and implementation and evaluation of the approach taken. Finally, the chosen solution has to be documented and presented in a short presentation.

Learning objectives:
- Students can practically apply knowledge from the Machine Learning lecture in a selected field of current research in robotics or cognitive automobiles.
- Students master the analysis and solution of corresponding problems in a team.
- Students can evaluate, document and present their concepts and results.

Recommendations:
Attendance of the lecture machine learning, C/C++ knowledge, Python knowledge

Workload:
The workload of 5 credit points consists of the time spent in the lab for practical implementation of the selected solution, as well as the time spent on literature research and planning/specifying the proposed solution. In addition, a short report and a presentation of the work carried out will be prepared.

Organizational issues
Anmeldung und weitere Informationen sind im WiWi-Portal zu finden.
Registration and further information can be found in the WiWi-portal.

Praktikum Security, Usability and Society (Master)
2512555, SS 2024, 3 SWS, Language: German/English, Open in study portal

Information Systems M.Sc.
Module Handbook as of 11/04/2024
Content
The Praktikum Security, Usability and Society will cover topics both of usable security and privacy programming, and how to conduct user studies. To reserve a place, please register on the WIWi portal and send an email with your chosen topic, plus a back-up one, to mattia.mossano@kit.edu. Topics are assigned first-come-first-served until all of them are filled. Topics in italics have been already assigned.

Application deadline 12.04.2024
Assignment 15.04.2024
Confirmation deadline 19.04.2024

Important dates:
Kick-off: 17.04.2024, 09:00 AM CET in Big Blue Button - Link
Report & code feedback deadline: 26.07.2024, 23:59 CET
Feedback on Report & code: 16.08.2024, 23:59 CET
Final report + code deadline: 01.09.2024, 23:59 CET
Presentation draft deadline: 06.09.2024, 23:59 CET
Feedback on presentation draft: 13.09.2024, 23:59 CET
Final presentation deadline: 17.09.2024, 23:59 CET
Presentation day: 18.09.2024, 09:00 CET

Topics:

Privacy Friendly Apps
In this area, students complete an app (or an extension of an app) among our Privacy-Friendly Apps. Please click the following link to know more about them: https://secuso.aifb.kit.edu/english/105.php. Students are provided with a point list of goals, containing both basic features mandatory to pass the course and more advanced ones that heighten the final grade.
Title: NoPhish App
Number of students: 2 Ba/Ma
Description: The NoPhish app was one of the first measures from the NoPhish concept. The app has been around for a long time and has not been updated since then. Accordingly, the task of the project is to make the app functional for the current Android version. The app is also to be optimised so that updates, e.g. new chapters, can be added easily.

Programming Usable Security Intervention
In this subject, students develop a part of coding, an extension, or another programming task dealing with various usable security interventions, eg as an extension. Eg TORPEDO (https://secuso.aifb.kit.edu/english/TORPEDO.php) or PassSec+ (https://secuso.aifb.kit.edu/english/PassSecPlus.php). Just as before, students are provided with a point list of goals, containing both basic features mandatory to pass the course and more advanced ones that heighten the final grade.
Title: Hacking TORPEDO
Number of students: 1-2 Ba/Ma
Description: TORPEDO has existed for many years both as a Thunderbird add-on and as a web extension. TORPEDO is intended to help address various forms of phishing attacks and thereby protect the user, e.g. against various manipulations of the domain or additional tooltips. However, no targeted attacks on TORPEDO have yet been found. The aim of the work is to subject TORPEDO to a stress test and also to develop attacks that specifically target the implementation of TORPEDO.
Title: Making e-mails more visible by embedding moving images
Number of students: 1 Ma
Description: In case of a security incident, it is necessary to inform the affected persons about their vulnerabilities as soon as possible. Within the context of the INSPECTION project, we are currently informing website owners via e-mail about security related vulnerabilities on their websites. Although e-mails have been shown to be the most cost-efficient means to deliver such information, they have not led to an appropriate remediation rate. While speaking to the affected website owners we learned that they would appreciate more information, although not being delivered as more text in the e-mail. Also, we learned that most e-mails were not read because they were considered spam. Thus, we need to find a way to make e-mail notifications more effective in raising peoples’ awareness. Videos have been proven effective to raise awareness in the context of IT security. The goal of the project will be, to explore ways to embed videos in an e-mail via HTML (either as gifs or as preview to a YouTube video). The challenge is to make this e-mail readable for different clients and webmail as well as getting it delivered through spam filters.

Designing Security User studies
These topics are related to how to set up and conduct user studies of various types. Online studies, interviews and lab studies are possible. At the end of the semester, the students present a report/paper and a talk in which they present their methodologies and the results of small pre-studies.
Title: Usability of Password Managers in Virtual Reality
Number of students: 2 Ma
Description: The pre-dominant form of authentication in Virtual Reality (VR) are passwords. Passwords create a burden for users in the VR environment because of special input methods and the virtual keyboard [Stephenson, S. et al (2022). SoK: Authentication in Augmented and Virtual Reality]. Password Managers (PMs) can support the user with handling this problem [Mayer, P. et al. (2022). Why Users (Don't) Use Password Managers at a Large Educational Institution]. They offer auto-filling features, store credentials in an overview or generate complex and secure passwords. Especially in the VR context, where typing a password is slow and complex, PMs can be beneficial. We want to explore the different PMs in VR and test the usability to find challenges and possible solutions.

Run Usable Security Studies and Results Analysis
These topics are related to run and analyse the results of user-studies. Online studies, interviews and lab studies are all possible, depending on the topic. At the end of the semester, the students present a report / paper with the analyses conducted and a talk in which they present the results.

Title: Visualization of Eye Gaze Patterns during Authentication Tasks
Number of students: 1 Ba/Ma
Description: In this project, students will analyze and visualize eye gaze data collected during two specific authentication tasks: the Dot Task and the Slider Task. The primary objective is to represent subjects' eye movements visually, enhancing the understanding of gaze patterns during the authentication process. *Dot Task Visualization:* For the Dot Task, participants were instructed to focus on a sequence of dots displayed on a screen. The dataset includes the positions of these dots and the corresponding gaze locations of the subjects. The student's task is to create a dynamic visualization that not only represents these positions accurately but also illustrates the sequence in which the dots were focused on by the subjects. *Slider Task Visualization:* The Slider Task involved presenting participants with a series of images, for which both the images' locations on the screen and the subjects' gaze locations are recorded. The challenge is to develop a heatmap visualization based on this data, effectively demonstrating the concentration and dispersion of gaze points across different images.

Title: How do website owners become aware that their website was hacked?
Number of student: 1 Ma
Description:

Title: Phishing through homographic attacks in messengers and social networks
Number of students: 1-2 Ba/Ma
Description: The task will be to test three types of attacks in messengers and social networks that work in some email clients. First is the link mismatch attack, where the link text differs from the actual link target. Second is an attack in which the actual link target is disguised by URL encoding [https://en.wikipedia.org/wiki/URL_encoding], and finally homographic attacks which uses Internationalized Domain Names [https://en.wikipedia.org/wiki/IDN_homograph_attack], in which Latin characters are replaced by characters of a different alphabet in the domain name. The attacks are predefined, so no knowledge of phishing techniques is required.

Title: Usability Study of Mobile Authentication for Elderly Users with Rheumatoid Arthritis (English only)
Number of students: 1 Ba/Ma
Description: Authentication is an ever important topic, especially in the mobile context. However, it becomes even more relevant when considering accessibility to it. Nowadays, a common authentication method is using a PIN. Yet, given the low hand mobility of users affected by rheumatoid arthritis, sometimes using PINs can be difficult. In this topic, the student will conduct several sessions of an already designed lab study with various participants using arthritis simulation gloves to evaluate three PIN-pad interfaces aimed at making authentication more accessible. The study will also investigate the preferences of users regarding PIN-pad interfaces through drawings and proposals of changes. The student will then analyse the results through inferential statistics. Depending on the quality of the outcome, the results will then be published in a paper and the student will be added to the authors list.

This event counts towards the KASTEL certificate. Further information on how to obtain the certificate can be found on the SECUSO website (https://secuso.aifb.kit.edu/Studium_und_Lehre.php).
### Course: Advanced Lab Realization of Innovative Services (Master) [T-WIWI-112914]

**Responsibility:** Prof. Dr. Andreas Oberweis  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101477 - Development of Business Information Systems

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### Events

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### Exams

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**Legend:** Online, Blended (On-Site/Online), On-Site, Cancelled

### Competence Certificate

The alternative exam assessment consists of:

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

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

### Annotation

As part of the lab, the participants should work together in small groups to produce innovative services (mainly for students). Further information can be found on the ILIAS page of the lab.

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

#### Lab Realisation of innovative services (Master)

**2512205, WS 23/24, 3 SWS, Language: German, Open in study portal**

**Practical course (P)**  
Blended (On-Site/Online)

**Content**

As part of the lab, the participants should work together in small groups to realize innovative services (mainly for students). Further information can be found on the ILIAS page of the lab.

**Organizational issues**

Die genauen Termine und Informationen zur Anmeldung werden auf der Veranstaltungsseite bekannt gegeben.

#### Lab Realisation of innovative services (Master)

**2512205, SS 2024, 3 SWS, Language: German, Open in study portal**

**Practical course (P)**  
On-Site

**Content**

As part of the lab, the participants should work together in small groups to realize innovative services (mainly for students). Further information can be found on the ILIAS page of the lab.

**Organizational issues**

Die genauen Termine und Informationen zur Anmeldung werden auf der Veranstaltungsseite bekannt gegeben.
6.12 Course: Advanced Lab Security, Usability and Society [T-WIWI-108439]

**Responsible:** Prof. Dr. Melanie Volkamer  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-104520 - Human Factors in Security and Privacy

### Type
- Examination of another type
- Credits: 4.5
- Grading scale: Grade to a third
- Recurrence: see Annotations
- Version: 2

#### Events

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#### Exams

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<td>3 SWS</td>
<td>Grade to a third</td>
<td>Volkamer</td>
</tr>
</tbody>
</table>

Legend: 🌐 Online, 🧩 Blended (On-Site/Online), 🏢 On-Site, ✖ Cancelled

**Competence Certificate**  
The alternative exam assessment 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.

**Annotation**  
The course will not be offered in the summer semester 2023.

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

Praktikum Security, Usability and Society (Bachelor)  
2512554, WS 23/24, 3 SWS, Language: German/English, Open in study portal

Practical course (P) Online
Content
The Praktikum Security, Usability and Society will cover topics both of usable security and privacy programming, and how to conduct user studies. To reserve a place, please register on the WiWi portal and send an email with your chosen topic, plus a back-up one, to mattia.mossano@kit.edu. Topics are assigned first-come-first-served until all of them are filled. Topics in italics have already been assigned.

There are two rounds to apply:
Summer round closes on 16.07.2023. Assignment will be done by 17.07.2023 and confirmation must be received by 21.07.2023.
Autumn round opens 11.09.2023 and closes on 08.10.2023. Assignment will be done by 09.10.2023 and confirmation must be received by 13.10.2023.

Important dates:
Kick-off: 05.10.2023, 09:00 AM CET in Big Blue Button - Link
Report & code feedback deadline: 01.03.2024, 23:59 CET
Feedback on Report & code: 08.03.2024, 23:59 CET
Final report & code deadline: 15.03.2024, 23:59 CET
Presentation draft deadline: 15.03.2024, 23:59 CET
Feedback on presentation draft: 19.03.2024, 23:59 CET
Final presentation deadline: 22.03.2024, 23:59 CET
Presentation day: 29.03.2024, 09:00 CET

Topics:
Privacy Friendly apps
In this subject, students complete an app (or an extension of an app) among our Privacy-Friendly Apps. Please click the following link to know more about them: https://secupo.aifb.kit.edu/english/105.php. Students are provided with a point list of goals, containing both basic features mandatory to pass the course and more advanced ones that heighten the final grade.
Title: Notes 2.0
Number of students: 1 Bachelor
Description: Update und Vorbereitung zur Veröffentlichung der Notes 2.0-App.

Designing Security User studies
These topics are related to how to set up and conduct user studies of various types. Online studies, interviews and lab studies are possible. At the end of the semester, the students present a report / paper and a talk in which they present their methodologies and the results of small pre-studies.
Title: Designing User Studies for Evaluating Biometric Authentication Systems
Number of students: 1 Bachelor or Master level
Description: The proposed topic focuses on designing and implementing a user study methodology to evaluate the usability and user perception of biometric authentication systems. Biometric authentication involves using unique physiological or behavioral characteristics, such as fingerprints, facial recognition, or voice patterns, to verify a user's identity. The goal of this research is to understand the factors that affect the effectiveness and acceptance of biometric authentication and provide insights for designing user-friendly and secure biometric authentication systems.
Title: How useful are security advice given by ChatGPT?
Number of students: 1-2 Bachelor level
Description: ChatGPT is nowadays used for multiple reasons. One of them is to obtain advice on security decision, asking the program how to be best defend oneself. However, what are these advice based on? And more importantly, is the quality of the advice in line with the best practices or are they misleading? The goal of this topic is to design an expert study where various advice given by ChatGPT on security topics (e.g., password policies, phishing, etc.) are compared against the advice of experts. The results then need to be analysed and classified to determine the quality of ChatGPT advice.

Run Usable Security Studies and Results Analysis
These topics are related to run and analyse the results of user-studies. Online studies, interviews and lab studies are all possible, depending on the topic. At the end of the semester, the students present a report / paper with the analyses conducted and a talk in which they present the results.
Title: Phishing through homographic attacks in messengers and social networks
Number of students: 1-2 Bachelor or Master level
Description: The task will be to test three types of attacks in messengers and social networks that work in some email clients. First is the link mismatch attack, where the link text differs from the actual link target. Second is an attack in which the actual link target is disguised by URL encoding [https://en.wikipedia.org/wiki/URL_encoding], and finally homographic attacks which uses Internationalized Domain Names [https://en.wikipedia.org/wiki/IDN_homograph_attack], in which Latin characters are replaced by characters of a different alphabet in the domain name. The attacks are predefined, so no knowledge of phishing techniques is required.
Title: Usability Study of Mobile Authentication for Elderly Users with Rheumatoid Arthritis (English only)
Number of students: 1 Bachelor or Master level
Description: Authentication is an ever important topic, especially in the mobile context. However, it becomes even more relevant when considering accessibility to it. Nowadays, a common authentication method is using a PIN. Yet, given the low hand mobility of users affected by rheumatoid arthritis, sometimes using PINs can be difficult. In this topic, the student will conduct several sessions of an already designed lab study with various participants using arthritis simulation gloves to evaluate three PIN-pad interfaces aimed at making authentication more accessible. The study will also investigate the preferences of users regarding PIN-pad interfaces through drawings and proposals of changes. The student will then analyse the results through inferential statistics. Depending on the quality of the outcome, the results will then be published in a paper and the student will be added to the authors list.

This event counts towards the KASTEL certificate. Further information on how to obtain the certificate can be found on the SECUSO website (https://secuso.aifb.kit.edu/Studium_und_Lehre.php).
Content
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Topics:

**Programming Usable Security Intervention**
In this subject, students develop a part of coding, an extension, or another programming task dealing with various usable security interventions, eg as an extension. Eg TORPEDO ( [https://secuso.aifb.kit.edu/english/TORPEDO.php](https://secuso.aifb.kit.edu/english/TORPEDO.php) ) or PassSec + ( [https://secuso.aifb.kit.edu/english/PassSecPlus.php](https://secuso.aifb.kit.edu/english/PassSecPlus.php) ). Just as before, students are provided with a point list of goals, containing both basic features mandatory to pass the course and more advanced ones that heighten the final grade.

**Title:** Making e-mails more visible by embedding moving images
**Number of students:** 1 Master
**Description:** In case of a security incident, it is necessary to inform the affected persons about their vulnerabilities as soon as possible. Within the context of the INSPECTION project, we are currently informing website owners via e-mail about security related vulnerabilities on their websites. Although e-mails have been shown to be the most cost-efficient means to deliver such information, they have not lead to an appropriate remediation rate. While speaking to the affected website owners we learned that they would appreciate more information, although not being delivered as more text in the e-mail. Also, we learned that most e-mails were not read because they were considered spam. Thus, we need to find a way to make e-mail notifications more effective in raising peoples’ awareness. Videos have been proven effective to raise awareness in the context of IT security. The goal of the project will be, to explore ways to embed videos in an e-mail via HTML (either as gifs or as preview to a YouTube video). The challenge is to make this e-mail readable for different clients and webmail as well as getting it delivered through spam filters.

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**Title:** Can anxiety influences security advices
**Number of students:** 1 Master level
**Description:** Nowadays ChatGPT is used for a multitude of reasons. One is to ask advice on security topics. However, previous research showed that oftentimes ChatGPT creates answers based on previous interactions with it. Therefore, is it possible that also security advice change according to the previous interaction? And if this is the case, can more anxious props lead to completely different results? The student will have to read the previous literature on ChatGPT, find expert advice on security topics and create an experiment to determine if anxiety influenced the advice given by ChatGPT.
Title: Investigating ChatGPT privacy tradeoffs and users perception of them (English only)
Number of students: 1 Master level
Description: As ChatGPT grows in popularity, it becomes increasingly vital to examine the privacy trade-offs associated with its usage. The user's willingness to accept these trade-offs is instrumental in understanding the wider implications of employing AI language models. This topic involves a two-part exploration into the privacy trade-offs of using ChatGPT. Initially, the student will analyse ChatGPT’s Terms and Conditions and conduct a short literature review to identify potential privacy trade-offs. The found trade-offs need to be categorised into a set of trade-offs that will be investigated. Subsequently, the student will design an online user study, incorporating various question types and a deception study, to gauge the willingness of ChatGPT users to accept these trade-offs. Finally, the student will test the designed online user study in the course of small pre-test.

Run Usable Security Studies and Results Analysis
These topics are related to run and analyse the results of user-studies. Online studies, interviews and lab studies are all possible, depending on the topic. At the end of the semester, the students present a report / paper with the analyses conducted and a talk in which they present the results.

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Practical lab Security, Usability and Society (Bachelor)
2512554, SS 2024, 3 SWS, Language: German/English, Open in study portal

Practical course (P)
Online
Content
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Application deadline: 12.04.2024
Assignment: 15.04.2024
Confirmation deadline: 19.04.2024

Important dates:
Kick-off: 17.04.2024, 09:00 AM CET in Big Blue Button - Link
Report & code feedback deadline: 26.07.2024, 23:59 CET
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Topics:

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Number of students: 2 Ba/Ma
Description: The NoPhish app was one of the first measures from the NoPhish concept. The app has been around for a long time and has not been updated since then. Accordingly, the task of the project is to make the app functional for the current Android version. The app is also to be optimised so that updates, e.g. new chapters, can be added easily.

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Title: Compare BSI Phishing Game with the NoPhish Game
Number of students: 1 Ba
Description: The NoPhish app, one of the first implementations of the NoPhish concept, is a form of serious game. The BSI has also developed a game in the field of phishing. Both "games" use different approaches to impart knowledge from the same context. The aim is to evaluate the two games in terms of similarities and differences.

Title: Phishing Advice from Organizations (English Only)
Number of students: 1 Ba
Description: Many companies distribute information on how to recognise phishing via various channels such as e-mails, e.g. Amazon or Telekom. The question arises as to how helpful these tips are in reality. Are they too specific to the context of the company or so abstractly formulated that they are of no real help to users? The aim of the work is to collect various hints and then compare them with the hints of the NoPhish concept in order to find differences and similarities between the hints and the concept.

Title: Chatbots for Literature Reviews
Number of students: 1 Ba
Description: Chatbots are becoming increasingly popular and are already being used in various areas. But in what form can these bots be used for science? The variety of chatbots also raises the question of whether there are chatbots that are better suited to a scientific context. The aim is to identify a selection of chatbots and evaluate them in terms of their effectiveness for future literature research. To this end, the results of the chatbots will be compared with the ACM database in order to check their effectiveness for finding literature for a specific period of time.

Title: Phishing through homographic attacks in messengers and social networks
Number of students: 1-2 Ba/Ma
Description: The task will be to test three types of attacks in messengers and social networks that work in some email clients. First is the link mismatch attack, where the link text differs from the actual link target. Second is an attack in which the actual link target is disguised by URL encoding [https://en.wikipedia.org/wiki/URL_encoding], and finally homographic attacks which uses Internationalized Domain Names [https://en.wikipedia.org/wiki/IDN_homograph_attack], in which Latin characters are replaced by characters of a different alphabet in the domain name. The attacks are predefined, so no knowledge of phishing techniques is required.

Title: Usability Study of Mobile Authentication for Elderly Users with Rheumatoid Arthritis (English only)
Number of students: 1 Ba/Ma
Description: Authentication is an ever important topic, especially in the mobile context. However, it becomes even more relevant when considering accessibility to it. Nowadays, a common authentication method is using a PIN. Yet, given the low hand mobility of users affected by rheumatoid arthritis, sometimes using PINs can be difficult. In this topic, the student will conduct several sessions of an already designed lab study with various participants using arthritis simulation gloves to evaluate three PIN-pad interfaces aimed at making authentication more accessible. The study will also investigate the preferences of users regarding PIN-pad interfaces through drawings and proposals of changes. The student will then analyse the results through inferential statistics. Depending on the quality of the outcome, the results will then be published in a paper and the student will be added to the authors list.

This event counts towards the KASTEL certificate. Further information on how to obtain the certificate can be found on the SECUSO website (https://secuso.aifb.kit.edu/Studium_und_Lehre.php).
6.13 Course: Advanced Machine Learning [T-WIWI-109921]

Responsible: Prof. Dr. Andreas Geyer-Schulz
Dr. Abdolreza Nazemi

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-105661 - Data Science: Intelligent, Adaptive, and Learning Information Services

<table>
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<td>4.5</td>
<td>Grade to a third</td>
<td>Each summer term</td>
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Events

| ST 2024 | 2540535 | Advanced Machine Learning | 2 SWS | Lecture | Nazemi |
| ST 2024 | 2540536 | Exercise Advanced Machine Learning | 1 SWS | Practice | Nazemi |

Exams

| WT 23/24 | 7900253 | Advanced Machine Learning (Nachklausur SoSe 2023) | Geyer-Schulz |
| ST 2024  | 7900227 | Advanced Machine Learning | Geyer-Schulz |

Competence Certificate

Written examination (60 minutes) according to §4(2), 1 SPO. The exam is considered passed if at least 50 out of a maximum of 100 possible points are achieved. The grades are graded in five steps (best grade 1.0 from 95 points). Details of the grade formation and scale will be announced in the course.

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 one grade level (0.3 or 0.4). The exact criteria for awarding a bonus will be announced at the beginning of the course.

Prerequisites

None

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

Advanced Machine Learning
2540535, SS 2024, 2 SWS, Language: English, Open in study portal

Lecture (V)
Content
In recent years, the volume, variety, velocity, veracity, and variability of available data have increased due to improvements in computational and storage power. The rise of the Internet has made available large sets of data that allow us to use and merge them for different purposes. Data science helps us to extract knowledge from the continually-increasing large datasets. This course will introduce students to a wide range of machine learning and statistical techniques such as deep learning, LASSO, and support vector machine. You will get familiar with text mining, and the tools you need to analyze the various facets of data sets in practice. Students will learn theory and concepts with real data sets from different disciplines such as marketing, finance, and business.

Tentative Course Outline:
- Introduction
- Statistical Inference
- Shrinkage Methods
- Model Assessment and Selection
- Tree-based Machine Learning Algorithms
- Dimensionality Reduction
- Neural Networks and Deep Learning
- Natural Language Processing with Deep Learning
- Support Vector Machine

Time of attendance
- Attending the lecture: 13 x 90min = 19h 30m
- Attending the exercise classes: 7 x 90min = 10h 30m

The student will learn
- A wide range of machine learning algorithms and their weaknesses.
- The fundamental issues and challenges: data, high-dimension, train, model selection, etc.
- How to imply machine learning algorithms for real-world applications.
- The fundamentals of deep learning, main research activities, and on-going research in this field.

Literature
6.14 Course: Advanced Machine Learning and Data Science [T-WIWI-111305]

**Responsible:** Prof. Dr. Maxim Ulrich

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

**Part of:** M-WIWI-105659 - Advanced Machine Learning and Data Science

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<td>Grade to a third</td>
<td>Each term</td>
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**Events**

| ST 2024 | 2500016 | Advanced Machine Learning and Data Science | 4 SWS | Project (P / Ulrich) |

Legend: 🖥 Online, 🧱 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

Due to the professor’s research sabbatical, the BSc module "Financial Data Science" and MSc module "Foundations for Advanced Financial -Quant and -Machine Learning Research" and the MSc module "Advanced Machine Learning and Data Science" along with the respective examinations will not be offered in SS2023. Bachelor and Master thesis projects are not affected and will be supervised.

The assessment is carried out in form of a written thesis based on the course "Advanced Machine Learning and Data Science".

**Annotation**

The course is targeted to students with a major in Data Science and/or Machine Learning. It offers students the opportunity to develop hands-on knowledge on new developments in data science and machine learning. Please apply via the link: https://portal.wiwi.kit.edu/forms/form/fbv-ulrich-msc-project.

An online meetup will be offered at 14:00 on Tuesday of the first week of summer semester 2022 (i.e., 19.04.2022).

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

**Advanced Machine Learning and Data Science**

2500016, SS 2024, 4 SWS, Language: English, Open in study portal

Project (PRO)

Blended (On-Site/Online)

**Content**

The course is targeted to students with a major in Data Science and/or Machine Learning. It offers students the opportunity to develop hands-on knowledge on new developments in data science and machine learning.

**Organizational issues**

Während des Kick-off Meetings in der ersten Wochen werden Themen vorgestellt.

Wir bereiten Themen für Studenten der Informatik, W-Ing und Wi-Ma vor.

Themen und studentische Bearbeiter werden nach dem Kick-off gematched.

**Literature**

Literatur und Computerprogramme wird in der ersten Vorlesung bekannt gegeben.
6.15 Course: Advanced Management Accounting [T-WIWI-102885]

**Responsible:** Prof. Dr. Marcus Wouters
**Organisation:** KIT Department of Economics and Management
**Part of:** M-WIWI-101510 - Cross-Functional Management Accounting

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**Events**

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**Exams**

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<td>Wouters</td>
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</table>

**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🔴 On-Site, ✗ Cancelled

**Competence Certificate**
The assessment consists of an oral exam (30 min) (according to §4 (2), 2 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

**Prerequisites**
None.

**Recommendation**
The course requires significant prior knowledge of Management Accounting, similar to the content of the courses MA 1 and 2, although completion of these particular courses is not a formal requirement.

**Annotation**
This course is held in English. Lectures and tutorials are integrated.
The course is compulsory and must be examined.
Students who are interested in attending this course should send an e-mail to Professor Wouters (marc.wouters@kit.edu).

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Language</th>
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</thead>
<tbody>
<tr>
<td>2579907</td>
<td>Advanced Management Accounting</td>
<td>English</td>
<td>Open in study portal</td>
</tr>
</tbody>
</table>
Content
This course is held in English. Students who are interested in attending this course should send an e-mail to Professor Wouters (marc.wouters@kit.edu).

Inhalt:
- The course addresses several topics where management accounting is strongly related to marketing, finance, or organization and strategy, such as customer value propositions, financial performance measures, managing new product development, and technology investment decisions.

Learning objectives:
- Students will be able to consider advanced management accounting methods in an interdisciplinary way and to apply these to managerial decision-making problems in operations and innovation.
- They will also be able to identify relevant research results on such methods.

Examination:
- The assessment consists of an oral exam (30 min) taking place in the recess period (according to § 4 (2) No. 2 of the examination regulation).
- The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Required prior Courses:
- The course is compulsory and must be examined.

Recommendations:
- The course requires significant prior knowledge of Management Accounting, similar to the content of the courses MA 1 and 2, although completion of these particular courses is not a formal requirement.

Workload:
- The total workload for this course is approximately 135 hours. For further information see German version.

Literature
Literature is mostly made available via ILIAS.
### 6.16 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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**Events**

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**Exams**

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<td>Grothe</td>
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</table>

**Legend:** 🇩 Online, 🎬 Blended (On-Site/Online), 🌐 On-Site, ✗ Cancelled

**Competence Certificate**
The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation. The exam is offered every semester. Re-examinations are offered only for repeaters.

**Prerequisites**
None
### 6.17 Course: Advanced Stochastic Optimization [T-WWI-106548]

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

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| Exams |  
|-------|---|-----------------------------|
| ST 2024 | 7900034 | Advanced Stochastic Optimization | Rebennack |

**Competence Certificate**  
The assessment consists of an oral exam (20 minutes). The exam is offered every semester.

**Prerequisites**  
None.

**Annotation**  
Lectures and tutorials are offered irregularly.
### 6.18 Course: Advanced Topics in Digital Management [T-WIWI-111912]

**Responsible:** Prof. Dr. Petra Nieken  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-105923 - Incentives, Interactivity & Decisions in Organizations

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<td>Grade to a third</td>
<td>Each term</td>
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**Events**

| ST 2024 | 2573016 | Advanced Topics in Digital Management | 2 SWS | Colloquium (K//Delete) | Nieken, Mitarbeiter |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

Alternative exam assessment. The following aspects are included:

- Regular and active participation in the course dates
- Presentation of a given research topic.

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.

**Recommendation**

We recommend visiting the course Incentives in Organization before taking this course. The course is strongly recommended for students interested in empirical research in the areas digital HRM, personnel economics, and leadership and those who are interest in an academic career path.

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

**Advanced Topics in Digital Management**

2573016, SS 2024, 2 SWS, Language: English, [Open in study portal](#)

**Colloquium (KOL)**

On-Site
Content
The students will discuss and analyze selected research papers in the areas digital HRM, personnel economics, and leadership with a focus on digital management. The students will present research papers and discuss research methods and designs as well as content. They will develop an own research design on a predefined topic.

Aim
The student

- Looks into current research topics in the areas HRM, personnel economics, and leadership with a focus on digital management and AI.
- Analyzes research papers in detail and evaluates the research outcomes.
- Trains their presentation skills and discussion skills.
- Practices scientific debating.
- Learns to critically evaluate research methods and trains the scientific discussion culture.
- Gains deeper knowledge in the area of digital HRM and management.
- Learns to evaluate research designs and takes into account the ethical dimension of research.
- Learns how to develop an own research design and idea.

Notes
Due to the interactive nature of the course, the number of participants is limited. If you are interested, please contact Prof. Nieken by email.

Workload
The total workload for this course is approximately 90 hours.
Lecture: 30 hours
Preparation: 45 hours
Exam preparation: 15 hours

Literature
Selected research papers

Organizational issues
Geb. 05.20, Raum 2A-25, Termine werden bekannt gegeben
6 COURSES

Course: Advanced Topics in Economic Theory [T-WIWI-102609]

6.19 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-101406 - Network Economics
M-WIWI-101500 - Microeconomic Theory
M-WIWI-101502 - Economic Theory and its Application in Finance

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Events

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Legend: ☑ Online, ☐ Blended (On-Site/Online), ☐ On-Site, ✗ Cancelled

Competence Certificate
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 2024, 2 SWS, Language: English, Open in study portal

Literature
Die Veranstaltung wird in englischer Sprache angeboten:
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.
Course: Advanced Topics in Human Resource Management [T-WIWI-111913]

**Responsibility:** Prof. Dr. Petra Nieken

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

**Part of:** M-WIWI-105923 - Incentives, Interactivity & Decisions in Organizations

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<td>Grade to a third</td>
<td>Each term</td>
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</table>

**Competence Certificate**
Alternative exam assessment. The following aspects are included:

- Regular and active participation in the course dates
- Presentation of a given research topic.

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.

**Recommendation**
We recommend visiting the course Incentives in Organization before taking this course. The course is strongly recommended for students interested in empirical research in the areas HRM, personnel economics, and leadership and those who are interested in an academic career path.
## 6.21 Course: Algorithm Engineering [T-INFO-101332]

**Responsible:** Prof. Dr. Peter Sanders  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100795 - Algorithm Engineering

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### Events

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### Exams

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</tbody>
</table>

| Sanders |

**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

### Competence Certificate

There are two partial achievements Algorithm Engineering (4 ECTS) and Algorithm Engineering Exercises (1 ECTS):

**Algorithm Engineering:**  
The assessment is carried out as an oral examination lasting 20 minutes. § 4 Abs. 2 Nr. 2 SPO

**Algorithm Engineering Exercises:**  
The assessment is carried out as an examination of another type.

The exercise can be evidenced by various performance records. This is determined individually during the lecture. Usually, the student prepares a seminar presentation and/or works on a practical tasks with written elaboration and evaluation (the main performance consists of the programming, documented by the source code that is to be handed in and supplemented by a short written report).

Students may redraw from the examination during the first XXX??? weeks after they have been assigned a task.

### Prerequisites

none.
6.22 Course: Algorithm Engineering Pass [T-INFO-111856]

**Responsible:** Prof. Dr. Peter Sanders  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100795 - Algorithm Engineering

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<td>Each summer term</td>
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**Exams**

| WT 23/24 | 7500187 | Algorithm Engineering Pass | Sanders |

**Competence Certificate**

There are two partial achievements Algorithm Engineering (4 ECTS) and Algorithm Engineering Exercises (1 ECTS):

**Algorithm Engineering:**

The assessment is carried out as an oral examination lasting 20 minutes.

**Algorithm Engineering Exercises:**

The assessment is carried out as an examination of another type. § 2 Abs. 2 Nr. 3

The exercise can be evidenced by various performance records. This is determined individually during the lecture. Usually, the student prepares a seminar presentation and/or works on a practical tasks with written elaboration and evaluation (the main performance consists of the programming, documented by the source code that is to be handed in and supplemented by a short written report).

Students may redraw from the examination during the first XXX?? weeks after they have been assigned a task.

**Prerequisites**

none.
6.23 Course: Algorithmic Graph Theory [T-INFO-103588]

**Responsible:** Dr. rer. nat. Torsten Ueckerdt

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100762 - Algorithmic Graph Theory

<table>
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<td>Irregular</td>
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### 6.24 Course: Algorithms for Routing [T-INFO-100002]

**Responsible:** TT-Prof. Dr. Thomas Bläsius  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100031 - Algorithms for Routing

<table>
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#### Events

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<td>2424638</td>
<td>Algorithmen für Routenplanung (mit Übungen)</td>
<td>3 SWS</td>
<td>Lecture / Practice /</td>
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#### Exams

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Responsible:** Dr. rer. nat. Torsten Ueckerdt

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-102094 - Algorithms for Visualization of Graphs

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<td>Lecture / Practice /</td>
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**Legend:** 🖥 Online, 🗣 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled
### Course: Algorithms II [T/INFO-102020]

**Responsible:** Prof. Dr. Peter Sanders  
**Organisation:** KIT Department of Informatics  
**Part of:** M/INFO-101173 - Algorithms II

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Legend: 🖥 Online, 🡦 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**
The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 120 minutes.

**Prerequisites**
none.
# 6.27 Course: Analysis of Multivariate Data [T-WIWI-103063]

**Responsible:** Prof. Dr. Oliver Grothe  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-105414 - Statistics and Econometrics II

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<td>Practice</td>
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<td>Grothe, Kächele</td>
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**Exams**

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Canceled

**Competence Certificate**  
The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation. The exam is offered every semester. Re-examinations are offered only for repeaters.

**Prerequisites**  
None

**Recommendation**  
Attendance of the courses Statistics 1 [2600008] and Statistics 2 [2610020] is recommended.

**Annotation**  
The lecture is not offered regularly. The courses planned for three years in advance can be found online.

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

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<thead>
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**Literature**  
Skript zur Vorlesung
### 6.28 Course: Application Security Lab [T-INFO-106289]

**Responsible:** Dr. Willi Geiselmans  
Prof. Dr. Jörn Müller-Quade

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-103166 - Application Security Lab

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<td>Application security lab</td>
<td>4 SWS</td>
<td>Practical course / Online</td>
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<td>Application security lab</td>
<td>4 SWS</td>
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**Exams**

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6.29 Course: Applied Econometrics [T-WIWI-111388]

**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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**Events**

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**Exams**

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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. A bonus can be acquired by successful completion of an assignment (written report + short in-class presentation) during the semester. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by one grade level (0.3 or 0.4).

**Prerequisites**

None

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

### Applied Econometrics

**2520020, WS 23/24, 2 SWS, Language: English, Open in study portal**

**Lecture (V) On-Site**

**Content**

The course covers two econometric topics: (1) Conditional expectation and regression, and (2) Causal inference. Part (1) reviews foundations like the best linear predictor, least squares estimation, and robust covariance estimation. Part (2) introduces the potential outcomes framework for studying causal, what-if type questions such as ‘How does an internship affect a person’s future wage?’.

For each part, we discuss econometric methods and theory, empirical examples (including recent research papers), and R implementation.

**Learning goal:**

Students are able to assess the properties of various econometric estimators and research designs, and to implement econometric estimators using R software.

**Workload:**

Total workload for 4.5 CP: approx. 135 hours

Attendance: 30 hours

Independent Study: 105 hours

**Literature**


# 6.30 Course: Applied material flow simulation [T-MACH-112213]

**Responsible:** Dr.-Ing. Marion Baumann  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:**  
- M-WIWI-102805 - Service Operations  
- M-WIWI-102832 - Operations Research in Supply Chain Management

<table>
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<td>Applied material flow simulation</td>
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<td>Baumann</td>
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**Exams**

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<td>Baumann, Furmans</td>
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**Legend:**  
- 🖥 Online  
- 🧩 Blended (On-Site/Online)  
- 🗣 On-Site  
- ❌ Cancelled

### Competence Certificate

The assessment consists of an oral exam (20 min.) taking place in the recess period according to § 4 paragraph 2 Nr. 2 of the examination regulation.

### Prerequisites

None

### Recommendation

- Basic statistical knowledge and understanding  
- Knowledge of a common programming language (Java, Python, ...)  
- Recommended course: T-WIWI-102718 - Discrete Event Simulation in Production and Logistics

---

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

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<th>Type</th>
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<td>3</td>
<td>Lecture / Practice (VÜ) On-Site</td>
</tr>
</tbody>
</table>

Information Systems M.Sc.  
Module Handbook as of 11/04/2024
Content

Learning Content:

- Methods of modeling a simulation such as:
  - Discrete-event simulation
  - Agent based simulation
- Design of a simulation model of a material flow system
- Data exchange in simulation models
- Verification and validation of simulation models
- Execution of simulation studies
- Statistical evaluation and parameter study

This is an application-oriented course in which the course contents are applied and deepened using the Anylogic software.

Learning Goals:

Students are able to:

- select the appropriate simulation modeling method depending on a modeling objective and build a suitable simulation model for material flow systems,
- extend a simulation model in a meaningful way with data import and export,
- verify and validate a simulation model,
- conduct a simulation study efficiently and with meaningful results, and
- design and conduct a parameter study and statistically analyze and evaluate the results.

Recommendations:

- Basic statistical skills
- Prior knowledge of a common programming language (Java, Python, ...).
- Recommended course: T-WIWI-102718 - Discrete Event Simulation in Production and Logistics

Workload for 4,5 ECTS (135 h):

- regular attendance: 21 hours
- self-study: 114 hours

Organizational issues

- Im Wintersemester 2023/2024 ist die Veranstaltung auf maximal 30 Teilnehmer beschränkt.
- Die Anmeldung ist durch Beitritt zum ILIAS-Kurs und Ausfüllen des Anmeldungsformulars (erforderliche Felder beim Beitritt zum ILIAS-Kurs) möglich.
- Die Anmeldung ist vom 01.09.2023 bis zum 30.09.2023 möglich.

Literature


6.31 Course: Artificial Intelligence in Service Systems [T-WIWI-108715]

**Responsible:** Prof. Dr. Gerhard Satzger

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

**Part of:**
- M-WIWI-101448 - Service Management
- M-WIWI-101506 - Service Analytics
- M-WIWI-103117 - Data Science: Data-Driven Information Systems
- M-WIWI-104814 - Information Systems: Analytical and Interactive Systems

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<td>Lecture / 🗣️</td>
<td>Kühl, Spitzer, Vössing</td>
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<td>ST 2024</td>
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**Competence Certificate**
The assessment consists of a written exam (60 min). Successful completion of the exercises is a prerequisite for admission to the written exam.

**Prerequisites**
None

**Annotation**
The course will be offered in the form of a flipped classroom concept starting in winter semester 2022/2023. The lecture will be recorded in advance and made available online. During the exercise classes, the contents of the lecture will be discussed and applied as part of programming exercises.

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

### Artificial Intelligence in Service Systems

**Type:** Lecture (V)

**Credits:** 4.5

**Grading scale:** Grade to a third

**Recurrence:** Each winter term

**Version:** 1

**Lecture (V)**

**2595650, WS 23/24, 1.5 SWS, Language: English, Open in study portal**

**Blended (On-Site/Online)**

**Content**

Artificial Intelligence (AI) and the application of machine learning is becoming more and more popular to solve relevant business challenges — both within isolated entities but also within co-creating systems (like value chains). However, it is not only essential to be familiar with precise algorithms but rather a general understanding of the necessary steps with a holistic view — from real-world challenges to the successful deployment of an AI-based solution. As part of this course, we teach the complete lifecycle of an AI project focusing on supervised machine learning challenges. We do so by also introducing the use of Python and the required packages like scikit-learn with exemplary data and use cases. We then take this knowledge to the more complex case of service systems with different entities (e.g., companies) who interact with each other and show possibilities on how to derive holistic insights. Apart from the technical aspects necessary when developing AI within service systems, we also shed light on the collaboration of humans and AI in such systems (e.g., with the support of XAI), topics of ethics and bias in AI, as well as AI's capabilities on being creative.

Students of this course will be able to understand and implement the complete lifecycle of a typical Artificial Intelligence use case with supervised machine learning. Furthermore, they understand the importance and the means of applying AI and Machine Learning within service systems, which allows multiple, independent entities to collaborate and derive insights. Besides technical aspects, they will gain an understanding of the broader challenges and aspects when dealing with AI. Students will be proficient with typical Python code for AI challenges.
Organizational issues
The course will be offered in the form of a flipped classroom concept starting in winter semester 2022/2023. The lecture will be recorded in advance and made available online. During the exercise classes, the contents of the lecture will be discussed and applied as part of programming exercises.

Literature
6.32 Course: Artificial Intelligence in Service Systems - Applications in Computer Vision [T-WIWI-111219]

**Responsible:** Prof. Dr. Gerhard Satzger  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101448 - Service Management  
- M-WIWI-101506 - Service Analytics  
- M-WIWI-103117 - Data Science: Data-Driven Information Systems  
- M-WIWI-104814 - Information Systems: Analytical and Interactive Systems  
- M-WIWI-105661 - Data Science: Intelligent, Adaptive, and Learning Information Services

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<td>Each summer term</td>
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**Events**

| ST 2024 | 2595501 | Artificial Intelligence in Service Systems - Applications in Computer Vision | 3 SWS | Lecture / 🗣 | Satzger, Schmitz |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**  
Alternative exam assessment.

**Annotation**  
This course is admission restricted (see [http://dsi.iism.kit.edu](http://dsi.iism.kit.edu)).  
The course replaces “Service Analytics A” as of summer semester 2021.

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

**Artificial Intelligence in Service Systems - Applications in Computer Vision**

2595501, SS 2024, 3 SWS, Language: English, [Open in study portal](#)  
Lecture (V)  
On-Site
Content
---We renamed this course from "Service Analytics A" to "Artificial Intelligence in Service Systems - Applications in Computer Vision" ---

Learning objectives
This course teaches students how to apply machine learning concepts to develop predictive models that form the basis of many innovative service offerings and business models today. Using a selected use case each term, students learn the foundations of selected algorithms and development frameworks and apply them to build a functioning prototype of an analytics-based service. Students will become proficient in writing code in Python to implement a data science case over the course period.

Description
Data-driven services have become a key differentiator for many companies. Their development is based on the increasing availability of structured and unstructured data and their analysis through methods from data science and machine learning. Examples comprise highly innovative service offerings based on technologies such as natural language processing, computer vision or reinforcement learning.

Using a selected use case, this lecture will teach students how to develop analytics-based services in an applied setting. We teach the theoretical foundations of selected machine learning algorithms (e.g., convolutional neural networks) and development concepts (e.g., developing modeling, training, inference pipelines) and teach how to apply these concepts to build a functioning prototype of an analytics-based service (e.g., inference running on a device). During the course, students will work in small groups to apply the learned concepts in the programming language Python using packages such as Keras, Tensorflow or Scikit-Learn. For more information on recent projects as part of the course, please visit the website of our lecture: https://www.aiss-cv.com.

Recommendations
The course is aimed at students in the Master's program with basic knowledge in statistics and applied programming in Python. Knowledge from the lecture Artificial Intelligence in Service Systems may be beneficial.

Additional information
The lecture will be held as part of 7 blocks within the summer semester. Due to the practical group sessions in the course, the number of participants is limited. The official application period in the WiWi portal will open mid of February. Please apply here: https://go.wiwi.kit.edu/aiss-cv. The course will be held mainly online via Zoom. For interim and final presentation, we will meet in person. Further information on the dates and rooms of interim and final presentation will be announced via Ilias and mail.

Literature
**6.33 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

<table>
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<td>Grade to a third</td>
<td>Each summer term</td>
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**Events**

| ST 2024 | 2530555 | Asset Pricing | 2 SWS | Lecture / 🗣 | Uhrig-Homburg, Müller |
| ST 2024 | 2530556 | Asset Pricing | 1 SWS | Practice / 🗣 | Böll, Uhrig-Homburg, Müller |

**Exams**

| WT 23/24 | 7900056 | Asset Pricing | Uhrig-Homburg |

**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**
Depending on further pandemic developments, the examination will be offered either as a 60-minute written examination or as an open-book examination (alternative exam assessment).

A bonus can be earned by correctly solving at least 50% of the posed bonus exercises. 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**
2530556, SS 2024, 1 SWS, Language: German, [Open in study portal](#)

**Practice (Ü)**
On-Site
### 6.34 Course: Auction Theory [T-WIWI-102613]

**Responsible:** Prof. Dr. Karl-Martin Ehrhart  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101446 - Market Engineering  
- M-WIWI-101453 - Applied Strategic Decisions  
- M-WIWI-101500 - Microeconomic Theory

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#### Events

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<td>Auktionstheorie</td>
<td>2 SWS</td>
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<td>WT 23/24</td>
<td>Übungen zu Auktionstheorie</td>
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#### Exams

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<td>Lecture</td>
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<tr>
<td>ST 2024</td>
<td>Auction Theory</td>
<td>Ehrhart</td>
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</table>

**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

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

**Auktionstheorie**  
2520408, WS 23/24, 2 SWS, [Open in study portal](#)

**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
6.35 Course: Automated Planning and Scheduling [T-INFO-109085]

**Responsible:** Prof. Dr. Peter Sanders

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-104447 - Automated Planning and Scheduling

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6.36 Course: Automated Visual Inspection and Image Processing [T-INFO-101363]

- **Responsible:** Prof. Dr.-Ing. Jürgen Beyerer
- **Organisation:** KIT Department of Informatics
- **Part of:** M-INFO-100826 - Automated Visual Inspection and Image Processing

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<td>Each winter term</td>
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**Events**

- **WT 23/24** 24169 - Automated Visual Inspection and Image Processing 4 SWS Lecture / On-Site, Beyerer, Zander

**Exams**

- **WT 23/24** 7500008 - Automated Visual Inspection and Image Processing Beyerer

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

**Automated Visual Inspection and Image Processing**

24169, WS 23/24, 4 SWS, Language: German, Open in study portal

**Lecture (V) On-Site**

**Content**

**Topics covered:**

- sensors and concepts for image acquisition
- light and colour
- image signals (system theory, Fourier transformation, stochastic processes)
- excursion to wave optics
- pre-processing and image enhancement
- image restoration
- segmentation
- morphological image processing
- texture analysis
- detection
- image pyramids, multi scale analysis and wavelet-transform

**Educational objective:**

- Students have a sound knowledge regarding the basic concepts and methods of image processing (pre-processing and image enhancement, image restoration, image segmentation, morphological filtering, texture analysis, detection, image pyramids, multi-scale analysis and the wavelet transform)
- Students are in the position to work out and to evaluate solution concepts for problems of automated visual inspection
- Students have a sound knowledge of the different sensors and methods for the acquisition of image data as well as of the relevant optical principles
- Students know different concepts to describe image data and they know the essential system theoretical concepts and interrelations

**Organizational issues**

Die Erfolgskontrolle wird in der Modulbeschreibung erläutert.

**Empfehlungen:**

Grundkenntnisse der Optik und der Signalverarbeitung sind hilfreich.

**Literature**

Weiterführende Literatur

### 6.37 Course: Automotive Software Engineering (ASE) [T-INFO-112203]

<table>
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<td>Lecture / 🗣</td>
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<td>WT 23/24</td>
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<td>7500233</td>
<td>Automotive Software Engineering (ASE)</td>
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<td>Schaefer</td>
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</table>

**Responsible:** Prof. Dr.-Ing. Ina Schaefer  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-106019 - Automotive Software Engineering (ASE)
### 6.38 Course: Automotive Software Engineering (ASE) - Pass [T-INFO-112204]

**Responsible:** Prof. Dr.-Ing. Ina Schaefer

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-106019 - Automotive Software Engineering (ASE)

<table>
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**Events**

| WT 23/24 | 2400110 | Automotive Software Engineering - Exercises | 1 SWS | Practice / 🗣 | Schaefer |

**Exams**

| WT 23/24 | 7500213 | Automotive Software Engineering (ASE) - Pass |                | Schaefer |

**Legend:** 🖥 Online, ☐ Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

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### 6.39 Course: Basics of German Company Tax Law and Tax Planning [T-WIWI-108711]

**Responsible:**
- Dr. Gerd Gutekunst
- Prof. Dr. Berthold Wigger

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

**Part of:**
- M-WIWI-101511 - Advanced Topics in Public Finance

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<td>Grade to a third</td>
<td>Each winter term</td>
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#### Events

| WT 23/24 | 2560134 | Basics of German Company Tax Law and Tax Planning | 3 SWS | Lecture / 🗣 | Wigger, Gutekunst |

<table>
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<th>Exams</th>
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<tr>
<td>WT 23/24</td>
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<tr>
<td>ST 2024</td>
</tr>
</tbody>
</table>

**Legend:**
- 🖥 Online
- 🧩 Blended (On-Site/Online)
- 🗣 On-Site
- ✗ Cancelled

**Competence Certificate**
Depending on the further pandemic development the assessment will consist either of an open book exam (following Art. 4, para. 2, clause 3 of the examination regulation), or of an 1.5 h written exam (following Art. 4, para. 2, clause 1 of the examination regulation).

**Prerequisites**
None

**Recommendation**
Knowledge of the collection of public revenues is assumed. Therefore it is recommended to attend the course “Öffentliche Einnahmen” beforehand.

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

**Content**

**Workload:**
The total workload for this course is approximately 135.0 hours. For further information see German version.
6.40 Course: Behavioral Lab Exercise [T-WIWI-111806]

Responsible: Prof. Dr. Petra Nieken
Prof. Dr. Benjamin Scheibehenne

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-105923 - Incentives, Interactivity & Decisions in Organizations

<table>
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Events

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<td>4.5 SWS</td>
<td>Seminar / On-Site</td>
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Exams

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<td>Nieken, Scheibehenne</td>
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</table>

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Competence Certificate

Alternative exam assessment.

Recommendation

This class caters towards Master students who are interested in empirical research and in running lab experiments.

Annotation

The course will be offered for the first time in the winter semester 21/22.

Due to the interactive nature of the class, the number of participants is limited. If you are interested, please contact the teachers directly via email.

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

**V** Behavioral Lab Exercise

2500040, WS 23/24, 4.5 SWS, Language: English, Open in study portal

Seminar (S) On-Site

Content

In this class, students learn the core principles of psychological and economic experiments. The course covers topics ranging from design principles, to best-practices, preregistration, and analysis of the experimental data. Students will actively participate in the course by covering one selected topic in a talk. All students will discuss the topics together with the professors to develop solid knowledge about experimental design and analysis plans. In a second step, all students will develop a draft of an experimental design and analysis plan for their own topic and present it to the class. The students will get detailed feedback enabling them to improve their drafts for future research.
### 6.41 Course: Biologically Inspired Robots [T-INFO-101351]

**Responsible:** Prof. Dr.-Ing. Arne Rönnau  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100814 - Biologically Inspired Robots

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<td>Each summer term</td>
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</table>

#### Events

| ST 2024     | 24619 | Biologisch Motivierte Roboter | 2 SWS | Lecture / 🧩 | Rönnau |

#### Exams

| WT 23/24 | 7500313 | Biologically Inspired Robots | Rönnau |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
6.42 Course: Bond Markets [T-WIWI-110995]

**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

<table>
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<td>Each winter term</td>
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**Events**

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<th>3 SWS</th>
<th>Lecture / Practice (✓)</th>
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**Exams**

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<th>7900311</th>
<th>Bond Markets</th>
<th>Uhrig-Homburg</th>
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</thead>
</table>

Legend: Online, Blended (On-Site/Online), On-Site, C Cancelled

**Competence Certificate**

The assessment consists of a written exam (75min.)

A bonus can be earned by correctly solving at least 50% of the posed bonus exercises. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by up to one level (0.3 or 0.4). The examination is offered in each semester and can be repeated at any regular examination date.

Depending on further pandemic developments, the examination will be offered as an open-book examination (alternative exam assessment).

**Annotation**

This course will be held in English.

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

**Bond Markets**

<table>
<thead>
<tr>
<th>Lecture / Practice (VÜ)</th>
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</thead>
<tbody>
<tr>
<td>On-Site</td>
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</tbody>
</table>

**Content**

The lecture "Bond Markets" deals with the national and international bond markets, which are an important source of financing for companies, as well as for the public sector. After an overview of the most important bond markets, different yield definitions are discussed. Based on this, the concept of the yield curve is presented. In addition, the theoretical and empirical relationships between ratings, default probabilities and spreads are analyzed. The focus will then be on questions regarding the valuation, measurement, management and control of credit risks.

The total workload for this course is approximately 135 hours (4.5 credits).

The assessment consists of a written exam (75min.) (according to §4(2), 1 SPO). A bonus can be earned by correctly solving at least 50% of the posed bonus exercises. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by up to one level (0.3 or 0.4). The examination is offered in each semester and can be repeated at any regular examination date.

Students deepen their knowledge of national and international bond markets. They gain knowledge of the traded instruments and their key figures for describing default risk such as ratings, default probabilities or credit spreads.

**Organizational issues**

Die Veranstaltung wird in der ersten Semesterhälfte an sechs Freitagen am Campus B (Geb. 09.21) im Raum 124 angeboten. Die Klausur findet dann direkt im Anschluss statt.
6.43 Course: Bond Markets - Models & Derivatives [T-WIWI-110997]

**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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<td>Bond Markets - Models &amp; Derivatives</td>
<td>2 SWS</td>
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<td>Block / 🗣️</td>
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**Exams**

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<td>Uhrig-Homburg</td>
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**Legend:**
- 🖥 Online
- 🧩 Blended (On-Site/Online)
- 🗣️ On-Site
- 🗑 Cancelled

**Competence Certificate**
The assessment of success consists in equal parts of a written thesis and an oral exam including a discussion of one’s own work. The main examination is offered once a year, re-examinations every semester.

**Recommendation**
Knowledge of “Bond Markets” and “Derivatives” courses is very helpful.

**Annotation**
This course will be held in English.

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

**Bond Markets - Models & Derivatives**
2530565, WS 23/24, 2 SWS, Language: English, [Open in study portal]

**Content**

- **Competence Certificate:** The assessment of success consists in equal parts of a written thesis and an oral exam (according to §4(2), 3 SPO) including a discussion of one’s own work. The main examination is offered once a year, re-examinations every semester.
- **Competence Goal:** Students deepen their knowledge of national and international bond markets. They are able to apply the knowledge they have gained about traded instruments and common valuation models for pricing derivative financial instruments.
- **Prerequisites:**
- **Content:** The lecture “Bond Markets – Models & Derivatives” deepens the content of the lecture “Bond Markets”. The modelling of the dynamics of yield curves and the management of credit risks forms the theoretical foundation for the valuation of interest rate and credit derivatives to be discussed. In this course, students deal intensively with selected topics and acquire the relevant knowledge on their own.
- **Recommendation:** Knowledge of “Bond Markets” and “Derivatives” courses is very helpful.
- **Workload:** The total workload for this course is approximately 90 hours (3.0 credits).

**Organizational issues**
Die Veranstaltung startet in der zweiten Semesterhälfte (Kickoff am 08.12.23) und hat Seminarcharakter - mit dem Ziel, ein selbstgewähltes Themenfeld in Form einer schriftlichen Ausarbeitung eigenständig zu erarbeiten.
Course: Bond Markets - Tools & Applications [T-WIWI-110996]

**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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<td>2530562</td>
<td><strong>Bond Markets - Tools &amp; Applications</strong></td>
<td>Uhrig-Homburg, Grauer</td>
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<td>Exams</td>
<td>WTO/24</td>
<td>7903317</td>
<td>Bond Markets - Tools &amp; Applications</td>
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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, x Cancelled

**Competence Certificate**
The assessment consists of an empirical case study with written elaboration and presentation. The main examination is offered once a year, re-examinations every semester.

**Recommendation**
Knowledge of the "Bond Markets" course is very helpful.

**Annotation**
This course will be held in English.

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

**Bond Markets - Tools & Applications**

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<td>1 SWS</td>
<td>Bond Markets - Tools &amp; Applications</td>
<td>Uhrig-Homburg</td>
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</table>

**Content**

- **Competence Certificate:** The assessment consists of an empirical case study with written elaboration and presentation (according to §4(2), 3 SPO). The main examination is offered once a year, re-examinations every semester.
- **Competence Goal:** The students apply various methods in practice within the framework of a project-related case study. They are able to deal with empirical data and analyze them in a targeted manner.
- **Content:** The course "Bond Markets – Tools & Applications" includes a hands-on project in the field of national and international bond markets. Using empirical datasets, the students have to apply practical methods in order to analyze the data in a targeted manner.
- **Recommendation:** Knowledge of the "Bond Markets" course is very helpful.
- **Workload:** The total workload for this course is approximately 45 hours (1.5 credits).

**Organizational issues**
Die Veranstaltung findet in der ersten Semesterhälfte statt (Kickoff am 10.11.23) und beinhaltet eine eigenständige Projektarbeit im Umgang mit realen Bond Daten. Die Erfolgskontrolle erfolgt anhand einer schriftlichen Ausarbeitung und einer kurzen Präsentation.
Course: Business Data Analytics: Application and Tools [T-WIWI-109863]

Responsible: Prof. Dr. Christof Weinhardt
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-103117 - Data Science: Data-Driven Information Systems
M-WIWI-103118 - Data Science: Data-Driven User Modeling
M-WIWI-104812 - Information Systems: Engineering and Transformation
M-WIWI-104814 - Information Systems: Analytical and Interactive Systems

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<td>Each summer term</td>
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Events

| ST 2024 | 2540466 | Business Data Analytics: Application and Tools | 2 SWS | Lecture / 🗣 | Knierim, Hariharan |
| ST 2024 | 2540467 | Exercise Business Data Analytics: Application and Tools | 1 SWS | Practice / 🗣 | Grote |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Canceled

Competence Certificate
Success is monitored through ongoing elaborations and presentations of tasks and a written exam (60 minutes) at the end of the lecture period. Successful participation in the exercises is a prerequisite for admission to the written examination. The scoring scheme for the overall evaluation will be announced at the beginning of the course. The number of participants is limited to 50, as this is the only way to ensure conscientious support for the case study. The selection of participants is based on a short letter of motivation (max. 2000 characters including spaces) in the faculty’s portal.

Prerequisites
None

Recommendation
Knowledge of (object-oriented) programming and statistics is helpful.

Annotation
The lecture is read in block sessions at the beginning of the semester. The dates will be communicated in the Wiwi-Portal.

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

Business Data Analytics: Application and Tools
2540466, SS 2024, 2 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Organizational issues
als Blockveranstaltung an 3 Terminen:
- Montag, 22.04.24 - 08:00 - 17:00 Uhr,
- Dienstag, 23.04.24 - 08:00 - 17:00 Uhr,
- Mittwoch, 24.04.24 - 08:00 - 17:00 Uhr,
6.46 Course: Business Data Strategy [T-WIWI-106187]

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

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

**Part of:** M-WIWI-103117 - Data Science: Data-Driven Information Systems

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**Events**

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<td>2540484</td>
<td>Business Data Strategy</td>
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<td>Lecture / 🗣</td>
<td>Weinhardt, van Dinther, Badewitz</td>
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**Exams**

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<td>7900267</td>
<td>Business data strategy</td>
<td>🗣</td>
<td>Weinhardt</td>
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</table>

**Legend:** Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation and an alternative exam assessment according to § 4 paragraph 2 Nr. 3 of the examination regulation. The grade is determined by 2/3 through the written exam and by 1/3 through the alternative exam assessment (e.g., presentation).

**Prerequisites**

None

**Recommendation**

Students should be familiar with basic concepts of business organisations, information systems, and programming. However, all material will be introduced, so no formal pre-conditions are applied.

**Annotation**

Limited number of participants.

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

**Business Data Strategy**

2540484, WS 23/24, 2 SWS, Language: German, Open in study portal

**Content**

With new methods for capturing and using different types of data and industry’s recognition that society’s use of data is less than optimal, the need for comprehensive strategies is more important than ever before. Advances in cybersecurity and information sharing and the use of data in its raw form for decision making all add to the complexity of integrated processes, ownership, stewardship, and sharing. The life cycle of data in its entirety spans the infrastructure, system design, development, integration, and implementation of information-enabling solutions. This lecture focuses on teaching about these dynamics and tools to comprehend and manage them in organisation contexts. Given the increasing size and complexity of data, methods for the transformation and structured preparation are an important tool in the process of sense-making. Modern software solutions and programming languages provide frameworks for such tasks that form another part of this course ranging from conceptual systems modelling to data manipulation to automated generation of HTML reports and web-applications.
Organizational issues
Application/Registration

Attendance will be limited to 20-25 participants. Application/registration is therefore preliminary. After the application deadline has passed, positions will be allocated, based on evaluation of the previous study records. Applications are accepted only through the Wiwi-Portal: https://portal.wiwi.kit.edu/ys/5254

Anmeldung

6 COURSES

Course: Business Dynamics [T-WIWI-102762]

Responsible: Prof. Dr. Andreas Geyer-Schulz
Dr Paul Glenn

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-101409 - Electronic Markets
M-WIWI-105661 - Data Science: Intelligent, Adaptive, and Learning Information Services

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**Events**

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<td>Business Dynamics</td>
<td>2 SWS</td>
<td>Geyer-Schulz, Glenn</td>
<td>On-Site</td>
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<td>WT 23/24</td>
<td>2540532</td>
<td>Exercise Business Dynamics</td>
<td>1 SWS</td>
<td>Geyer-Schulz, Glenn</td>
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<td>Business Dynamics (WS 2023/2024)</td>
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<td>ST 2024</td>
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<td>Geyer-Schulz</td>
<td>On-Site</td>
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</table>

**Competence Certificate**

Written examination (60 minutes) according to §4(2), 1 SPO. The exam is considered passed if at least 50 out of a maximum of 100 possible points are achieved. The grades are graded in five steps (best grade 1.0 from 95 points). Details of the grade formation and scale will be announced in the course.

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 one grade level (0.3 or 0.4). The exact criteria for awarding a bonus will be announced at the beginning of the course.

**Prerequisites**

None

**Recommendation**

None

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

**Business Dynamics**

2540531, WS 23/24, 2 SWS, Language: German, Open in study portal

**Literature**

### Course: Business Intelligence Systems [T-WIWI-105777]

**Responsible:** Prof. Dr. Alexander Mädche  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101506 - Service Analytics  
- M-WIWI-101510 - Cross-Functional Management Accounting  
- M-WIWI-103117 - Data Science: Data-Driven Information Systems  
- M-WIWI-104068 - Information Systems in Organizations  
- M-WIWI-104814 - Information Systems: Analytical and Interactive Systems

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<td>Each winter term</td>
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**Events**

| WT 23/24 | 2540422 | Business Intelligence Systems | 3 SWS | Lecture / 🧩 | Mädche, Gnewuch |

**Exams**

| WT 23/24 | 7900224 | Business Intelligence Systems | Mädche |
| ST 2024  | 7900149 | Business Intelligence Systems | Mädche |

**Legend:**  
- 🖥 Online  
- 🧩 Blended (On-Site/Online)  
- 🗣 On-Site  
- ❌ Cancelled

**Competence Certificate**

Alternative exam assessment. The assessment consists of a one-hour exam and the implementation of a Capstone project. Details will be announced at the beginning of the course.

**Prerequisites**

None

**Recommendation**

Basic knowledge on database systems is helpful.

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

<table>
<thead>
<tr>
<th>Business Intelligence Systems</th>
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</thead>
<tbody>
<tr>
<td>2540422, WS 23/24, 3 SWS, Language: English, Open in study portal</td>
</tr>
</tbody>
</table>

**Lecture (V)**  
**Blended (On-Site/Online)**
Content
In most modern enterprises, Business Intelligence & Analytics (BI&A) Systems represent a core enabler of 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. Modern BI&A systems leverage beyond reporting and dashboards also advanced analytical functions. Thus, today they also play a major role in enabling data-driven products and services. The aim of this course is to introduce theoretical foundations, concepts, tools, and current practice of BI&A Systems from a managerial and technical perspective.

The course is complemented with an engineering capstone project, where students work in a team with real-world use cases and data in order to create running Business intelligence & Analytics system prototypes.

Learning objectives
- Understand the theoretical foundations of key Business Intelligence & Analytics concepts supporting decision-making
- Explore key capabilities of state-of-the-art Business Intelligence & Analytics Systems
- Learn how to successfully implement and run Business Intelligence & Analytics Systems from multiple perspectives, e.g. architecture, data management, consumption, analytics
- Get hands-on experience by working with Business Intelligence & Analytics Systems with real-world use cases and data

Prerequisites
This course is limited to a capacity of 50 places. The capacity limitation is due to the attractive format of the accompanying engineering capstone project. Strong analytical abilities and profound skills in SQL as well as Python and/or R are required. Students have to apply with their CV and transcript of records. All organizational details and the underlying registration process of the lecture and the capstone project will be presented in the first lecture. The teaching language is English.

Literature
- Economist Intelligence Unit. 2015 "Big data evolution: Forging new corporate capabilities for the long term”

Further literature will be made available in the lecture.
6.49 Course: Business Models in the Internet: Planning and Implementation [T-WWI-102639]

Responsible: Prof. Dr. Christof Weinhardt
Organisation: KIT Department of Economics and Management
Part of: M-WWI-102806 - Service Innovation, Design & Engineering

Type: Examination of another type
Credits: 4.5
Grading scale: Grade to a third
Recurrence: Each summer term
Version: 2

Competence Certificate
As of summer semester 2022, the course “Business Models in the Internet: Planning and Implementation” can no longer be taken. The exam will be offered in summer semester 2022 and winter semester 2022/23 for repeaters.

Prerequisites
None

Recommendation
None
6.50 Course: Business Planning [T-WIWI-102865]

**Responsible:** Prof. Dr. Orestis Terzidis  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101488 - Entrepreneurship (EnTechnon)

<table>
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**Events**

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<td>Seminar / 🗣</td>
<td>Martjan, Terzidis</td>
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<td>2</td>
<td>Seminar / 🗣</td>
<td>Terzidis, Tittel, Rosales Bravo</td>
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**Exams**

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<td>Business Planning for Founders</td>
<td>2</td>
<td>Seminar / 🗣</td>
<td>Terzidis</td>
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**Legend:**  🖥 Online,  🧩 Blended (On-Site/Online),  🗣 On-Site,  ✗ CANCELLED

**Competence Certificate**
Alternative exam assessment.

**Prerequisites**
None

**Recommendation**
None

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

**Business Planning for Founders**
2545109, WS 23/24, 2 SWS, Language: English, [Open in study portal](#)

**Content**

Course Content:
In the course Business Planning for Founders, you will be working in interdisciplinary teams on a real-world challenge. The challenge for this semester will be about Chatbots and in the context of privacy risks. To solve the case, you will learn about human-centered design using design thinking methods. These methods will help you develop your own business idea. Building on your idea, you will deploy a business plan and finally present, as a team, the results on the pitch day in front of the seminar participants and a jury.

Information about the seminar:
ONLY ONE of the two options - Business Planning for founders OR Business Planning for founders in the field of IT-Security - can be taken and credited under the in CAS mentioned partial credit, as they cover similar content. Registration must take place in the CAS for the respective examination.

Target group: Master Student

Organizational issues
Registration is via the Wiwi-Portal.
In the seminar you will work on a project in teams of max. 5 persons. Team applications are welcome but not a prerequisite for participation. The seminars will be held in English.

**Business Planning for Founders**
2545109, SS 2024, 2 SWS, Language: English, [Open in study portal](#)
Content

Embark on a transformative journey into the dynamic realm of startup finance with our comprehensive course designed for Master’s students interested in the task of aspiring to become future Chief Financial Officers (CFOs) or Chief Executive Officers (CEOs) in the startup. Particularly, students who previously attended classes on entrepreneurship or developed their business ideas in Design Thinking Seminars will work on the financial viability and, therefore, the potential for realizing their business ideas. The three-day seminar develops the financial literacy needed to start and operate an entrepreneurial venture, including analyzing and determining the cost and revenue structure of the firm and creating a financial strategy to execute the business plan successfully. Additionally, students will learn about the sources and conditions of different investment types and develop tailored fundraising strategies. The seminar is not restricted to the financial aspects but follows the Triple Bottom Line philosophy (3BL).

Throughout the course, real-world case studies and guest lectures, professional experts will provide valuable insights into the practical application of financial concepts. By the end of this course, you will be well-equipped to take on leadership roles in startups and startup ecosystems, armed with the managerial understanding required to drive success in dynamic and competitive markets.

Learning Objectives

Upon completion of this seminar, course participants will be able to

1. Analyze, forecast, and plan the cost structure and revenue streams of the venture project.
2. Reflect on the sustainability of a business based on the Triple Bottom Line theory.
3. Develop the essential financial statements for a startup.
4. Recall and reflect on investment strategies for startups.
5. Discover business stakeholders and prepare a tailored communication strategy.
6. Reflect on the role of information technology.
7. Apply negotiation techniques essential for securing favorable terms and agreements.
8. Have a brief overview of the related topic.

Credentials:

ONLY ONE of the two options - Business Planning for founders OR Business Planning for founders in the field of IT-Security - can be taken and credited under the in CAS mentioned partial credit, as they cover similar content. Registration must take place in the CAS for the respective examination.

Organizational issues

Wednesday, 05.06.2024
Wednesday, 19.06.2024
Wednesday, 17.07.2024

Registration is via the Wiwi-Portal.

In the seminar you will work on a project in teams of max. 5 persons. Team applications are welcome but not a prerequisite for participation. The seminars will be held in English.
### 6.51 Course: Business Strategies of Banks [T-WIWI-102626]

**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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**Competence Certificate**  
The lecture will be offered for the last time in the winter semester 2021/22. The exam will take place for the last time in the summer semester 2022 (only for repeaters).

**Prerequisites**  
None

**Recommendation**  
None

**Annotation**  
The lecture will be offered for the last time in the winter semester 2021/22.
6.52 Course: Case Studies Seminar: Innovation Management [T-WIWI-102852]

**Responsible:** Prof. Dr. Marion Weissenberger-Eibl  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101488 - Entrepreneurship (EnTechnon)  
- M-WIWI-101507 - Innovation Management  
- M-WIWI-101507 - Innovation Management

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<td>Each winter term</td>
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**Events**

| WT 23/24 | 2545105 | Case studies seminar: Innovation management | 2 SWS | Seminar / On-Site | Weissenberger-Eibl |

**Exams**

| WT 23/24 | 7900237 | Case Studies Seminar: Innovation Management | | Weissenberger-Eibl |

**Competence Certificate**

Alternative exam assessments (§4(2), 3 SPO).

**Prerequisites**

None

**Recommendation**

Prior attendance of the course Innovation Management is recommended.

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

**Case studies seminar: Innovation management**

- 2545105, WS 23/24, 2 SWS, Language: German, [Open in study portal]

**Content**

The objective of the seminar is to master selected concepts and methods of innovation management and then to apply these practically. Working in groups, the students apply the described concepts and methods of innovation management to a case study from the industry to answer specific questions. Accordingly, the block seminar involves a switch from input to the application of this input. At the end, the results of the group work are presented in the form of a seminar paper and discussed by the whole course. A short introduction to presentation techniques is planned to help students prepare the seminar papers.

**Literature**

Werden in der ersten Veranstaltung bekannt gegeben.
6.53 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  
- M-WIWI-102808 - Digital Service Systems in Industry

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**Events**

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<th>Challenges in Supply Chain Management</th>
<th>3 SWS</th>
<th>Lecture / Mohr</th>
</tr>
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**Legend:** 🌐 Online, 🌐 Blended (On-Site/Online), 🌐 On-Site, 🌐 Canceled

**Competence Certificate**  
The assessment consists of a written paper and an oral exam of ca. 30-40 min.

**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**  
2550494, SS 2024, 3 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
Blended (On-Site/Online)

**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.

**Organizational issues**

Bewerbung über das Wiwi-Portal möglich:

[http://go.wiwi.kit.edu/ChallengesSCM](http://go.wiwi.kit.edu/ChallengesSCM)

(Bewerbungszeitraum: 01.03.2024 - 18.03.2024)

**Literature**

Wird in Abhängigkeit vom Thema in den Projektteams bekanntgegeben.
# 6.54 Course: Collective Perception in Autonomous Driving [T-WIWI-113363]

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<th>Responsible:</th>
<th>Prof. Dr. Alexey Vinel</th>
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<tr>
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<td>KIT Department of Economics and Management</td>
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<td>Grade to a third</td>
<td>Each summer term</td>
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## Events

| ST 2024 | 2511456 | Collective Perception in Autonomous Driving | 2 SWS | Lecture / Online | Bied, Zhao, Vinel |
| ST 2024 | 2511457 | Exercise Collective Perception in Autonomous Driving | 1 SWS | Practice / Online | Bied, Zhao, Lucena |

## Exams

| ST 2024 | 79AIFB_CPAD_C3 | Collective Perception in Autonomous Driving (Registration until 15 July 2024) | Vinel |

**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

The default assessment of this course is a written examination (60 min).

The exam takes place every semester and can be repeated at every regular examination date.

**Prerequisites**

None.
6.55 Course: Competition in Networks [T-WIWI-100005]

**Responsible:** Prof. Dr. Kay Mitusch  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101406 - Network Economics

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<td>Übung zu Wettbewerb in Netzen</td>
<td>Practice / 📚</td>
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**Exams**

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**  
Result of success is made by a 60 minutes written examination during the semester break (according to §4(2), 1 ERSC). Examination is offered every semester and can be retried at any regular examination date.

**Prerequisites**  
None.

**Recommendation**  
Basics of microeconomics obtained within the undergraduate programme (B.Sc) of economics are required.

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

**Competition in Networks**  
2561204, WS 23/24, 2 SWS, Language: German, Open in study portal

**Lecture (V)**  
Blended (On-Site/Online)

**Content**  
Network or infrastructure industries like telecommunication, transport, and utilities form the backbone of modern economies. The lecture provides an overview of the economic characteristics of network industries. The planning of networks is complicated by the multitude of aspects involved (like spatial differentiation and the like). The interactions of different companies - competition or cooperation or both - are characterized by complex interdependencies within the networks: network effects, economies of scale, effects of vertical integration, switching costs, standardization, compatibility etc. appear increasingly in these sectors and even tend to appear in combination. Additionally, government interventions can often be observed, partly driven by the aims of competition policy and partly driven by the aims industrial policy. All these issues are brought up, analyzed formally (in part) and illustrated by several examples in the lecture.

**Literature**  
Literatur und Skripte werden in der Veranstaltung angegeben.
6.56 Course: Computational Complexity Theory, with a View Towards Cryptography [T-INFO-103014]

**Responsible:** Prof. Dr. Dennis Hofheinz
Prof. Dr. Jörn Müller-Quade

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-101575 - Computational Complexity Theory, with a View Towards Cryptography

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**Events**

| ST 2024 | 2400124 | Computational Complexity Theory, with a View Towards Cryptography | 4 SWS | Lecture | Müller-Quade, Benz, Berger |

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

**Computational Complexity Theory, with a View Towards Cryptography**

2400124, SS 2024, 4 SWS, Language: German, Open in study portal Lecture (V)
6.57 Course: Computational Geometry [T-INFO-104429]

**Responsible:** TT-Prof. Dr. Thomas Bläsius  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-102110 - Computational Geometry

### Events

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### Exams

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ⌠ Cancelled

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

**Computational Geometry**  
2400083, WS 23/24, 4 SWS, Language: German, Open in study portal  
Lecture / Practice (VÜ)  
On-Site

**Organizational issues**  
nur Masterstudiengang Informatik
6.58 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>Each winter term</td>
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**Competence Certificate**
The module examination takes the form of an alternative exam assessment. The alternative exam assessment consists of a Python-based "Takehome Exam". At the end of the third week of January, the student is given a "Takehome Exam" which he processes and sends back independently within 4 hours using Python. Precise instructions will be announced at the beginning of the course. The alternative exam assessment can be repeated a maximum of once. A timely repeat option takes place at the end of the third week in March of the same year. More detailed instructions will be given at the beginning of the course.

**Prerequisites**
None.

**Recommendation**
Basic knowledge of capital market theory.
# 6.59 Course: Computer Architecture [T-INFO-101355]

**Responsible:** Prof. Dr. Wolfgang Karl  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100818 - Computer Architecture

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**Exams**

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled
6.60 Course: Computer Contract Law [T-INFO-102036]

Responsible: Michael Menk
Organisation: KIT Department of Informatics
Part of: M-INFO-101216 - Private Business Law

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Events
- WT 23/24 2411604 Computer Contract Law 2 SWS Lecture / On-Site Menk
- WT 23/24 7500065 Computer Contract Law Sattler, Matz
- ST 2024 7500066 Computer Contract Law Sattler

Exams
- WT 23/24 7500065 Computer Contract Law
- ST 2024 7500066 Computer Contract Law

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

**Computer Contract Law**
2411604, WS 23/24, 2 SWS, Language: German, [Open in study portal]

Lecture (V) On-Site

Content
The course deals with contracts from the following areas:

- Contracts of programming, licencing and maintaining software
- Contracts in the field of IT employment law
- IT projects and IT Outsourcing
- Internet Contracts

From these areas single contracts will be chosen and discussed (e.g. software maintenance, employment contract with a software engineer). Concerning the respective contract the technical features, the economic background and the subsumption in the national law of obligation (BGB-Schuldrrecht) will be discussed. As a result different contractual clauses will be developed by the students. Afterwards typical contracts and conditions will be analysed with regard to their legitimacy as standard business terms (AGB). It is the aim to show the effects of the german law of standard business terms (AGB-Recht) and to point out that contracts are a means of drafting business concepts and market appearance.

It is the aim of this course to provide students with knowledge in the area of contract formation and formulation in practice that builds upon the knowledge the students have already acquired concerning the legal protection of computer programs. Students shall understand how the legal rules depend upon, and interact with, the economic background and the technical features of the subject. The contract drafts shall be prepared by the students and will be corporately completed during the lecture. It is the aim of the course that students will be able to formulate contracts by themselves.

Literature
- Langenfeld, Gerrit Vertragsgestaltung Verlag C.H.Beck, III. Aufl. 2004
- Heussen, Benno Handbuch Vertragsverhandlung und Vertragsmanagement Verlag C.H.Beck, II. Aufl. 2002
- Schneider, Jochen Handbuch des EDV-Rechts Verlag Dr. Otto Schmidt KG, III. Aufl. 2002

Weiterführende Literatur
Ergänzende Literatur wird in den Vorlesungsfolien angegeben.
### Course: Computer Graphics [T-INFO-101393]

**Responsible:** Prof. Dr.-Ing. Carsten Dachsbacher  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100856 - Computer Graphics

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<td>Computergrafik</td>
<td>Lecture / 🗣️</td>
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**Exams**

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣️ On-Site, ✗ Cancelled

**Responsible:** Prof. Dr.-Ing. Carsten Dachsbacher  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100856 - Computer Graphics

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**Events**

| WT 23/24 | 24083 | Übungen zu Computergrafik | Lecture / Practice | Bretl, Dolp, Piochowiak |

**Exams**

| WT 23/24 | 7500508 | Computer Graphics | Dachsbacher |
# 6.63 Course: Context Sensitive Systems [T-INFO-107499]

**Responsible:** Prof. Dr.-Ing. Michael Beigl  
**Organisation:** KIT Department of Informatics

**Part of:**  
- M-INFO-100728 - Context Sensitive Systems  
- M-WIWI-104814 - Information Systems: Analytical and Interactive Systems

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### Events

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### Exams

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, x Cancelled

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Information Systems M.Sc.  
Module Handbook as of 11/04/2024
6.64 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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**Competence Certificate**  
The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation. The successful completion of the exercises is required for admission to the written exam. The examination is held in the semester of the lecture and in the following semester.

**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).
# 6.65 Course: Cooperative Autonomous Vehicles [T-WIWI-112690]

**Responsible:** Prof. Dr. Alexey Vinel  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-104403 - Critical Digital Infrastructures  
M-WIWI-106631 - Cooperative Autonomous Vehicles

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**Competence Certificate**

The default assessment of this course is a written examination (60 min). The exam takes place every semester and can be repeated at every regular examination date.

**Prerequisites**

None.
### Course: Copyright [T-INFO-101308]

**Responsible:** N.N.  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101215 - Intellectual Property Law

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| Events |  |  |  |  |
|--------|  |  |  |  |
| WT 23/24 | 24121 | Copyright | 2 SWS | Lecture / Sattler |

| Exams |  |  |  |  |
|-------|  |  |  |  |
| WT 23/24 | 7500064 | Copyright |  | Sattler |
| ST 2024 | 7500064 | Copyright |  | Sattler |

Legend: ![Online](<image_url>), ![Blended](<image_url>), ![On-Site](<image_url>)
# 6.67 Course: Corporate Compliance [T-INF-101288]

**Responsible:** Andreas Herzig  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101216 - Private Business Law

<table>
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## Events

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, 🗑 Cancelled
**6.68 Course: Corporate Risk Management [T-WIWI-109050]**

**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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**Exams**  
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<td>7900136</td>
<td>Corporate Risk Management</td>
<td>Ruckes</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. 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. Please note that the exam is only offered in the semester of the lecture as well as in the following semester.

**Prerequisites**  
None

**Recommendation**  
None

**Annotation**  
The course will be held again in the summer term 2023 at the earliest. Please pay attention to the announcements on our website.
6.69 Course: Critical Information Infrastructures [T-WIWI-109248]

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

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

**Part of:**
- M-WIWI-104403 - Critical Digital Infrastructures
- M-WIWI-104812 - Information Systems: Engineering and Transformation

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**Exams**

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗂 On-Site, ✗ Cancelled

**Competence Certificate**

The alternative exam assessment 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.

The examination is only offered to first-time students in the winter semester, but can be repeated in the following summer semester.

**Prerequisites**

None.

**Annotation**

6.70 Course: Cryptographic Voting Schemes [T-INFO-101279]

**Responsible:** Prof. Dr. Jörn Müller-Quade

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100742 - Cryptographic Voting Schemes

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6.71 Course: Curves and Surfaces for Geometric Design II [T-INFO-102041]

**Responsible:** Prof. Dr. Hartmut Prautzsch  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101231 - Curves and Surfaces for Geometric Design

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**Competence Certificate**  
The assessment is carried out as an oral examination (§ 4 Abs. 2 Nr. 2 SPO) lasting 20 minutes. oral exam (80%) and exercises (20%)

**Prerequisites**  
None.
## 6.72 Course: Curves and Surfaces in CAD I [T-INFO-101374]

**Responsible:** Prof. Dr. Hartmut Prautzsch  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100837 - Curves and Surfaces in CAD I  

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### Competence Certificate

The assessment is carried out as an oral examination (§ 4 Abs. 2 Nr. 2 SPO) lasting 20 minutes.  
oral exam (80%) and exercises (20%)

### Prerequisites

None.
6.73 Course: Curves and Surfaces in CAD II [T-INFO-102006]

**Responsible:** Prof. Dr. Hartmut Prautzsch

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-101213 - Curves and Surfaces in CAD III

- **Type:** Examination of another type
- **Credits:** 5
- **Grading scale:** Grade to a third
- **Recurrence:** Irregular
- **Version:** 1
6.74 Course: Data Privacy: From Anonymization to Access Control [T-INFO-108377]

**Responsible:** Prof. Dr.-Ing. Klemens Böhm

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-104045 - Data Privacy: From Anonymization to Access Control

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### 6.75 Course: Data Science [T-INFO-113124]

**Responsible:** Prof. Dr.-Ing. Klemens Böhm  
**Organisation:** KIT Department of Informatics  
**Part of:**  
M-INFO-106505 - Data Science  
M-WIWI-104814 - Information Systems: Analytical and Interactive Systems

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**Exams**

- WT 23/24 7500289 Data Science 1 & Data Science 2 Böhm
- ST 2024 7500199 Data Science 1 & Data Science 2 Böhm

**Legend:**  
🖥 Online, 📱 Blended (On-Site/Online), 🗣 On-Site, 🗑 Cancelled

**Prerequisites**

None.
6.76 Course: Database as a Service [T-INFO-111400]

**Responsible:** Prof. Dr.-Ing. Klemens Böhm

**Organisation:** KIT Department of Informatics

**Part of:**
- M-INFO-105724 - Database as a Service
- M-WIWI-104814 - Information Systems: Analytical and Interactive Systems

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**Prerequisites**

none
6.77 Course: Database Systems and XML [T-WIWI-102661]

**Responsible:** Prof. Dr. Andreas Oberweis

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

**Part of:**
- M-WIWI-101456 - Intelligent Systems and Services
- M-WIWI-101477 - Development of Business Information Systems

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**Legend:** Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**
The assessment consists of a written exam (60 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (alternative exam assessment, following §4(2), 3 of the examination regulation).

**Prerequisites**
None

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

**Database Systems and XML**

2511202, WS 23/24, 2 SWS, Language: German, Open in study portal

**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.

**Note on the event format:**
The course Database Systems and XML will be held in WS 23/24 in a "Flipped Classroom" format. Videos and supporting materials are provided for the lecture content, which students can work through independently and at their own pace. During the semester, interactive classroom sessions are held at regular intervals to practice and reinforce the lecture content.

**Learning objectives:**
Students
- know the basics of XML and generate XML documents,
- are able to use XML database systems and to formulate queries to XML documents,
- know to assess the use of XML in operational practice in different application contexts.

**Workload:**
- Lecture 30h
- Exercise 15h
- Preparation of lecture 24h
- Preparation of exercises 25h
- Exam preparation 40h
- Exam 1h
Literature

- W. Kazakos, A. Schmidt, P. Tomchyk: Datenbanken und XML. Springer-Verlag 2002
- G. Vossen: Datenbankmodelle, Datenbanksprachen und Datenbankmanagementsysteme. Oldenbourg 2008

Weitere Literatur wird in der Vorlesung bekannt gegeben.

**Responsible:** Prof. Dr. Hannes Hartenstein  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INF-105334 - Decentralized Systems: Fundamentals, Modeling, and Applications

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**Exams**

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<td>Lecture / Practice (VÜ)</td>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled

**Competence Certificate**
The assessment is carried out as an oral examination (§ 4 Abs. 2 Nr. 2 SPO) lasting 20 minutes. Depending on the number of participants, it will be announced six weeks before the examination (§ 6 Abs. 3 SPO) whether the examination takes place in the form of an oral examination lasting 30 minutes pursuant to § 4 Abs. 2 Nr. 2 SPO or in the form of a written examination lasting 60 minutes in accordance with § 4 Abs. 2 Nr. 1 SPO.

**Prerequisites**
None.

**Recommendation**
Prior knowledge in Foundations of IT-Security and Computer Networks is recommended.

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

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<td>Decentralized Systems: Fundamentals, Modeling, and Applications</td>
<td>Lecture / Practice (VÜ)</td>
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Language: English, Open in study portal
Content

Decentralized Systems (like blockchain-based systems) represent distributed systems that are controlled by multiple parties who make their own independent decisions. In this course, we cover fundamental theoretical aspects as well as up-to-date decentralized systems and connect theory with current practice. We thereby address fault tolerance, security and trust, as well as performance aspects at the example of applications like Bitcoin, Ethereum, IPFS, and Matrix. As a research-oriented lecture, we may cover additional current topics like verifiable computing and/or identity and access management in decentralized settings.

The lecture covers at least the following topics:

- **Fundamentals**
  - Peer-to-Peer Overlay Networks, Sybil and Eclipse Attacks
  - Formalization of decentralized systems, including models for their computation, communication, faults, and timing.
  - Leader election and mutual exclusion in decentralized systems based on different models for node identities and timing.
  - Byzantine consensus in synchronous and asynchronous settings, including Bracha's fundamental algorithm for reliable broadcast, Practical Byzantine Fault Tolerant consensus, and fundamental limits.
  - Consistency models and protocols including Conflict-Free Replicated Data Types.

- **Applications**
  - The Matrix decentralized messaging platform
  - Distributed Ledgers and Blockchains at the examples of Bitcoin and Ethereum, in particular Proof-of-Work and Proof-of-Stake consensus
  - Payment Channel Networks and Rollups
  - Decentralized storage systems, at the example of IPFS

Compentency Goals:

1. Fundamentals & Modeling
   1. The student is able to recognize and distinguish distributed, federated, and decentralized systems.
   2. The student understands consensus, consistency and coordination within the context of networked and decentralized systems.
   3. The student understands the concept of Sybil attacks.
   4. The student is familiar with decentralized algorithms for leader election and mutual exclusion for execution contexts with various guarantees.
   5. The student understands the formally proven limits of fault tolerance and their underlying assumptions. This includes an understanding of synchronous and asynchronous network models which underpin the respective proofs. The student also understands several models for fault tolerance, notably silent and noisy crash as well as byzantine fault tolerance within the context of decentralized and distributed systems.
   6. The student has a basic understanding of state machine replication.
   7. The student knows various models for and levels of consistency.

2. Applications
   1. The student understands conflict-free replicated data types and their use in decentralized systems like Matrix.
   2. The student has a fundamental understanding of blockchain-based systems (e.g. Bitcoin/Ethereum), Payment Channels, Rollups, and decentralized communication systems like Matrix.
   3. The student understands trust relations in distributed and decentralized systems and applications.
   4. The student is able to understand how theoretical foundations relate to networked and decentralized systems in practice.
   5. The student understands concepts of decentralized storage systems.

Workload:

Lecture workload:
1. Attendance time (Course, exercise, etc.)
   - Lecture: 3 SWS: 3,0h x 15 = 45h
   - Exercise: 1 SWS: 1,0h x 15 = 15h
2. Self-study (e.g. independent review of course material, work on homework assignments)
   - Weekly preparation and follow-up of the lecture: 15 x 1h x 3 = 45h
   - Weekly preparation and follow-up of the exercise: 15 x 2h = 30h
3. Preparation for the exam: 45 h

\[ \Sigma = 180 \text{h} = 6 \text{ ECTS} \]
Competency certificate:
Depending on the number of participants, it will be announced six weeks before the examination (§ 6 Abs. 3 SPO) whether the examination takes place

- in the form of an oral examination lasting 30 minutes pursuant to § 4 Abs. 2 Nr. 2 SPO or
- in the form of a written examination lasting 60 minutes in accordance with § 4 Abs. 2 Nr. 1 SPO.
## 6.79 Course: Deep Learning and Neural Networks [T-INFO-109124]

**Responsible:** Prof. Dr. Jan Niehues  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-104460 - Deep Learning and Neural Networks

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### Events

| ST 2024 | 2400024 | Deep Learning and Neural Networks | 4 SWS | Lecture / 🗣 | Niehues |

### Exams

| WT 23/24 | 7500259 | Deep Learning and Neural Networks | Waibel |
| ST 2024 | 7500044 | Deep Learning and Neural Networks | Niehues, Waibel |

**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, 🗿 Cancelled
6.80 Course: Deep Learning for Computer Vision I: Basics [T-INFO-111491]

**Responsible:** Prof. Dr.-Ing. Rainer Stiefelhagen

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-105753 - Deep Learning for Computer Vision I: Basics

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**Exams**

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<td>7500122</td>
<td>Deep Learning for Computer Vision I: Basics</td>
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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ⏳ Cancelled

**Competence Certificate**
The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 120 minutes.

**Prerequisites**
None.

**Recommendation**
Basic knowledge of pattern recognition as taught in the module Cognitive Systems, is expected.

**Annotation**
The course is partially given in German and English.
## Course: Deep Learning for Computer Vision II: Advanced Topics [T-INFO-111494]

**Responsible:** Prof. Dr.-Ing. Rainer Stiefelhagen  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-105755 - Deep Learning for Computer Vision II: Advanced Topics

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled
6.82 Course: Demand-Driven Supply Chain Planning [T-WIWI-110971]

**Responsible:** Dr. Josef Packowski

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

**Part of:** M-WIWI-102805 - Service Operations

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**Legend:** 🖥 Online, ☐ Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**
The assessment consists of a written exam.

**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 winter term. The planned lectures and courses for the next three years are announced online.
6.83 Course: Deployment of Database Systems [T-INFO-101317]

**Responsible:** Prof. Dr.-Ing. Klemens Böhm  
**Organisation:** KIT Department of Informatics  
**Part of:**  
- M-INFO-100780 - Deployment of Database Systems  
- M-WIWI-104814 - Information Systems: Analytical and Interactive Systems

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 👤 On-Site, ✗ Cancelled
# 6.84 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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**Competence Certificate**

Depending on further pandemic developments, the examination will be offered either as a 60-minute written examination or as an open-book examination (alternative exam assessment).

A bonus can be earned by correctly solving at least 50% of the posed bonus exercises. 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:

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**Literature**


**Weiterführende Literatur:**

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

**Design and architectures of embedded systems (ES2)**

WT 23/24 2424106 Design and architectures of embedded systems (ES2) 2 SWS Lecture Khdr, Henkel

Exams

WT 23/24 7500124 VL: Design and architectures of embedded systems (ES2) Henkel

**Content**

State-of-the-art System-on-Chips (SoCs) integrate more than a billion transistors on a single chip. Embedded devices powered by these SoCs would be increasingly ubiquitous and seamlessly integrated into the environment. Therefore they will no longer be perceived as separate computing devices. Such examples can be found in Wireless Sensor Networks (WSNs), Cyber Physical Systems (CPSs), electronic textiles and many more.

However, new efficient ESL (Embedded System Level) design tools as well as novel hardware-software architectures must be developed in order to enable embedded devices to achieve their true potential. The focus of this lecture is therefore on the high-level design methods and architectures for embedded systems. Since the power consumption of embedded systems is of paramount importance, this lecture emphasizes on hardware-software co-design procedures targeting low power consumption.

Appointments for the oral exam can be requested at ces.itec.kit.edu/972.php

The student learns complex hardware-software co-design methods that can be applied to the design of embedded systems. The student assesses and selects specific hardware-software architecture most suitable for an embedded system given its function. Furthermore, the student receives an introduction to the relevant current research topics.
6.86 Course: Design Thinking [T-WIWI-102866]

**Responsible:** Prof. Dr. Orestis Terzidis

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

**Part of:**
- M-WIWI-101488 - Entrepreneurship (EnTechnon)
- M-WIWI-101507 - Innovation Management

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<td>Design Thinking (Track 1)</td>
<td>2 SWS</td>
<td>Jochem, Terzidis</td>
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<td>ST 2024</td>
<td>2545008</td>
<td>Design Thinking (Track 1)</td>
<td>2 SWS</td>
<td>Bhargava, Jochem, Terzidis</td>
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**Exams**

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**Competence Certificate**

Alternative exam assessments (S4(2), 3 SPO).

**Prerequisites**

None

**Recommendation**

None

**Annotation**

The seminar content will be published on the website of the institute.

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

**Design Thinking (Track 1)**

2545008, WS 23/24, 2 SWS, Language: English, [Open in study portal]

**Content**

**Course Content:**

Design Thinking is a user-centric innovation management method. The iterative process first analyzes the problem space and builds a sound understanding of the future users. Subsequently, ideas for the solution are generated, prototypes are created and tested by the user group. The result is a proven and validated product.

**Learning Objectives**

During the seminar, the students learn basic procedures for achieving user-centric innovations. These are concrete methods that start with the potential user of certain products and services. The method is problem-oriented and emphasizes the specific customer situation. After attending the seminar, the students have a clear understanding of the need to explore end-user needs and are able to independently apply the methods of Design Thinking for developing market-driven innovations at a basic level.

**Credentials:**

Registration is via the Wiwi portal.

ATTENTION: Creditability in the seminar module: The seminar is NOT credited in the seminar module! Crediting is only possible in the EXPERT MODULE ENTREPRENEURSHIP.

**Organizational issues**

Registration is via the Wiwi portal.

In the seminar you will work on a project in teams of 4-5 persons. The groups are formed in the seminar.
Design Thinking (Track 1)
2545008, SS 2024, 2 SWS, Language: English, Open in study portal

Content

Design Thinking is a user-centric innovation management method. The iterative process first analyzes the problem space and builds a sound understanding of the future users. Subsequently, ideas for the solution are generated, prototypes are created and tested by the user group. The result is a proven and validated product.

Learning Objectives

During the seminar, the students learn basic procedures for achieving user-centric innovations. These are concrete methods that start with the potential user of certain products and services. The method is problem-oriented and emphasizes the specific customer situation. After attending the seminar, the students have a clear understanding of the need to explore end-user needs and are able to independently apply the methods of Design Thinking for developing market-driven innovations at a basic level.

Credentials:

ATTENTION: Creditability in the seminar module: The seminar is NOT credited in the seminar module! Crediting is only possible in the EXPERT MODULE ENTREPRENEURSHIP.

Organizational issues

Registration is via the Wiwi-Portal.
6.87 Course: Designing Interactive Systems: Human-AI Interaction [T-WIWI-113465]

Responsible: Prof. Dr. Alexander Mädche
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-104068 - Information Systems in Organizations
M-WIWI-104080 - Designing Interactive Information Systems
M-WIWI-104814 - Information Systems: Analytical and Interactive Systems
M-WIWI-105923 - Incentives, Interactivity & Decisions in Organizations

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Events

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Competence Certificate
Alternative exam assessment. The assessment consists of a one-hour exam and the implementation of a Capstone project. Details will be announced at the beginning of the course.

Annotation
The course is held in English.

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

Designing Interactive Systems: Human-AI Interaction
2540558, SS 2024, 3 SWS, Language: English, Open in study portal
Lecture (V)
Blended (On-Site/Online)

Content Description
Computers have evolved from batch processors towards highly interactive systems. With the rapid progress in the field of artificial intelligence, computers can now learn and adapt to their environment, simulate human intelligence processes as well as support or even take over tasks from humans. This offers great possibilities, but at the same time raises new challenges for the successful design of interactive systems.

The aim of this course is to introduce advanced concepts and theories as well as current practice of designing interactive systems. A specific focus is set on designing AI-based interactive systems for individuals and groups at work ranging from personal productivity assistants to AI-augmented virtual collaboration.

The course is complemented with hands-on exercises and a design capstone project in cooperation with an industry partner. In the project, students in a team effort apply state-of-the-art design methods & techniques and create an interactive system design prototype with a specific focus on human-AI interaction.

Learning objectives
- Explain what interactive systems are and how they can be conceptualized
- Describe the unique characteristics of human-AI interaction and their impact on designing interactive systems
- Understand the human-centered design process and know how to apply corresponding methods and tools
- Understand the concepts and theoretical foundations that guide the design of interactive systems
- Know key concepts, design principles and design methods for contemporary interactive systems focusing on human-AI interaction
- Get hands-on experience by applying lecture content in a design capstone project

Prerequisites
No specific prerequisites are required for the lecture
Literature

Die Vorlesung basiert zu einem großen Teil auf


Weiterführende Literatur wird in der Vorlesung bereitgestellt.
6.88 Course: Development of Sustainable Business Models [T-WIWI-112143]

**Responsible:** Prof. Dr. Marion Weissenberger-Eibl

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

**Part of:** M-WIWI-101507 - Innovation Management

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🔸 On-Site, ❌ Cancelled

**Competence Certificate**

Non exam assessment. The final grade is composed 50% of the grade of the written paper (ca. 5 Pages /Person) and 50% of the presentation of the results.

**Prerequisites**

None

**Recommendation**

Prior attendance of the course Innovation Management is recommended.
### 6.89 Course: Digital Accessibility and Assistive Technologies [T-INFO-111830]

**Responsible:** Prof. Dr.-Ing. Rainer Stiefelhagen  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-105882 - Digital Accessibility and Assistive Technologies

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
6.90 Course: Digital Democracy [T-WIWI-113160]

**Responsible:** Jonas Fegert

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

**Part of:**
- M-WIWI-101410 - Business & Service Engineering
- M-WIWI-101446 - Market Engineering
- M-WIWI-103117 - Data Science: Data-Driven Information Systems
- M-WIWI-103118 - Data Science: Data-Driven User Modeling

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**Exams**

| WT 23/24 | 00059 | Digital Democracy | — | — | Weinhardt |

**Legends:** 🖥 Online, 🕹 Blended (On-Site/Online), 📌 On-Site, ❌ Cancelled

**Competence Certificate**

Alternative exam assessment. The examination consists of two parts (presentation and oral exam). Details on the design of the exam will be announced at the beginning of the course.

**Annotation**

Limited to 25 students. Application (cover letter) via the Wiwi-portal.

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

**Digital Democracy**

00052, WS 23/24, 2 SWS, Language: English, Open in study portal

**Lecture (V)**

Blended (On-Site/Online)

**Content**

The “Digital Democracy” Lecture deals with opportunities and challenges of democracy and participation in a digitalized world. Social networks and other platforms have become a central place for human interaction.

These technologies open up many possibilities to connect people, promote societal discourse, and organize social movements. On the other hand, they are also used to undermine democracy by extremist forces.

One example is the spread of disinformation through social media, which can undermine trust in democratic institutions and exacerbate divisions in society. Big tech actors pursue their own economically driven interests, some of which run counter to societal ones.

So to what extent can Internet platforms help strengthen social discourse? And what measures can be taken to promote the quality and diversity of discourse in the digital world? What role do big tech players play in digital democracy and how can their interests be reconciled with democratic principles? These and many more questions will be explored in the lecture. The lecture introduces theoretical foundations and evidence-based research on digital democracy. It will address the following questions: What characterizes deliberative democracies, how do democracies change, and what can damage them? How does social polarization emerge and what drives it - off- and online. Accordingly, different platform types and phenomena of disinformation, such as clickbait, will be presented. The last part of the lecture series will deal with the search for approaches and alternatives to these problems.

**Organizational issues**

Beschränkung auf 25 Plätze mit Bewerbung per kurzem Motivationsschreiben (ab Anfang/Mitte September über das Wiki-Portal)
6.91 Course: Digital Health [T-WIWI-109246]

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

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

**Part of:**
- M-WIWI-104403 - Critical Digital Infrastructures
- M-WIWI-104813 - Information Systems: Internet-Based Markets and Services

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<td>Digital Health</td>
<td>2 SWS</td>
<td>🧩</td>
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**Exams**

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**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. The examination is only offered to first-time writers in the winter semester, but can be repeated in the following summer semester.

**Prerequisites**

None.
**Course: Digital Marketing [T-WIWI-112693]**

**Responsible:** Prof. Dr. Ann-Kristin Kupfer  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
M-WIWI-105312 - Marketing and Sales Management  
M-WIWI-106258 - Digital Marketing

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**Competence Certificate**  
The control of success is done by the elaboration and presentation of a group task as well as a written exam. Further details on the design of the performance review will be announced during the lecture.

**Prerequisites**  
None

**Recommendation**  
Students are highly encouraged to actively participate in class.

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

**Digital Marketing**  
2571185, SS 2024, 2 SWS, Language: English, [Open in study portal](#)

**Content**  
Students learn the theoretical foundations of digital marketing and its most important concepts. They develop an understanding both for the digital consumer and the digital environment. Special emphasis will be given to digital marketing strategies and practices, such as content marketing and influencer marketing. A tutorial offers the opportunity to apply the key learnings of the lecture as part of a group work.

The learning objectives are as follows:

- Getting to know the theoretical foundations of digital marketing  
- Evaluating digital marketing strategies and practices (e.g., in the context of content marketing and influencer marketing)  
- Fostering critical and analytical thinking skills and the application of knowledge to marketing problems  
- Improving English skills

Total time required for 4.5 credit points: approx. 135 hours  
Attendance time: 30 hours  
Self-study: 105 hours

**Organizational issues**  
Termine werden bekannt gegeben.
6.93 Course: Digital Marketing and Sales in B2B [T-WIWI-106981]

**Responsible:** Prof. Dr. Martin Klarmann
Anja Konhäuser

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

**Part of:**
- M-WIWI-105312 - Marketing and Sales Management
- M-WIWI-106258 - Digital Marketing

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<td>Others (sons)</td>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

Alternative exam assessment according to § 4 paragraph 2 Nr. 3 of the examination regulation. (team presentation of a case study with subsequent discussion totalling 30 minutes).

**Prerequisites**

None.

**Annotation**

This course will not take place in the summer term 2023, but is expected to be offered again on a regular basis starting in the summer term 2024.

Participation requires an application. The application period starts at the beginning of the semester. More information can be obtained on the website of the research group Marketing and Sales (marketing.iism.kit.edu). Access to this course is restricted. Typically all students will be granted the attendance of one course with 1.5 ECTS. Nevertheless attendance can not be guaranteed. For further information please contact Marketing and Sales Research Group (marketing.iism.kit.edu). Please note that only one of the 1.5-ECTS courses can be attended in this module.

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

**Digital Marketing and Sales in B2B**

2571156, SS 2024, 1 SWS, Language: English, Open in study portal
Content

Learning Sessions:
The class gives insights into digital marketing strategies as well as the effects and potential of different channels (e.g., SEO, SEA, Social Media). After an overview of possible activities and leverages in the digital marketing field, including their advantages and limits, the focus will turn to the B2B markets. There are certain requirements in digital strategy specific to the B2B market, particularly in relation to the value chain, sales management and customer support. Therefore, certain digital channels are more relevant for B2B marketing than for B2C marketing.

Once the digital marketing and tactics for the B2B markets are defined, further insights will be given regarding core elements of a digital strategy: device relevance (mobile, tablet), usability concepts, website appearance, app decision, market research and content management. A major advantage of digital marketing is the possibility of being able to track many aspects of user reactions and user behaviour. Therefore, an overview of key performance indicators (KPIs) will be discussed and relationships between these KPIs will be explained. To measure the effectiveness of digital activities, a digital report should be set up and connected to the performance numbers of the company (e.g. product sales) – within the course the setup of the KPI dashboard and combination of digital and non-digital measures will be shown to calculate the Return on Investment (ROI).

Presentation Sessions:
After the learning sessions, the students will form groups and work on digital strategies within a case study format. The presentation of the digital strategy will be in front of the class whereas the presentation will take 20 minutes followed by 10 minutes questions and answers.

- Understand digital marketing and sales approaches for the B2B sector
- Recognise important elements and understand how-to-setup of digital strategies
- Become familiar with the effectiveness and usage of different digital marketing channels
- Understand the effect of digital sales on sales management, customer support and value chain
- Be able to measure and interpret digital KPIs
- Calculate the Return on Investment (ROI) for digital marketing by combining online data with company performance data

time of presentness = 15 hrs.

private study = 30 hrs.

Organizational issues
Blockveranstaltung, Raum 115, Geb. 20.21, Termine werden noch bekannt gegeben

Literature
-
Course: Digital Services: Innovation & Business Models [T-WIWI-112757]

**Responsible:** Prof. Dr. Gerhard Satzger

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

**Part of:**
- M-WIWI-101410 - Business & Service Engineering
- M-WIWI-101448 - Service Management
- M-WIWI-102754 - Service Economics and Management
- M-WIWI-102806 - Service Innovation, Design & Engineering
- M-WIWI-102808 - Digital Service Systems in Industry
- M-WIWI-104813 - Information Systems: Internet-Based Markets and Services

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**Exams**

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<td>Digital Services: Innovation &amp; Business Models</td>
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**Competence Certificate**

The assessment consists of a written exam (60 min.).

**Prerequisites**

None

**Recommendation**

None

**Annotation**

The course Digital Services: Innovation & Business Models replaces the course Service Innovation based on a revised course concept and content. The focus will be on the closer integration of the topics of service innovation and digitalization. Previous foundational content (e.g., on service innovation challenges or human-centered innovation methods) will remain. New content will cover topics such as digital platforms and ecosystems, IoT and smart service innovation, and business models.

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

**Digital Services: Innovation & Business Models**

2595468, SS 2024, 1.5 SWS, Language: English, Open in study portal

Lecture (V) Blended (On-Site/Online)
Content
Leveraging data and digital technologies for business success is a key challenge for organizations as they need to

- get aware of the newly arising potential
- develop suitable digital services that are user-centric and individualized
- "servitize" their offering portfolio and business model
- transform their organizations

This course will equip students with concepts and methods to tackle this challenge along two dimensions: First, we will cover innovation as a concept as well as apply contemporary innovation methods (like Design Thinking, Open Innovation) to the services space. Second, we deal with leveraging innovation to develop new business models (including multi-partner concepts in platforms or ecosystems), to servitize existing business models (e.g., via product-service-systems), and to accordingly transform the organization.

The course links innovation and business model theories with practical examples and exercises. Students are asked to actively engage in the discussion.

Organizational issues
The course will be offered in the form of a flipped classroom concept. The lecture will be recorded in advance and made available online. During the “in presence” sessions, the contents of the lecture will be applied and expanded on.

Literature


Übung zu Digital Services: Innovation & Business Models
2595469, SS 2024, 1.5 SWS, Language: English, Open in study portal

Content
Leveraging data and digital technologies for business success is a key challenge for organizations as they need to

- get aware of the newly arising potential
- develop suitable digital services that are user-centric and individualized
- "servitize" their offering portfolio and business model
- transform their organizations

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The course links innovation and business model theories with practical examples and exercises. Students are asked to actively engage in the discussion.

Organizational issues
The course will be offered in the form of a flipped classroom concept. The lecture will be recorded in advance and made available online. During the “in presence” sessions, the contents of the lecture will be applied and expanded on.
Literature

6.95 Course: Digital Transformation and Business Models [T-WIWI-108875]

Responsible: Dr. Daniel Jeffrey Koch
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101507 - Innovation Management

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Competence Certificate
Non exam assessment (following §4(2) of the examination regulation). The final grade is composed 75% of the grade of the written paper and 25% of the presentation.

Prerequisites
None

Recommendation
Prior attendance of the course Innovation Management is recommended.
**Course: Discrete-Event Simulation in Production and Logistics [T-WIWI-102718]**

**Responsible:** Hon.-Prof. Dr. Sven Spieckermann

**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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**Events**

| ST 2024 | 2550488 | Ereignisdiskrete Simulation in Produktion und Logistik | 3 SWS | Lecture / 🗣 | Spieckermann |

**Exams**

| ST 2024 | 7900244 | Discrete-Event Simulation in Production and Logistics | 3 SWS | Lecture (V) | Spieckermann |

**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Canceled

**Competence Certificate**
The assessment consists of a written paper and an oral exam of about 30-40 min (alternative exam assessment).

**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:*

**Ereignisdiskrete Simulation in Produktion und Logistik**
2550488, SS 2024, 3 SWS, Language: German, Open in study portal

**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.

**Organizational issues**
Den Bewerbungszeitraum finden Sie auf der Veranstaltungswebseite im Lehre-Bereich unter dol.ior.kit.edu
**Literature**

6.97 Course: Distributed Computing [T-INFO-101298]

**Responsibility:** Prof. Dr. Achim Streit

**Organisation:** KIT Department of Informatics

**Part of:** M/INFO-100761 - Distributed Computing

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**Exams**

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Legend: 🖥 Online, ☑️ Blended (On-Site/Online), 🗣️ On-Site, ❌ Cancelled

**Competence Certificate**
The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 60 minutes. Depending on the number of participants it will be announced six weeks before the assessment (§3 Abs. 3 SPO) if the assessment is done

• as an oral examination according to § 4 Abs. 2 No. 2 SPO or
• as a written examination according to § 4 Abs. 2 No. 1 SPO.

**Prerequisites**
none.

**Recommendation**
Knowledge in the area of computer networks helpful.
6 COURSES

Course: Dynamic Macroeconomics [T-WIWI-109194]

6.98 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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Exams

| WT 23/24 | 7900261 | Dynamic Macroeconomics |     | Brumm |

Competence Certificate
The assessment is a written exam (60 min.).

Prerequisites
None.

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

Dynamic Macroeconomics
2560402, WS 23/24, 2 SWS, Language: English, Open in study portal
Lecture (V) Blended (On-Site/Online)

Content
This course addresses macroeconomic questions on an advanced level. The main focus of this course is on dynamic programming and its fundamental role in modern macroeconomics. In the first part of the course, the necessary mathematical tools are introduced as well as basic applications in labor economics, economic growth and business cycle analysis. In the second part of the course, these basic models are expanded to incorporate household heterogeneity in various forms: Models of economic inequality to analyze the distributional impact of tax policies and models of overlapping generations to analyze the impact of social security reforms or changes in government debt. Finally, advanced methods based on sparse grids or neural nets are introduced to solve high-dimensional models. 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 programming language Python.

Literature
Literatur und Skripte werden in der Veranstaltung angegeben.
6.99 Course: Economics of Innovation [T-WIWI-112822]

**Responsible:** Prof. Dr. Ingrid Ott  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101478 - Innovation and Growth  
M-WIWI-101514 - Innovation Economics

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</table>

**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**
Depending on further pandemic developments, the examination will be offered either as a 60-minute written examination (written examination according to SPO § 4 Abs. 2, Pkt. 1) or as an open-book examination (alternative exam assessment according to SPO § 4 Abs. 2, Pkt. 3).

**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:*
Content
Learning objectives:

Students shall be given the ability to

- identify the importance of alternative incentive mechanisms for the emergence and dissemination of innovations
- understand the relationships between market structure and the development of innovation
- 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

Course content:
The course covers the following topics:

- Incentives for the emergence of innovations
- Patents
- Diffusion
- Impact of technological progress
- Innovation Policy

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

Exam description:
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.

Literature
Auszug:

### 6.100 Course: Efficient Energy Systems and Electric Mobility [T-WIWI-102793]

**Responsible:** Prof. Dr. Patrick Jochem  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101452 - Energy Economics and Technology

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**Events**

| ST 2024 | 2581006 | Efficient Energy Systems and Electric Mobility | 2 SWS | Lecture / 📚 | Jochem |

**Exams**

| WT 23/24 | 7981006 | Efficient Energy Systems and Electric Mobility | Fichtner |
| ST 2024  | 7981006 | Efficient Energy Systems and Electric Mobility | Fichtner |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 📚 On-Site, x Cancelled

**Competence Certificate**
The assessment consists of a written exam (60 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (alternative exam assessment, following §4(2), 3 of the examination regulation).

**Prerequisites**
None

**Recommendation**
None

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

### Efficient Energy Systems and Electric Mobility

**2581006, SS 2024, 2 SWS, Language: English, Open in study portal**

**Lecture (V) On-Site**

**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.

- Understand the concept of energy efficiency as applied to specific systems
- Obtain an overview of the current trends in energy efficiency
- Be able to determine and evaluate alternative methods of energy efficiency improvement
- Overview of technical and economical stylized facts on electric mobility
- Judging economical, ecological and social impacts through electric mobility

**Organizational issues**
s. Institutsausshang

**Literature**
Wird in der Vorlesung bekanntgegeben.
Course: eFinance: Information Systems for Securities Trading [T-WIWI-110797]

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

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

**Part of:**
- M-WIWI-101446 - Market Engineering
- M-WIWI-101480 - Finance 3
- M-WIWI-101483 - Finance 2

**Type:** Written examination

**Credits:** 4.5

**Grading scale:** Grade to a third

**Recurrence:** Each winter term

**Version:** 1

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**Events**

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<td>Practice</td>
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**Exams**

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

Success is monitored by means of ongoing elaborations and presentations of tasks and an examination (60 minutes) at the end of the lecture period. The scoring scheme for the overall evaluation will be announced at the beginning of the course.

**Annotation**

The course “eFinance: Information Systems for Securities Trading” covers different actors and their function in the securities industry in-depth, highlighting key trends in modern financial markets, such as Distributed Ledger Technology, Sustainable Finance, and Artificial Intelligence. Security prices evolve through a large number of bilateral trades, performed by market participants that have specific, well-regulated and institutionalized roles. Market microstructure is the subfield of financial economics that studies the price formation process. This process is significantly impacted by regulation and driven by technological innovation. Using the lens of theoretical economic models, this course reviews insights concerning the strategic trading behaviour of individual market participants, and models are brought market data. Analytical tools and empirical methods of market microstructure help to understand many puzzling phenomena in securities markets.

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

**eFinance: Information Systems for Securities Trading**

- Lecture (V) On-Site

**Literature**


**Weiterführende Literatur:**

6.102 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-104403 - Critical Digital Infrastructures

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### Events

| ST 2024 | 2513404 | Seminar Emerging Trends in Digital Health (Bachelor) | 2 SWS | Seminar / 📚 | Sunyaev, Toussaint, Brecker, Danylak |
| ST 2024 | 2513405 | Seminar Emerging Trends in Digital Health (Master) | 2 SWS | Seminar / 📚 | Sunyaev, Toussaint, Brecker, Danylak |

**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

### Competence Certificate

The alternative exam assessment consists of a final thesis.

### Prerequisites

None.

### Annotation

The course is usually held as a block course.
6.103 Course: Emerging Trends in Internet Technologies [T-WIWI-110143]

**Responsible:** Prof. Dr. Ali Sunyaev  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-104403 - Critical Digital Infrastructures

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Legend: 🖥 Online, ☑ Blended (On-Site/Online), 🔴 On-Site, ✗ Cancelled

**Competence Certificate**  
The alternative exam assessment consists of a final thesis.

**Prerequisites**  
None.

**Annotation**  
The course is usually held as a block course.
6.104 Course: Emissions into the Environment [T-WIWI-102634]

**Responsible:** Ute Karl

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

**Part of:**
- M-WIWI-101412 - Industrial Production III
- M-WIWI-101471 - Industrial Production II

**Type** - Written examination

**Credits** - 3,5

**Grading scale** - Grade to a third

**Recurrence** - Each winter term

**Version** - 1

### Competence Certificate

The assessment consists of an oral (30 minutes) or written exam (60 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (alternative exam assessment, following §4(2), 3 of the examination regulation).

### Recommendation

None

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

**Emissions into the Environment**

2581962, WS 23/24, 2 SWS, Language: German, Open in study portal

**Lecture (V)**

On-Site

### Content

Emission sources/emission monitoring/emission reduction: The lecture gives an overview of relevant emissions of air pollutants and greenhouse gases, emission monitoring and pollutant abatement options together with relevant legal regulations at national and international level. In addition, the fundamentals of circular economy, waste management and recycling are explained.

**Structure:**

- Air pollution control
  - Introduction, terms and definitions
  - Sources of air pollutants
  - Legal framework of air quality control
  - Technical measures to reduce air pollutant emissions

- Circular economy, recycling and waste management
  - Waste collection and logistics
  - Dual systems for packaging waste
  - Recycling
  - Thermal and biological waste treatment
  - Final waste disposal

**Literature**

Wird in der Veranstaltung bekannt gegeben.

**Responsible:** Dr. Christopher Gerking

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100798 - Empirical Software Engineering

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**Exams**

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## 6.106 Course: Employment Law [T-INFO-111436]

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<th>Responsible</th>
<th>Dr. Alexander Hoff</th>
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### Events

| ST 2024    | 24668 | Employment Law | 2 SWS | Lecture / 🗣 | Hoff |

### Exams

| WT 23/24 | 7500001 | Employment Law | 7500082 | Employment Law | Sattler, Matz |
| ST 2024   | 7500082 | Employment Law | Sattler |

Legend: 🔄 Online, ☐ Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
6.107 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
- M-WIWI-101468 - Environmental Economics

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<td>Each summer term</td>
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Competence Certificate
The assessment consists of a written exam (60 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (alternative exam assessment, following §4(2), 3 of the examination regulation).

Prerequisites
None.

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

### Energy and Environment

**2581003, SS 2024, 2 SWS, Language: German, Open in study portal**

**Lecture (V)**

**On-Site**

**Content**
The lecture focuses on the environmental impacts arising from fossil fuels use and on the methods for the evaluation of such impacts. The first part of the lecture describes the environmental impacts of air pollutants and greenhouse gases as well as technical measures for emission control. The second part covers methods of impact assessment and their use in environmental communication as well as methods for the scientific support of emission control strategies.

The topics include:
- Fundamentals of energy conversion
- Formation of air pollutants during combustion
- Technical measures to control emissions from fossil-fuel combustion processes
- External effects of energy supply (life cycle analyses of selected energy systems)
- Environmental communication on energy services (e.g. electricity labelling, carbon footprint)
- Integrated Assessment Modelling to support the European Clean Air Strategy
- Cost-effectiveness analyses and cost-benefit analyses for emission control strategies
- Monetary valuation of external effects (external costs)

**Literature**
Die Literaturhinweise sind in den Vorlesungsunterlagen enthalten (vgl. ILIAS)
6.108 Course: Energy Informatics 1 [T-INFO-103582]

Responsible: Prof. Dr. Veit Hagenmeyer
Organisation: KIT Department of Informatics
Part of: M-INFO-101885 - Energy Informatics 1

<table>
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Events

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Exams

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

**Energy Informatics 1**

2400058, WS 23/24, 4 SWS, Language: German/English, Open in study portal

Content

This module provides an overview of the physical and technical principles of different forms of energy, their storage, their transmission and the corresponding energy conversion processes. Furthermore, this module covers the system-technical combination of different local energy systems to form an overall energy system and provides an outlook on typical information technology applications in the energy sector.

In detail, the following topics are discussed with examples:

- Energy forms, systems and storage
- Energy conversion processes in power plants
- Renewable resources
- Energy transmission (electricity/gas/heat networks)
- Electrical networks of the future, load management
- Use of information and communication technology (ICT)
- Energy Economics

Literature

Diese werden in der Vorlesung gegeben.
6.109 Course: Energy Informatics 1 - Preliminary Work [T-INFO-110356]

**Responsible:** Prof. Dr. Veit Hagenmeyer

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-101885 - Energy Informatics 1

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### 6.110 Course: Energy Informatics 2 [T-INFO-106059]

**Responsible:** Prof. Dr. Veit Hagenmeyer  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-103044 - Energy Informatics 2

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**Exams**

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**Legend:**  
- 🖥 Online  
- 🧩 Blended (On-Site/Online)  
- 🗣 On-Site  
- ☑️ On-Site  
- ✗ Cancelled
Course: Energy Market Engineering [T-WIWI-107501]

Responsible: Prof. Dr. Christof Weinhardt
Organisation: KIT Department of Economics and Management

Part of:
- M-WIWI-101446 - Market Engineering
- M-WIWI-103720 - eEnergy: Markets, Services and Systems
- M-WIWI-104813 - Information Systems: Internet-Based Markets and Services

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Events

| ST 2024 | 2540464 | Energy Market Engineering | 2 SWS | Lecture / 🗣 | Weinhardt, Miskiw |
| ST 2024 | 2540465 | Übung zu Energy Market Engineering | 1 SWS | Practice / 🗣 | Semmelmann |

Exams

| WT 23/24 | 7900127 | Energy Market Engineering | Weinhardt |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

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 2024, 2 SWS, Language: German, Open in study portal

Organizational issues
Vorlesungsstart: 25.04.24

Literature
6.12 Course: Energy Networks and Regulation [T-WIWI-107503]

**Responsible:** Prof. Dr. Christof Weinhardt  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101446 - Market Engineering  
- M-WIWI-103720 - eEnergy: Markets, Services and Systems

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**Events**

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**Exams**

<table>
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<th>Credits</th>
<th>Type</th>
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</tr>
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<tbody>
<tr>
<td>WT 23/24</td>
<td>2 SWS</td>
<td>Energy Networks and Regulation</td>
<td>Weinhardt</td>
</tr>
<tr>
<td>ST 2024</td>
<td>2 SWS</td>
<td>Energy Networks and Regulation</td>
<td>Weinhardt</td>
</tr>
</tbody>
</table>

**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 23/24, 2 SWS, Language: German, [Open in study portal](#)
6 COURSES

Course: Energy Networks and Regulation [T-WWI-107503]

Content

Learning Goals

The student,

- understands the business model of a network operator and knows its central tasks in the energy supply system,
- has a holistic overview of the interrelationships in the network economy,
- understands the regulatory and business interactions,
- is in particular familiar with the current model of incentive regulation with its essential components and understands its implications for the decisions of a network operator
- is able to analyse and assess controversial issues from the perspective of different stakeholders.

Content of teaching

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
- First major 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.

Literature


6.113 Course: Energy Trading and Risk Management [T-WIWI-112151]

**Responsible:** N.N.

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

**Part of:** M-WIWI-101451 - Energy Economics and Energy Markets

**Type**
- Written examination

**Credits**
- 3.5

**Grading scale**
- Grade to a third

**Recurrence**
- Each summer term

**Version**
- 2

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<tr>
<td>2581020</td>
<td>Energy Trading and Risk Management</td>
<td>Kraft, Fichtner, Beranek</td>
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</table>

**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣️ On-Site, ❌ Cancelled

**Competence Certificate**
The lecture "Energiehandel und Risikomanagement" will be held in English under the title "Energy Trading and Risk Management" from the summer semester 2022. The examination for the English-language lecture will be offered in English from the summer semester 2022.
The assessment consists of a written exam (60 minutes). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (alternative exam assessment).

**Prerequisites**
None

**Recommendation**
None

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

**Energy Trading and Risk Management**

- **2581020, SS 2024, 2 SWS, Language: English, Open in study portal**

**Content**

1. Introduction to Markets, Mechanisms and Interaction
2. Electricity Trading (platforms, products, mechanisms)
4. Coal Markets (reserves, supply, demand, and transport)
5. Investments and Capacity Markets
6. Oil and Gas Markets (supply, demand, trade, and players)
7. Trading Game
8. Risk Management in Energy Trading
Literature
Weiterführende Literatur:


www.riskglossary.com

**Responsible:** Prof. Dr. Alexander Mädche

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

**Part of:**
- M-WIWI-102806 - Service Innovation, Design & Engineering
- M-WIWI-104080 - Designing Interactive Information Systems
- M-WIWI-104812 - Information Systems: Engineering and Transformation
- M-WIWI-104813 - Information Systems: Internet-Based Markets and Services

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<td>Each winter term</td>
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</table>

**Competence Certificate**

Alternative exam assessment. The assessment consists of a one-hour exam and the implementation of a Capstone project. Details will be announced at the beginning of the course.

**Prerequisites**

None

**Recommendation**

None

**Annotation**

The course is held in English.
6 COURSES

Course: Engineering Self-Adaptive Systems [T-INFO-113349]


Responsible: Prof. Dr. Raffaela Mirandola
Organisation: KIT Department of Informatics
Part of: M-INFO-106626 - Engineering Self-Adaptive Systems

<table>
<thead>
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<td>Lecture</td>
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</table>

Competence Certificate
The assessment is carried out as an oral examination (§ 4 Abs. 2 Nr. 2 SPO) lasting 20 minutes.

Prerequisites
None.

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

Engineering Self-Adaptive Systems
2400186, WS 23/24, SWS, Language: English, Open in study portal

Content
Learning objectives

- Understand the motivation for self-adaptation
- Get familiar with the basic principles and conceptual model of self-adaptation
- Understand how to engineer self-adaptive software systems from a software engineering perspective
- Understand the decision-making process using formal analysis at runtime for quality assurance
- Understand the notion of uncertainty in self-adaptive systems and how to tame it with formal verification at runtime
- Understand the level of adoption of self-adaptive systems in industry
6.116 Course: Entrepreneurship [T-WIWI-102864]

**Responsible:** Prof. Dr. Orestis Terzidis

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

**Part of:**
- M-WIWI-101488 - Entrepreneurship (EnTechnon)
- M-WIWI-101507 - Innovation Management

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<tr>
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<td>Lecture / 🛩</td>
<td>Each term</td>
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<td>7900229</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). Students are offered the opportunity to earn a grade bonus through separate assignments. If the grade of the written exam is between 4.0 and 1.3, the bonus improves the grade by a maximum of one grade level (0.3 or 0.4). The exact criteria for awarding a bonus will be announced at the beginning of the lecture.

**Prerequisites**

None

**Recommendation**

None

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

<table>
<thead>
<tr>
<th>Entrepreneurship</th>
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<tbody>
<tr>
<td>2545001, WS 23/24, 2 SWS, Language: English, Open in study portal</td>
</tr>
</tbody>
</table>

Lecture (V)

Blended (On-Site/Online)
Content
The lecture as an obligatory part of the module "Entrepreneurship" introduces the basic concepts of entrepreneurship. Important concepts and empirical facts are presented that relate to the conception and implementation of newly founded companies. The focus here is on the introduction to methods for generating innovative business ideas, for transferring patents into business concepts and general principles of business modelling and business planning. In particular approaches such as Lean Startup and Effectuation as well as concepts for the financing of young enterprises are treated.
A "KIT Entrepreneurship Talk" is part of each session, in which experienced founder and entrepreneur personalities report on their experiences in practice of the establishment of an enterprise. Dates and speakers will be announced on the EnTechnon homepage.

Learning objectives:
The students are introduced to the topic Entrepreneurship. After successful attendance of the meeting they are to have an overview of the subranges of the Entrepreneurships and be able to understand basic concepts of the Entrepreneurships and apply key concepts.

Workload:
Total effort with 3 credit points: approx. 90 hours
Presence time: 30 hours
Pre- and postprocessing of the LV: 45.0 hours
Exam and exam preparation: 15.0 hours

Examination:
The assessment of success takes place in the form of a written examination (60 min.) (according to §4(2), 1 SPO). The grade is the grade of the written exam.
A grade bonus can be earned through successful participation in a case study in the Entrepreneurship lecture. If the grade of the written exam is between 4.0 and 1.3, the bonus improves the grade by up to 0.3 or 0.4. The bonus only applies if you have passed the exam with at least a 4.0. More details will be provided in the lecture. Participation in the case study is voluntary.

Exam date: tba

Organizational issues
VL findet jeweils Mo, 15:45 - 19:00 an folgenden Terminen statt:
23.10.2023
30.10.2023
06.11.2023
13.11.2023
20.11.2023
27.11.2023
04.12.2023
11.12.2023 (Prep Session)

Literature
Füglistaller, Urs, Müller, Christoph and Volery, Thierry (2008): Entrepreneurship
Content
The lecture as a compulsory part of the module "Entrepreneurship" introduces the basic concepts of entrepreneurship. Important concepts and empirical facts are introduced, which relate to the conception and implementation of newly founded companies.

The focus here is on introducing methods for generating innovative business ideas, translating patents into business concepts, and general principles of business modeling and business planning. In particular, approaches such as Lean-Startup and Effectuation as well as concepts for financing young companies are covered.

A "KIT Entrepreneurship Talk" is part of each session, in which experienced founder and entrepreneur personalities report on their experiences in the practice of the establishment of an enterprise. Dates and speakers will be announced on the EnTechnon homepage.

Learning objectives:
The students will be introduced to the topic of entrepreneurship. After successful attendance of the course they should have an overview of the sub-areas of entrepreneurship and be able to understand basic concepts of entrepreneurship and apply key concepts.

Workload:
The total effort with 3 credit points: approx. 90 hours
Presence time: 30 hours
Pre- and postprocessing of the LV: 45.0 hours
Exam and exam preparation: 15.0 hours

Examination:
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation)

A grade bonus can be earned by successfully participating in a case study as part of the Entrepreneurship lecture. If the grade of the written exam is between 4.0 and 1.3, the bonus improves the grade by up to 0.3 or 0.4. The bonus only applies if you have passed the exam with at least a 4.0. More details will be provided in the lecture. Participation in the case study is voluntary.

Exam dates: tbd

Organizational issues
VL findet jeweils Di, 15:45 - 19:00 an folgenden Terminen statt:
16.04.2024
23.04.2024
30.04.2024
07.05.2024
14.05.2024
28.05.2024
04.06.2024
11.06.2024 (Prep Session)
18.06.2024 (Klausur)

Literature
Füglistaller, Urs, Müller, Christoph und Volery, Thierry (2008): Entrepreneurship
Ries, Eric (2011): The Lean Startup

## 6.117 Course: Entrepreneurship Research [T-WIWI-102894]

**Responsible:** Prof. Dr. Orestis Terzidis  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101488 - Entrepreneurship (EnTechnon)

<table>
<thead>
<tr>
<th>Type</th>
<th>Credits</th>
<th>Grading scale</th>
<th>Recurrence</th>
<th>Version</th>
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</thead>
<tbody>
<tr>
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<td>Grade to a third</td>
<td>Each summer term</td>
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### Events

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<th>Title</th>
<th>Duration</th>
<th>Type</th>
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<tbody>
<tr>
<td>ST 2024</td>
<td>2545002</td>
<td>Entrepreneurship Research</td>
<td>2 SWS</td>
<td>Seminar / 🗣️</td>
<td>Terzidis, Tittel, Rosales Bravo</td>
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### Exams

<table>
<thead>
<tr>
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<td>7900052</td>
<td>Entrepreneurship Research</td>
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<td>Terzidis</td>
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</tbody>
</table>

### Competence Certificate

The performance review is done via a so called other methods of performance review (term paper) (alternative exam assessment). The final grade is a result from both, the grade of the term paper and its presentation, as well as active participation during the seminar.

### Prerequisites

None

### Recommendation

None

### Annotation

The topics will be prepared in groups. The presentation of the results is done during a block period seminar at the end of the semester. Students have to be present all day long during the seminar.

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

### Content

**Content**

In this course, the students choose from various relevant and current research topics in entrepreneurship and independently develop a topic that suits them in small teams. Initially, there is an introduction to standard methods such as systematic literature review, design science, qualitative and quantitative data analysis, and more. The seminar topic must be scientifically prepared and presented in 15-20 pages as part of a written elaboration. The seminar results are presented in a block event at the end of the semester (20 min + 10 min open discussion).

### Learning Objectives

The foundations of independent scholarly work (literature review, argumentation + discussion, citation of literature sources, application of qualitative, quantitative, and simulation methods) are developed as part of the written elaboration. The competencies acquired in the seminar can be utilized in preparing for a potential master's thesis. Therefore, the seminar is mainly aimed at students who intend to write their thesis at the Chair of Entrepreneurship and Technology Management and wish to gain substantial experience in entrepreneurship research.
Organizational issues
Monday, 17.06.2024, 10.00-17.00
Thursday, 27.06.2024, 10.00-17.00
Thursday, 25.07.2024, 10.00-17.00
Registration is via the Wiwi-Portal.

Literature
Will be announced in the seminar.
6.118 Course: Entrepreneurship Seasonal School [T-WIWI-113151]

**Responsible:** Prof. Dr. Orestis Terzidis

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

**Part of:** M-WIWI-101488 - Entrepreneurship (EnTechnon)

<table>
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**Events**

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<td><strong>Entrepreneurship Seasonal School</strong></td>
<td>2 SWS</td>
<td>Block / On-Site</td>
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<td>Weimar, Terzidis</td>
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**Exams**

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<td>7900146</td>
<td><strong>Entrepreneurship Seasonal School</strong></td>
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<td>Terzidis</td>
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</table>

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Alternative exam assessment. The grade is composed of the presentation and the written elaboration. Details on the design of the examination will be announced in the course.

**Prerequisites**

The Seasonal School is intended for advanced bachelor’s and all master’s students (all disciplines). Participation in the selection process is a prerequisite.

**Recommendation**

Basic knowledge of business administration, attendance of the lecture Entrepreneurship as well as openness and interest in intercultural exchange are recommended. Solid knowledge of the English language is an advantage.

**Annotation**

Entrepreneurship Seasonal School

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

**Entrepreneurship Seasonal School**

2500215, WS 23/24, 2 SWS, Language: English, Open in study portal

Block (B) On-Site
Content
During the Entrepreneurship Seasonal School, students develop a business model based on innovative technologies and social problems in workshops in international teams for one week.

Course Content:
The Entrepreneurship Seasonal School brings together students from different universities to spend a week strengthening their knowledge of digital entrepreneurship in healthcare. Experience the life of an entrepreneur and learn how to attain resources to realize a product vision. During one week, you will develop a range of entrepreneurial competences crucial for establishing a successful venture. Our primary focus is on digital healthcare ventures, granting you the opportunity to delve into the realm of entrepreneurship within the healthcare system. By gaining a deep understanding of healthcare needs, you will utilize creativity techniques to uncover potential business ideas that provide value for patients and doctors. Additionally, you will learn how to create viable business models, dive into health regulations, and pitch your idea to a jury.

In WS 2023/24 the one-week program is being hosted by the Karlsruhe Institute of Technology, with co-teaching support from the Eucor partners University of Basel and the University of Strasbourg.

In the seminar you will work on a project in teams of max. 5 persons.

Learning Objectives:
After attending the event, you will be able to...

- describe the role of entrepreneurship
- develop innovative and technology-based solutions for societal problems,
- develop a viable business model for a problem,
- present a business idea to a panel of judges,
- and be empowered to work independently in multidisciplinary and multicultural teams

Organizational issues
19.02.24 – 23.02.24, Details will be announced later. Registration via wiwi portal.
6.119 Course: Environmental and Resource Policy [T-WIWI-102616]

Responsibility: Rainer Walz
Organization: KIT Department of Economics and Management
Part of: M-WIWI-101468 - Environmental Economics

<table>
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Events

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<td>Environmental and Resource Policy</td>
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<td>Lecture / Practice</td>
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</table>

Competence Certificate
See German version

Recommendation
It is recommended to already have knowledge in the area of industrial organization and economic policy. This knowledge may be acquired in the courses Introduction to Industrial Organization [2520371] and Economic Policy [2560280].

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

Environmental and Resource Policy
2560548, SS 2024, 2 SWS, Language: German, Open in study portal

Literature
Weiterführende Literatur:
Michaelis, P.: Ökonomische Instrumente in der Umweltpolitik. Eine anwendungsorientierte Einführung, Heidelberg
OECD: Environmental Performance Review Germany, Paris
Course: Environmental Economics and Sustainability [T-WIWI-102615]

**Responsible:** Prof. Dr. Rainer Walz

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

**Part of:** M-WIWI-101468 - Environmental Economics

- **Type:** Written examination
- **Credits:** 3
- **Grading scale:** Grade to a third
- **Recurrence:** Each winter term
- **Version:** 2

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<td>Umweltökonomik und Nachhaltigkeit (mit Übung)</td>
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<td>Environmental Economics and Sustainability</td>
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</table>

**Competence Certificate**
See German version

**Prerequisites**
None

**Recommendation**
It is recommended to already have knowledge in the area of macro- and microeconomics. This knowledge may be acquired in the courses Economics I: Microeconomics [2600012] and Economics II: Macroeconomics [2600014].
### 6.121 Course: Environmental Law [T-BGU-111102]

**Responsible:** Dr. Urich Smeddinck  
**Organisation:** KIT Department of Civil Engineering, Geo and Environmental Sciences  
**Part of:** M-WIWI-101468 - Environmental Economics

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#### Events

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<th>Recurrence</th>
<th>Expansion</th>
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**Legend:**  
- 🖥 Online  
- 🧩 Blended (On-Site/Online)  
- 🗣️ On-Site  
- ❌ Cancelled

**Competence Certificate**  
Written exam with 120 min

**Prerequisites**  
None

**Annotation**  
None
## 6.122 Course: European and International Law [T-INFO-101312]

**Responsible:** Ulf Brühann  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101217 - Public Business Law

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### Exams

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6.123 Course: Experimental Economics [T-WIWI-102614]

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

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

**Part of:**
- M-WIWI-101446 - Market Engineering
- M-WIWI-101453 - Applied Strategic Decisions
- M-WIWI-101505 - Experimental Economics
- M-WIWI-103118 - Data Science: Data-Driven User Modeling
- M-WIWI-105923 - Incentives, Interactivity & Decisions in Organizations

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**Competence Certificate**

The assessment consists of a written exam (60 min).

By successful completion of 70% of the maximum number of points in the exercise(s) 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 exact criteria for the award of a bonus will be announced at the beginning of the lecture.

**Prerequisites**

None

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

**Experimental Economics**

2540489, WS 23/24, 2 SWS, Language: German, Open in study portal

**Literature**

- Strategische Spiele; S. Berninghaus, K.-M. Ehrhart. W. Güth; Springer Verlag, 2. Aufl. 2006.
6.124 Course: Explainable Artificial Intelligence [T-INFO-112774]

 Responsible: TT-Prof. Dr. Rudolf Lioutikov
 Organisation: KIT Department of Informatics
 Part of: M-INFO-106302 - Explainable Artificial Intelligence

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Exams

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Competence Certificate

The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 120 minutes.

A bonus can be acquired through successful participation in the exercise as a success control of a different kind (§4(2), 3 SPO 2008) or study performance (§4(3) SPO 2015). The exact criteria for awarding a bonus will be announced at the beginning of the lecture. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by one grade level (0.3 or 0.4). The bonus is only valid for the main and post exams of the semester in which it was earned. After that, the grade bonus expires.

Prerequisites

None.

Recommendation

- Experience in Machine Learning is recommended, e.g. through prior coursework.
- The Computer Science Department offers several great lectures e.g., "Maschinelles Lernen - Grundlagen und Algorithmen" and "Deep Learning ."
- A good mathematical background will be beneficial
- Python / PyTorch experience could be beneficial when we discuss practical examples/ implementations.

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

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Content

Recent advances in Machine Learning and Deep Learning in particular have lead to the imminent introduction of AI agents into a wide variety of applications. However, the apparent "black-box" nature of these approaches hinders their application in both critical systems and close human-robot interactions. The sub-field of eXplainable Artificial Intelligence (XAI) aims to address this shortcoming. This lecture will introduce and discuss various concepts and methods of XAI and consider them from perspective of Robot Learning and Human-Robot Interaction.

The lecture will start with a (brief) introduction into relevant deep learning approaches, before discussing interpretable scene, task and behavior representations. Afterward the lecture will consider itself with Data-Driven and Goal-Driven AI. Finally, first approaches that incorporate XAI and XAI-based human feedback directly into the learning process itself will be discussed. An exemplary list of topics is given below:

- Introduction to XAI
  - Interpretable Machine Learning vs Explainable Machine Learning
    - Primer / Introduction to relevant Deep Learning Concepts
  - MLPs and CNNs
  - Graph Neural Networks
  - Transformers
  - Diffusion Models
  - Score Based Methods
  - Interpretable Structures
  - Scene Representations
  - Task Representations
  - Behavior Representations
    - Data-Driven Explainable AI: XAI Methods for
      - Shapley Values
      - Saliency Maps
      - Concept Activation Vectors
      - Linguistic Neuron Annotation
        - Goal-Driven Explainable AI: XAI Methods for
          - Generative Explaining Models
          - Behavior Verbalization
          - Behavior Visualization
          - Interactive Learning
          - Integrating Human Feedback
          - Explanatory Interactive Learning

Experience in Machine Learning is recommended, e.g. through prior coursework.
- The Computer Science Department offers several great lectures e.g., “Maschinelles Lernen - Grundlagen und Algorithmen” and “Deep Learning”
- A good mathematical background will be beneficial

Python / PyTorch experience could be beneficial when we discuss practical examples/implementations.

Arbeitsaufwand = 90h = 3 ECTS
- ca 30h Vorlesungsbesuch
- ca 30h Nachbearbeitung
- ca 30h Prüfungsvorbereitung
Organizational issues
Als Blockvorlesung 29.07.-02.08.2024

KIT-Fakultät für Informatik/1. Informatik Lehrveranstaltungen/1.10 Wahlvorlesungen
Course: Extraordinary Additional Course in the Module Cross-Functional Management Accounting [T-WIWI-108651]

Responsible: Prof. Dr. Marcus Wouters
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101510 - Cross-Functional Management Accounting

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<td>Each term</td>
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Competence Certificate
The assessment depends on which extraordinary course becomes part of the module "Cross-Functional Management Accounting".

Prerequisites
None

Annotation
The purpose of this placeholder is to make it possible zu include an extraordinary course in the module "Cross-Functional Management Accounting". Proposals for specific courses have to be approved in advance by the module coordinator.
### 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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**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:

- **Financial Analysis**
  - Code: 2530205, SS 2024, 2 SWS, Language: German, [Open in study portal](#)

**Literature**


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
M-WIWI-105414 - Statistics and Econometrics II

Type: Written examination
Credits: 4.5
Grading scale: Grade to a third
Recurrence: Each winter term
Version: 2

Events

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Exams

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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 next lecture will take place in the winter semester 2022/23.

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

Financial Econometrics I
2520022, WS 23/24, 2 SWS, Language: English, Open in study portal

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

Content

Learning objectives:
The student
- shows a broad knowledge of financial econometric estimation and testing techniques
- is able to apply his/her technical knowledge using software in order to critically assess empirical problems

Content:
ARMA, ARIMA, ARFIMA, (non)stationarity, causality, cointegration, ARCH/GARCH, stochastic volatility models, computer based exercises

Requirements:
It is recommended to attend the course Economics III: Introduction to Econometrics [2520016] prior to this course.

Workload:
Total workload for 4.5 CP: approx. 135 hours
Attendance: 30 hours
Preparation and follow-up: 65 hours
Exam preparation: 40 hours
Literature
Additional literature will be discussed in the lecture.
Course: Financial Econometrics II [T-WIWI-110939]

6.128

**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
- M-WIWI-105414 - Statistics and Econometrics II

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**Exams**

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

Written examination (90 minutes). If the number of participants is low, an oral examination will be held instead.

**Prerequisites**

None

**Recommendation**

Knowledge of the contents covered by the course "Financial Econometrics"

**Annotation**

Course language is English
The next lecture will take place in the summer semester of 2023.
### 6.129 Course: Financial Intermediation [T-WIWI-102623]

**Responsible:** Prof. Dr. Martin Ruckes  
**Organisation:** KIT Department of Economics and Management

**Part of:**  
- M-WIWI-101453 - Applied Strategic Decisions  
- M-WIWI-101480 - Finance 3  
- M-WIWI-101483 - Finance 2  
- M-WIWI-101502 - Economic Theory and its Application in Finance

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**Exams**

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣️ On-Site, ✗ Cancelled

**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 23/24, 2 SWS, Language: German, Open in study portal**

**Lecture (V) On-Site**

**Organizational issues**

Terminankündigungen des Instituts beachten

**Literature**

6.130 Course: Formal Systems [T-INFO-101336]

**Responsible:** Prof. Dr. Bernhard Beckert

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100799 - Formal Systems

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**Events**

| WT 23/24 | 24086 | Formale Systeme | 4 SWS | Lecture / Practice (Beckert, Ulbrich, Weigl) |

**Exams**

| WT 23/24 | 7500036 | Formal Systems | Beckert |
| ST 2024  | 7500009 | Formal Systems | Beckert |

**Responsible:** Prof. Dr. Bernhard Beckert

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100744 - Formal Systems II: Application

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**Responsible:** Prof. Dr. Bernhard Beckert  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100841 - Formal Systems II: Theory

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*Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 👤 On-Site, ✗ Cancelled*

**Responsible:** Prof. Dr. Maxim Ulrich

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

**Part of:** M-WIWI-105894 - Foundations for Advanced Financial -Quant and -Machine Learning Research

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**Competence Certificate**

Due to the professor’s research sabbatical, the BSc module "Financial Data Science" and MSc module "Foundations for Advanced Financial -Quant and -Machine Learning Research" and the MSc module "Advanced Machine Learning and Data Science" along with the respective examinations will not be offered in SS2023. Bachelor and Master thesis projects are not affected and will be supervised.

The module examination is an alternative exam assessment with a maximum score of 100 points to be achieved. These points are distributed over 4 worksheets to be submitted during the semester. The worksheets cover the respective material of the module and are handed out, worked on and assessed in lecture weeks 3 (10 points), 6 (20 points), 9 (30 points) and 12 (40 points).

The module-wide exam (all 4 worksheets) must be taken in the same semester.

The worksheets are a mixture of analytical tasks and programming tasks with financial data.

**Recommendation**

- Strongly recommended to have good knowledge in financial econometrics (MLE, OLS, GLS, ARMA-GARCH), mathematics (differential equations, difference equations and optimization), investments (CAPM, factor models), asset pricing (SDF, SDF pricing), derivatives (Black-Scholes, risk-neutral pricing), and programming of statistical concepts (Java or R or Python or Matlab or C or ...)
- Strongly recommended to have a strong interest for interdisciplinary research work in statistics, programming, applied math and financial economics.
- Students lacking the prior knowledge might find the resources of the Chair helpful: www.youtube.com/c/cram-kit.

**Annotation**

The course is offered every second year.

**Responsible:** Prof. Dr. Berthold Wigger  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101511 - Advanced Topics in Public Finance

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**Exams**

**Competence Certificate**

Depending on the further pandemic development the assessment will consist either of an open book exam (following Art. 4, para. 2, clause 3 of the examination regulation), or of an 1.5h written exam (following Art. 4, para. 2, clause 1 of the examination regulation).

**Prerequisites**

None

**Recommendation**

It is recommended to attend the course “Basics of German Company Tax Law and Tax Planning” beforehand.
6.135 Course: Fuzzy Sets [T-INFO-101376]

**Responsible:** Prof. Dr.-Ing. Uwe Hanebeck

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100839 - Fuzzy Sets

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**Exams**

| WT 23/24 | 7500011 | Fuzzy Sets | Pfaff |

Information Systems M.Sc.
Module Handbook as of 11/04/2024
6.136 Course: Geometric Optimization [T-INFO-101267]

**Responsible:** Prof. Dr. Hartmut Prautzsch

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100730 - Geometric Optimization

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Information Systems M.Sc.
Module Handbook as of 11/04/2024

461
Course: Global Manufacturing [T-WIWI-112103]

Responsible: Dr. Henning Sasse
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101412 - Industrial Production III
M-WIWI-101471 - Industrial Production II

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Exams

| WT 23/24 | 7981956 | Global Manufacturing | Schultmann |
| ST 2024  | 7981956 | Global Manufacturing | Schultmann |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

Competence Certificate

The assessment consists of an oral (30 minutes) or written exam (60 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (alternative exam assessment, following §4(2), 3 of the examination regulation).

Prerequisites

None

Recommendation

None

Annotation

The lecture will be held for the first time in the winter semester 2022/23.

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

Global Manufacturing

2581956, WS 23/24, 2 SWS, Language: English, Open in study portal

Lecture (V)

Blended (On-Site/Online)

Content

- Fundamentals of international business
- Forms of international cooperation and value creation
- Site selection
- Cost driven internationalization and site selection
- Sales and customer driven internationalization and site selection
- Challenges, risks and risk mitigation
- Management of international production sites
- Types and case studies of international production

Organizational issues

Blockveranstaltung, siehe Homepage

Literature

Wird in der Veranstaltung bekannt gegeben.
6 COURSES

Course: Global Optimization I [T-WIWI-102726]

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

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

**Part of:** M-WIWI-101473 - Mathematical Programming

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**Events**

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Legend: Online, Blended (On-Site/Online), On-Site, X Canceled

**Competence Certificate**

Success is in the form of a written examination (60 min.) (according to § 4(2), 1 SPO). The successful completion of the exercises is required for admission to the written exam.

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:

**Global Optimization I**

2550134, SS 2024, 2 SWS, Language: German, Open in study portal

Lecture (V) On-Site
Content
In many optimization problems from economics, engineering and natural sciences, solution algorithms 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 lecture treats methods for global optimization of convex functions under convex constraints. It is structured as follows:

- Introduction, examples, and terminology
- Existence results for optimal points
- Optimality in convex optimization
- Duality, bounds, and constraint qualifications
- Algorithms (Kelley’s cutting plane method, Frank-Wolfe method, primal-dual interior point methods)

The lecture is accompanied by exercises which, amongst others, offers the opportunity to implement and to test some of the methods on practically relevant examples.

Remark:
The treatment of nonconvex optimization problems forms the contents of the lecture "Global Optimization II". The lectures "Global Optimization I" and "Global Optimization II" are held consecutively in the same semester.

Learning objectives:
The student
- knows and understands the fundamentals of deterministic global optimization in the convex case,
- is able to choose, design and apply modern techniques of deterministic global optimization in the convex case in practice.

Literature

Weiterführende Literatur:
- W. Alt, Numerische Verfahren der konvexen, nichtglatten Optimierung, Teubner, 2004
- C.A. Floudas, Deterministic Global Optimization, Kluwer, 2000
6.139 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-101473 - Mathematical Programming

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

The assessment of the lecture is a written examination (120 minutes) according to §4(2), 1 of the examination regulation. The successful completion of the exercises is required for admission to the written exam.

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:

**Global Optimization I**

2550134, SS 2024, 2 SWS, Language: German, [Open in study portal](#)
Content
In many optimization problems from economics, engineering and natural sciences, solution algorithms 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 lecture treats methods for global optimization of convex functions under convex constraints. It is structured as follows:

- Introduction, examples, and terminology
- Existence results for optimal points
- Optimality in convex optimization
- Duality, bounds, and constraint qualifications
- Algorithms (Kelley's cutting plane method, Frank-Wolfe method, primal-dual interior point methods)

The lecture is accompanied by exercises which, amongst others, offers the opportunity to implement and to test some of the methods on practically relevant examples.

Remark:
The treatment of nonconvex optimization problems forms the contents of the lecture "Global Optimization II". The lectures "Global Optimization I" and "Global Optimization II" are held consecutively in the same semester.

Learning objectives:
The student

- knows and understands the fundamentals of deterministic global optimization in the convex case,
- is able to choose, design and apply modern techniques of deterministic global optimization in the convex case in practice.

Literature

Weiterführende Literatur:
- W. Alt, Numerische Verfahren der konvexen, nichtglatten Optimierung, Teubner, 2004
- C.A. Floudas, Deterministic Global Optimization, Kluwer, 2000

Global Optimization II
2550136, SS 2024, 2 SWS, Language: German, Open in study portal

Content
In many optimization problems from economics, engineering and natural sciences, solution algorithms 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 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 alphaBB method
- Branch-and-bound methods
- Lipschitz optimization

The lecture is accompanied by exercises which, amongst others, offers the opportunity to implement and to test some of the methods on practically relevant examples.

Remark:
The treatment of convex optimization problems forms the contents of the lecture "Global Optimization I". The lectures "Global Optimization I" and "Global Optimization II" are held consecutively in the same semester.

Learning objectives:
The student

- knows and understands the fundamentals of deterministic global optimization in the nonconvex case,
- is able to choose, design and apply modern techniques of deterministic global optimization in the nonconvex case in practice.
Literature

Weiterführende Literatur:

- W. Alt, Numerische Verfahren der konvexen, nichtglatten Optimierung, Teubner, 2004
- C.A. Floudas, Deterministic Global Optimization, Kluwer, 2000
Course: Global Optimization II [T-WIWI-102727]

**Responsibility:** Prof. Dr. Oliver Stein  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101473 - Mathematical Programming

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**Events**

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**Exams**

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation. The successful completion of the exercises is required for admission to the written exam. 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:*

**Global Optimization II**

2550136, SS 2024, 2 SWS, Language: German, [Open in study portal](#)
Content
In many optimization problems from economics, engineering and natural sciences, solution algorithms 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.

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- Convex relaxation via alphaBB method
- Branch-and-bound methods
- Lipschitz optimization

The lecture is accompanied by exercises which, amongst others, offers the opportunity to implement and to test some of the methods on practically relevant examples.

Remark:
The treatment of convex optimization problems forms the contents of the lecture "Global Optimization I". The lectures "Global Optimization I" and "Global Optimization II" are held consecutively in the same semester.

Learning objectives:
The student

- knows and understands the fundamentals of deterministic global optimization in the nonconvex case,
- is able to choose, design and apply modern techniques of deterministic global optimization in the nonconvex case in practice.

Literature

Weiterführende Literatur:

- W. Alt, Numerische Verfahren der konvexen, nichtglatten Optimierung, Teubner, 2004
- C.A. Floudas, Deterministic Global Optimization, Kluwer, 2000
## 6.141 Course: Graph Partitioning and Graph Clustering in Theory and Practice [T-INFO-101295]

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**Responsible:** Prof. Dr. Peter Sanders  
Dr. rer. nat. Torsten Ueckerdt

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100758 - Graph Partitioning and Graph Clustering in Theory and Practice
T 6.142 Course: Graph Partitioning and Graph Clustering in Theory and Practice - Practical [T-INFO-110999]

**Responsible:** Prof. Dr. Peter Sanders  
Dr. rer. nat. Torsten Ueckerdt

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100758 - Graph Partitioning and Graph Clustering in Theory and Practice

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<td>Each summer term</td>
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Information Systems M.Sc.  
Module Handbook as of 11/04/2024
6.143 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
Grading scale: Grade to a third
Recurrence: Irregular
Version: 2

Events
WT 23/24 2500007 1,5 SWS Practice / 🧩 Bakker
WT 23/24 2550484 Graph Theory and Advanced Location Models 3 SWS Lecture / 🧩 Nickel

Exams
WT 23/24 7900033 Graph Theory and Advanced Location Models Nickel
ST 2024 7900283 Graph Theory and Advanced Location Models Nickel

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.

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

Graph Theory and Advanced Location Models
2550484, WS 23/24, 3 SWS, Language: English, Open in study portal
Lecture (V)
Blended (On-Site/Online)

Content
Graph Theory is an important part of Discrete Mathematics. A special attraction is in its clearness and variety of proof techniques. Topic of the first part "Graph Theory" is the mediation of basic graph theoretical concepts and algorithms, which are deployed in many areas of operations research. In focus is the modeling of different problems with graph theoretical methods and their solutions with efficient algorithms. Significant focal points are shortest paths, flows, matchings, colorings and matroids. A variety of application areas of location theory has attracted increasing research interest within the last decades, because location decisions are a critical factor in strategic planning. In the second part "Advanced Location Models", some current research questions of modern industrial location theory are discussed after a short introduction. Thereby, practical models and suitable solution methods for location problems in general networks are presented. The lecture goes into details about pareto solutions in networks, ordered median problems, covering problems and allocation problems.

Literature
- Diestel: Graph Theory, 3rd edition, Springer, 2006
- Bondy, Murty: Graph Theory, Springer, 2008
- Nickel, Puerto: Location Theory, Springer, 2005
Course: Growth and Development [T-WIWI-112816]

**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

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**Competence Certificate**

Depending on further pandemic developments, the examination will be offered either as an open-book examination or as a 60-minute written examination.

**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:**

**Growth and Development**

2561503, WS 23/24, 2 SWS, Language: German/English, Open in study portal

Lecture (V)

On-Site
Content
This course is intended as an introduction to the field of advanced macroeconomics with a special focus on economic growth. Lectures aim to deal with the theoretical foundations of exogenous and endogenous growth models. The importance of growth for nations and discussion of some (well-known) growth theories together with the role of innovation, human capital and environment will therefore be primary focuses of this course.

Learning objective:
Students shall be given the ability to understand, analyze and evaluate selected models of endogenous growth theory.

Course content:
- Intertemporal consumption decision
- Growth models with exogenous saving rates: Solow
- Growth models with endogenous saving rates: Ramsey
- Growth and environmental resources
- Basic models of endogenous growth
- Human capital and economic growth
- Modelling of technological progress
- Diversity Models
- Schumpeterian growth
- Directional technological progress
- Diffusion of technologies

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

Exam description:
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.

Literature
Auszug:
6.145 Course: Hands-on Bioinformatics Practical [T-INFO-103009]

**Responsible:** Prof. Dr. Alexandros Stamatakis

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-101573 - Hands-on Bioinformatics Practical

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6.146 Course: Heat Economy [T-WIWI-102695]

**Responsible:** Prof. Dr. Wolf Fichtner  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101452 - Energy Economics and Technology

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**Exams**

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**Competence Certificate**
The assessment consists of a written (60 minutes) or oral exam (30 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

**Prerequisites**
None.

**Recommendation**
None

**Annotation**
See German version.

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

**Heat Economy**
2581001, SS 2024, 2 SWS, Language: German, [Open in study portal](#)

**Organizational issues**
Block, Seminarraum Standort West - siehe Institutsaußhang
# Course: Heterogeneous Parallel Computing Systems [T-INFO-101359]

**Responsible:** Prof. Dr. Wolfgang Karl  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100822 - Heterogeneous Parallel Computing Systems

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<td>Heterogene parallele Rechensysteme</td>
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<td>Lecture / 🗣</td>
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**Exams**

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Legend: 🖥 Online, 🗼 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Responsible:**
Prof. Dr.-Ing. Tamim Asfour  
Hon.-Prof. Dr. Uwe Spetzger

**Organisation:**
KIT Department of Informatics

**Part of:**

<table>
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#### Exams

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<td>7500145</td>
<td>Human Brain and Central Nervous System: Anatomy, Information Transfer, Signal Processing, Neurophysiology and Therapy</td>
<td>Spetzger</td>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
Course: Human Factors in Autonomous Driving [T-WIWI-113059]

**Responsible:** Prof. Dr. Alexey Vinel

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

**Part of:** M-WIWI-106631 - Cooperative Autonomous Vehicles

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ CANCELLED

**Competence Certificate**

The assessment of this course is a written examination (60 min) or an oral exam (20 min).

The exam takes place every semester and can be repeated at every regular examination date.
### 6.150 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-104520 - Human Factors in Security and Privacy  
M-WIWI-104812 - Information Systems: Engineering and Transformation

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, 🗑 Cancelled

**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. Only those who have successfully participated in the exercises and the lecture will be admitted to the examination.

**Prerequisites**
Both need to be done:
- Pass Quiz on Paper for Graphical Passwords
- Presentation of Results Exercise 2

+ 9 of the following 11 need to be done:
- Submit ILIAS certificate until Oct 24
- Pass Quiz on InfoSec Lecture
- Active participation exercise 1 Part 1 - Evaluation and analyses methods
- Pass Quiz Paper Discussion 1 - User Behaviour and motivation theories
- Active participation exercise 1 Part 2
- Pass Quiz Paper Discussion 2 - User Behaviour and motivation theories
- Pass Quiz Paper Discussion 3 - Security Awareness
- Active participation exercise 1 Part 3
- Pass Quiz Paper Discussion 4 - Graphical Authentication
- Pass Quiz Paper Discussion 5 - Shoulder Surfing Authentication
- Active participation exercise 2

**Recommendation**
The prior attendance of the lecture "Information Security" is strongly recommended.

**Annotation**
The lecture will not be offered in winter semester 2020/21.
Some lectures are in English, some in German.

*Below you will find excerpts from events related to this course:*
Content
Please take a look at all the information provided before the first event (e.g. first slides)!

The event will be conducted with 3G. Accordingly, either a one-time proof of vaccination or an official proof of a negative test is required for each event.

Some lectures are in English, some in German.

To participate in the quizzes at the beginning of the event a charged device is needed e.g. laptop or cell phone.

To successfully pass the course, the following requirements must be met:
Both need to be done:
- Reading Paper, Active Participation & Pass Quiz on Paper for Graphical Passwords
- Presentation of Results Exercise 2

+ 9 of the following 11 need to be done:
- Submit ILIAS certificate until Oct 24
- Pass Quiz on InfoSec Lecture
- Active participation exercise 1 – Part 1
- Reading Paper, Active Participation & Pass Quiz “Users are not the enemy” Active participation exercise 1 – Part 2
- Reading Paper, Active Participation & Pass Quiz “Why Johnny can’t encrypt”
- Reading Paper, Active Participation & Pass Quiz “Put Your Warning Where Your Link Is: Improving and Evaluating Email Phishing Warnings”
- Active participation exercise 1 – Part 3
- Active participation exercise 1 – Part 4 Results
- Reading Paper, Active Participation & Pass Quiz “User-centered security” Active participation exercise 2 – Part 1

Here is a first preview of the topics planned for the lecture:

1. General Introduction
2. Self-Study: Knowledge of Information Security Lecture
3. Terminology + Basics
4. Evaluation and analyses methods
5. Risk Communication
6. Security Awareness
7. Security Indicators
8. Graphical Authentication
9. Shoulder Surfing Authentication
10. Usable Verifiable Electronic Voting
11. Q&A + Exam preparation

Literature

- Security and Usability: Designing Secure Systems that People Can Use von Lorrie Faith Cranor und Simson Garfinkel. 2005
### 6.151 Course: Human-Machine-Interaction [T-INFO-101266]

**Responsible:** Prof. Dr.-Ing. Michael Beigl  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100729 - Human Computer Interaction

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#### Exams

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🔴 On-Site, ☑️ Cancelled

**Responsible:** Prof. Dr.-Ing. Jürgen Beyerer  
Dr.-Ing. Florian van de Camp

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100824 - Human-Machine-Interaction in Anthropomatics: Basics

**Type**  
Written examination

**Credits**  
3

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

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### Exams

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*Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled*
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
6.154 Course: Humanoid Robotics Laboratory [T-INFO-111590]

**Responsible:** Prof. Dr.-Ing. Tamim Asfour  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-105792 - Humanoid Robotics Laboratory

<table>
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**Events**

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<td>Practical course / Asfour</td>
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**Exams**

**Recommendation**

- Very good programming skills in at least one high-level programming language are strongly recommended.
- Attendance of the lectures Robotics 1, Robotics 2, Robotics 3, as well as the robotics practical course are recommended.
- Project-specific recommendations (knowledge of C++, Python, ...) will be announced in the individual project descriptions.

**Annotation**

- Internship dates are always by arrangement with the supervising staff member.
- An extension work of the topic as a master thesis is possible in principle.
- The number of participants in this practical course is generally **limited** and varies with the number of available research projects at the institute.

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

**Humanoid Robotics Laboratory**

24890, WS 23/24, 4 SWS, Language: German/English, [Open in study portal](#)

**Practical course (P)**

**On-Site**

**Content**

In this practical course, a is worked on alone or in small teams with up to 3 students. Questions of humanoid robotics are dealt with, such as semantic scene interpretation, active perception, planning of grasping and manipulation tasks, action representation with motion primitives, and programming by demonstration.

The project work (alone or in groups) is performed largely independently but supported by scientific staff of the H2T. At the end of the practical course, the work has to be documented and presented in a scientific talk.

**Learning Objectives:**

- Students will be able to independently understand, structure, analyze, and solve a complex humanoid robotics problem using existing programming skills, alone or in a small team.
- Students can convey complex technical content in a presentation.

**Recommendation:**

- Very good programming skills in at least one high-level programming language are strongly recommended.
- Attendance of the lectures Robotics 1, Robotics 2, Robotics 3, as well as the robotics practical course are recommended.
- Project-specific recommendations (knowledge of C++, Python, ...) will be announced in the individual project descriptions.
Organizational issues
Die Erfolgskontrolle erfolgt in Form einer mündlichen Prüfung nach § 4 Abs. 2 Nr. 2 SPO.
Die Modulnote ist die Note der mündlichen Prüfung.
Zielgruppe: Das Praktikum richtet sich an Studierende der Informatik, Elektrotechnik, Maschinenbau, Mechatronik im Masterstudium sowie alle Interessenten an der Robotik.

Arbeitsaufwand:
6 LP entspricht ca. 180h, davon

1. 10h Präsenzzeit in Praktikumsbesprechungen
2. 10h Vor- und Nachbereitung derselben
3. 150h Selbststudium zur Bearbeitung des Themas

c. 10h Vorbereitung und Halten eines wissenschaftlichen Vortrags
6.155 Course: Incentives in Organizations [T-WIWI-105781]

Responsible: Prof. Dr. Petra Nieken
Organisation: KIT Department of Economics and Management
Part of:
M-WIWI-101453 - Applied Strategic Decisions
M-WIWI-101500 - Microeconomic Theory
M-WIWI-101505 - Experimental Economics
M-WIWI-101510 - Cross-Functional Management Accounting
M-WIWI-105923 - Incentives, Interactivity & Decisions in Organizations

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Exams

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Legend: Online, Blended (On-Site/Online), On-Site, C Cancelled

Competence Certificate
The assessment of this course is a written examination (60 min). 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.

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

V Incentives in Organizations
2573003, SS 2024, 2 SWS, Language: English, Open in study portal
Content
The students acquire profound knowledge about the design and the impact of different incentive and compensation systems. Topics covered are, for instance, performance based compensation, team work, intrinsic motivation, multitasking, and subjective performance evaluations. We will use microeconomic or behavioral models as well as empirical data to analyze incentive systems. We will investigate several widely used compensation schemes and their relationship with corporate strategy. Students will learn to develop practical implications which are based on the acquired knowledge of this course.

Aim
The student
- develops a strategic understanding about incentives systems and how they work.
- analyzes models from personnel economics.
- understands how econometric methods can be used to analyze performance and compensation data.
- knows incentive schemes that are used in companies and is able to evaluate them critically.
- can develop practical implications which are based on theoretical models and empirical data from companies.
- understands the challenges of managing incentive and compensation systems and their relationship with corporate strategy.

Workload
The total workload for this course is: approximately 135 hours.
Lecture: 32 hours
Preparation of lecture: 52 hours
Exam preparation: 51 hours

Literature
Slides, Additional case studies and research papers will be announced in the lecture.
Literature (complementary):
Behavioral Game Theory, Camerer, Russel Sage Foundation, 2003
Introduction to Econometrics, Wooldridge, Andover, 2014
Econometric Analysis of Cross Section and Panel Data, Wooldridge, MIT Press, 2010
# 6.156 Course: Information Processing in Sensor Networks [T-INFO-101466]

**Responsible:** Prof. Dr.-Ing. Uwe Hanebeck  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100895 - Information Processing in Sensor Networks

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<td>Information Processing in Sensor Networks</td>
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6.157 Course: Information Service Engineering [T-WIWI-106423]

**Responsible:** Prof. Dr. Harald Sack

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

**Part of:** M-WIWI-101456 - Intelligent Systems and Services

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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

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

**V Information Service Engineering**

2511606, SS 2024, 2 SWS, Language: English, Open in study portal

Lecture (V)

On-Site
Content

- The Art of Understanding
  - From Numbers to Insights
  - Data, Information, and Knowledge
  - Natural Language
  - What is Successful Communication?
  - The Art of Understanding

- Natural Language Processing
  - NLP and Basic Linguistic Knowledge
  - NLP Applications, Techniques and Challenges
  - How to evaluate an NLP Experiment?
  - Tokenization and Word Normalisation
  - Statistical Language Models (N-Gram Model)
  - Naive Bayes Text Classification
  - Distributional Semantics and Word Vectors

- Knowledge Graphs
  - Knowledge Representations and Ontologies
  - Resource Description Framework (RDF)
  - Modeling with RDFS
  - Querying RDF(S) with SPARQL
  - Popular Knowledge Graphs - Wikidata and DBpedia
  - Ontologies with the Web Ontology Language (OWL)
  - Linked Data Quality Assurance with SHACL
  - From Linked Data to Knowledge Graphs

- Basic Machine Learning
  - Machine Learning Fundamentals
  - Evaluation and Generalization Problems
  - Linear Regression
  - Decision Trees
  - Unsupervised Learning
  - Neural Networks and Deep Learning
  - Word Embeddings
  - Knowledge Graph Embeddings

- ISE Applications
  - Knowledge Graph Completion
  - Knowledge Graphs and Large Language Models
  - Semantic and Exploratory Search
  - Semantic Recommender Systems

Learning objectives:

- The students know the fundamentals and measures of information theory and are able to apply those in the context of Information Service Engineering.
- The students have basic skills of natural language processing and are enabled to apply natural language processing technology to solve and evaluate simple text analysis tasks.
- The students have fundamental skills of knowledge representation with ontologies as well as basic knowledge of Semantic Web and Linked Data technologies. The students are able to apply these skills for simple representation and analysis tasks.
- The students have fundamental skills of information retrieval and are enabled to conduct and to evaluate simple information retrieval tasks.
- The students apply their skills of natural language processing, Linked Data engineering, and Information Retrieval to conduct and evaluate simple knowledge mining tasks.
- The students know the fundamentals of recommender systems as well as of semantic and exploratory search.

Literature


**Responsible:** Prof. Dr. Marion Weissenberger-Eibl

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

**Part of:**
- M-WIWI-101488 - Entrepreneurship (EnTechnon)
- M-WIWI-101507 - Innovation Management

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled

**Competence Certificate**
The assessment consists of a written exam (60 minutes). The exam takes place in every summer semester. Re-examinations are offered at every ordinary examination date.

**Prerequisites**
None

**Recommendation**
None

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

**Innovation Management: Concepts, Strategies and Methods**

2545100, SS 2024, 2 SWS, Language: German, [Open in study portal](#)

**Content**
The course ‘Innovation Management: Concepts, Strategies and Methods’ offers scientific concepts which facilitate the understanding of the different phases of the innovation process and resulting strategies and appropriate methodologies suitable for application. The concepts refer to the entire innovation process so that an integrated perspective is made possible. This is the basis for the teaching of strategies and methods which fulfil the diverse demands of the complex innovation process. The course focuses particularly on the creation of interfaces between departments and between various actors in a company’s environment and the organisation of a company’s internal procedures. In this context a basic understanding of knowledge and communication is taught in addition to the specific characteristics of the respective actors. Subsequently methods are shown which are suitable for the profitable and innovation-led implementation of integrated knowledge.

**Aim:** Students develop a differentiated understanding of the different phases and concepts of the innovation process, different strategies and methods in innovation management.

**Organizational issues**

**Wichtig!** Bitte treten Sie dem ILIAS-Kurs zur Vorlesung bei, damit wir Ihnen weitere Informationen mitteilen können.

**Literature**
Eine ausführliche Literaturliste wird mit den Vorlesungsunterlagen zur Verfügung gestellt.

**6.159 Course: Innovative Concepts for Programming Industrial Robots [T-INFO-101328]**

**Responsible:** Prof. Dr.-Ing. Björn Hein  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100791 - Innovative Concepts for Programming Industrial Robots

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣️ On-Site, ✗ Cancelled
6.160 Course: Intelligent Agent Architectures [T-WIWI-111267]

**Responsible:** Prof. Dr. Andreas Geyer-Schulz  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-104814 - Information Systems: Analytical and Interactive Systems  
- M-WIWI-105661 - Data Science: Intelligent, Adaptive, and Learning Information Services

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**Exams**

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**Legend:** Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Written examination (60 minutes) according to §4(2), 1 SPO. The exam is considered passed if at least 50 out of a maximum of 100 possible points are achieved. The grades are graded in five steps (best grade 1.0 from 95 points). Details of the grade formation and scale will be announced in the course.

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 one grade level (0.3 or 0.4). The exact criteria for awarding a bonus will be announced at the beginning of the course.

**Prerequisites**

None

**Recommendation**

It is recommended to additionally review the Bachelor-level lecture “Customer Relationship Management” from the module “CRM and Servicemanagement”.

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

- **Intelligent Agent Architectures**  
  2540525, WS 23/24, 2 SWS, Language: English, Open in study portal  
  Lecture (V)  
  On-Site
Content
Course content:
The lecture is structured in three parts:
In the first part the methods used for architecture design are introduced (system analysis, UML, formal specification of interfaces, software and analysis patterns, and the separation in conceptual and IT-architectures. The second part is dedicated to learning architectures and machine learning methods. The third part presents examples of learning CRM-Architectures.

Workload:
The total workload for this course is approximately 135 hours (4.5 credits):
Time of attendance
- Attending the lecture: 15 x 90min = 22h 30m
- Attending the exercise classes: 7 x 90min = 10h 30m
- Examination: 1h 00m

Self-study
- Preparation and wrap-up of the lecture: 15 x 180min = 45h 00m
- Preparing the exercises: 25h 00m
- Preparation of the examination: 31h 00m

Sum: 135h 00m

Learning Goals:
Students have special knowledge of software architectures and of the methods which are used in their development (Systems analysis, formal methods for the specification of interfaces and algebraic semantic, UML, and, last but not least, the mapping of conceptual architectures to IT architectures.

Students know important architectural patterns and they can – based on their CRM knowledge – combine these patterns for innovative CRM applications.

Assessment:
The 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.

The course is considered successfully taken if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 10) from exercise work will be added.

Grade: Minimum points
- 1.0: 95
- 1.3: 90
- 1.7: 85
- 2.0: 80
- 2.3: 75
- 2.7: 70
- 3.0: 65
- 3.3: 60
- 3.7: 55
- 4.0: 50
- 5.0: 0

Literature
6 COURSES

Course: Intelligent Agents and Decision Theory [T-WIWI-110915]

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<th>Prof. Dr. Andreas Geyer-Schulz</th>
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| Part of:           | M-WIWI-104814 - Information Systems: Analytical and Interactive Systems  
                       M-WIWI-105661 - Data Science: Intelligent, Adaptive, and Learning Information Services |

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Competence Certificate
Oral (30 minutes) or written examination (60 minutes). The exam is held in each semester and can be repeated at any regular examination date. Details of the grading system and any exam bonus that may be achieved from the practice are announced in the course.

Prerequisites
None

Recommendation
We assume knowledge in statistics, operations research and microeconomics as taught in the Bachelor program (VWL I, Operations Research I + II, Statistics I + II) and a familiarity with preferably the Python programming language.

Annotation
new lecture starting summer semester 2020

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

V Intelligent Agents and Decision Theory
2540537, SS 2024, 2 SWS, Language: English, Open in study portal

Lecture (V)
Content
The key assumption of this lecture is that the concept of artificial intelligence is inseparably linked to the economic concept of rationality of agents. We consider different classes of decision problems - decisions under certainty, risk and uncertainty - from an economic, managerial and AI-engineering perspective:

From an economic point of view, we analyze how to act rationally in these situations based on classic utility theory. In this regard, the course also introduces the relevant parts of decision theory for dealing with

- multiple conflicting objectives,
- incomplete, risky and uncertain information about the world,
- assessing utility functions, and
- quantifying the value of information ...

From an engineering perspective, we discuss how to develop practical solutions for these decision problems, using appropriate AI components. We introduce

- a general, agent-based design framework for AI systems,

as well as AI methods from the fields of

- search (for decisions under certainty),
- inference (for decisions under risk) and
- learning (for decisions under uncertainty).

Where applicable, the course highlights the theoretical ties of these methods with decision theory.

We conclude with a discussion of ethical and philosophical issues concerning the development and use of AI.

Learning objectives
Students are able to design, analyze, implement, and evaluate intelligent agents.

Lecture Outline
1. Introduction: Artificial intelligence and the economic concept of rationality
2. Intelligent Agents: A general, agent-based design framework for AI systems
3. Decision under certainty: Assessing utility functions for decisions with multiple objectives
4. Search: Linear programming for decisions under certainty
5. Decisions under risk: The expected utility principle
6. Information systems: Improving economic decisions under risk
7. Inference: Bayesian networks for decisions under risk
8. Information Learning objectives value: When should an agent gather new information?
9. Decisions under uncertainty: Complete lack of information
10. Learning: Statistical learning of bayesian networks
11. Learning: Supervised learning with neural networks
12. Learning: Reinforcement learning
13. Learning: Preference-based reinforcement learning
14. Discussion: Ethical and philosophical issues

Note: This rough outline may be subject to change.
Literature

Basic literature (by lecture):

1. Russell & Norvig (2016, chapter 1), Bamberg et al. (2019, chapters 1 & 2)
2. Russell & Norvig (2016, chapter 2)
4. Nickel et al. (2014, chapter 1) [German], Russell & Norvig (2016, chapter 3)
6. Bamberg et al. (2019, chapter 6)
7. Russell & Norvig (2016, chapters 13, 14, 16)
8. Russell & Norvig (2016, chapter 16), Bamberg et al. (2019, chapter 6)
9. Bamberg et al. (2019, chapter 5)
10. Russell & Norvig (2016, chapter 20)
11. Goodfellow et al. (2016, chapter 6)
13. Wirth et al. (2017)

Detailed references:
### 6.162 Course: Interactive Computer Graphics [T-INFO-101269]

**Responsible:** Prof. Dr.-Ing. Carsten Dachsbacher  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100732 - Interactive Computer Graphics

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#### Exams

| WT 23/24     | 7500202 | Interactive Computer Graphics | Dachsbacher |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
6.163 Course: International Business Development and Sales [T-WIWI-110985]

**Responsible:** Erice Casenave  
Prof. Dr. Martin Klarmann  
Prof. Dr. Orestis Terzidis

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

**Part of:**  
M-WIWI-101488 - Entrepreneurship (EnTechnon)  
M-WIWI-105312 - Marketing and Sales Management

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<td>Klarmann, Terzidis, Schmitt</td>
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**Type:** Examination of another type  
**Credits:** 6  
**Grading scale:** Grade to a third  
**Recurrence:** see Annotations  
**Version:** 1

**Competence Certificate**  
Non exam assessment. The grade is based on the presentation, the subsequent discussion and the written elaboration.

**Annotation**  
Please contact the Marketing and Sales Research Group for further information.

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

**International Business Development and Sales**  
2572189, WS 23/24, 4 SWS, Language: English, Open in study portal

**Content**  
This course is offered as part of the EUCOR programme in cooperation with EM Strasbourg. Max. 10 students of KIT and max. 10 students of EM Strasbourg will develop a sales presentation in tandems (teams of 2). This is based on the value proposition of a business model.

- An application is required to participate in this event. The application phase usually takes place at the beginning of the lecture period. Further information on the application process can be found on the website of the Marketing and Sales Research Group (marketing.iism.kit.edu) shortly before the start of the lecture period.

Total workload for 6 ECTS: about 180 hours.
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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**Competence Certificate**

Depending on further pandemic developments, the examination will be offered either as a 60-minute written examination (written examination according to SPO § 4 Abs. 2, Pkt. 1) or as an open-book examination (alternative exam assessment according to SPO § 4 Abs. 2, Pkt. 3).

**Prerequisites**

None

**Recommendation**

None

**Annotation**

The course is offered as a 14-day or block course.

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

**International Finance**

Lecture (V)  
On-Site

**Organizational issues**

Kickoff am Mittwoch, 24.04.24, 15:45 - 19:00 Uhr im Raum 320 im Geb. 09.21 (Blücherstr. 17). Die Veranstaltung wird samstags als Blockveranstaltung angeboten, nach dem Kickoff nach Absprache.

**Literature**

Weiterführende Literatur:

### 6.165 Course: Internet Law [T-INFO-101307]

- **Responsible:** N.N.
- **Organisation:** KIT Department of Informatics
- **Part of:** M-INFO-101215 - Intellectual Property Law

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
Course: Internet of Everything [T-INFO-101337]

**Responsible:** Prof. Dr. Martina Zitterbart  
**Organisation:** KIT Department of Informatics  
**Part of:**  
- M-INFO-100800 - Internet of Everything  
- M-WIWI-104812 - Information Systems: Engineering and Transformation

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**Events**  

| WT 23/24 | 24104 | Internet of Everything | 2 SWS | Lecture / 🗣 | Zitterbart, Mahrt, Neumeister |

**Exams**  

| WT 23/24 | 7500009 | Internet of Everything | Zitterbart |
| ST 2024 | 7500071 | Internet of Everything | Zitterbart |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ⚰ Cancelled
6.167 Course: Introduction to Bayesian Statistics for Analyzing Data [T-WIWI-110918]

**Responsible:** Prof. Dr. Benjamin Scheibehenne  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-103117 - Data Science: Data-Driven Information Systems

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**Events**

| WT 23/24 | 2500025 | Bayesian Statistics for Analyzing Data | 2 SWS | Seminar | Scheibehenne |

**Competence Certificate**

Grades will be based on active participation (50%) and homework assignments (50%).

**Prerequisites**

Participants should already have a basic knowledge of R and standard frequentist statistical tests. Please bring your own Laptop with you as we will be using R for several hands-on examples and exercises during the class. We will mainly work with the book "Statistical Rethinking. A Bayesian Course with Examples in R and Stan" by Richard McElrath. Students are advised to obtain the book before the class starts.

**Annotation**

Due to its interactive nature, the number of participants will be limited.

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

**Bayesian Statistics for Analyzing Data**

2500025, WS 23/24, 2 SWS, Language: English, Open in study portal

**Content**

The goal of this class is to introduce Bayesian statistics as a viable alternative to conventional Null-Hypothesis significance testing (NHST) and the calculation of p-values. The class introduces the theoretical background of Bayesian statistics and its advantages over NHST. Based on this, students will work through hands-on approaches for analyzing various empirical data using Bayesian statistics. These analyses will mainly be conducted with the statistics software R and JASP. The class provides participants with the necessary skills to evaluate and interpret the results of published Bayesian analyses and to use the method for testing hypotheses and estimating model parameters based on empirical data. There will be regular reading and homework assignments.
6.168 Course: Introduction to Bioinformatics for Computer Scientists [T-INFO-101286]

**Responsible:** Prof. Dr. Alexandros Stamatakis  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100749 - Introduction to Bioinformatics for Computer Scientists

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**Legend:** Online, Blended (On-Site/Online), On-Site, Cancelled

**Recommendation**

Grundlegende Kenntnisse in den Bereichen der theoretischen Informatik (Algorithmen, Datenstrukturen) und der technischen Informatik (sequentielle Optimierung in C oder C++, Rechnerarchitekturen, parallele Programmierung, Vektorprozessoren) werden vorausgesetzt.
### 6.169 Course: Introduction to Quantum Computing (IQC) [T-INFO-112344]

**Responsible:** Prof. Dr. Bernhard Beckert  
Prof. Dr.-Ing. Ina Schaefer

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-106101 - Introduction to Quantum Computing (IQC)

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Legend: 🖥 Online, 🛠 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
**6.170 Course: Introduction to Stochastic Optimization [T-WIWI-106546]**

**Responsible:** Prof. Dr. Steffen Rebennack  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
M-WIWI-102832 - Operations Research in Supply Chain Management  
M-WIWI-103289 - Stochastic Optimization

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- **ST 2024 2550470**  
  Introduction to Stochastic Optimization  
  2 SWS  
  Lecture / 🖥  
  Rebennack

- **ST 2024 2550471**  
  Übung zur Einführung in die Stochastische Optimierung  
  1 SWS  
  Practice / 🗣  
  Rebennack, Kandora

- **ST 2024 2550474**  
  Rechnerübung zur Einführung in die Stochastische Optimierung  
  2 SWS  
  Others (sons)  
  Rebennack, Kandora

### Exams
- **WT 23/24 7900242**  
  Introduction to Stochastic Optimization  
  Rebennack

- **ST 2024 7900311**  
  Introduction to Stochastic Optimization  
  Rebennack

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**Competence Certificate**  
The assessment consists of a written exam (60 minutes). The exam takes place in every semester.

**Prerequisites**  
None.
### 6.171 Course: Introduction to Video Analysis [T-INFO-101273]

**Responsible:** Prof. Dr.-Ing. Jürgen Beyerer  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100736 - Introduction to Video Analysis

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6.172 Course: IT Security [T-INFO-112818]

Responsible: Prof. Dr. Hannes Hartenstein
Prof. Dr. Jörn Müller-Quade
Prof. Dr. Thorsten Strufe
TT-Prof. Dr. Christian Wressnegger

Organisation: KIT Department of Informatics
Part of: M-INFO-106315 - IT Security

Type: Written examination
Credits: 6
Grading scale: Grade to a third
Recurrence: Each winter term
Version: 2

Events

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<th>4 SWS</th>
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Exams

| WT 23/24   | 7500038 | IT Security | Müller-Quade, Strufe, Wressnegger, Hartenstein |

Legend: 🖥 Online, 🕰 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled

Competence Certificate
The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 90 minutes.

Prerequisites
None.

Recommendation
Students should be familiar with the content of the compulsory lecture "Informationssicherheit".

Information Systems M.Sc.
Module Handbook as of 11/04/2024
### Course: IT-Security Management for Networked Systems [T-INFO-101323]

**Responsible:** Prof. Dr. Hannes Hartenstein  
**Organisation:** KIT Department of Informatics  
**Part of:**  
- M-INFO-100786 - IT-Security Management for Networked Systems  
- M-WIWI-101458 - Ubiquitous Computing  
- M-WIWI-104812 - Information Systems: Engineering and Transformation

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
6.174 Course: Joint Entrepreneurship Summer School [T-WIWI-109064]

**Responsible:** Prof. Dr. Orestis Terzidis  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101488 - Entrepreneurship (EnTechnon)

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**Exams**

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**Competence Certificate**

The learning control of the program (Summer School) consists of two parts:

A) **Investor Pitch**  
Based on a presentation (investor pitch) in front of a jury, the insights gained and developed during the course of the event are presented and the business idea presented. Among other things, the presentation performance of the team, the structured content and the logical consistency of the business idea are evaluated. The exact evaluation criteria will be announced in the course.

B) **Written elaboration:**  
The second part of the assessment is a written report. The iterative knowledge gain of the entire event is systematically logged and can be further supplemented by the contents of the presentation. The report documents key action steps, applied methods, findings, market analyzes and interviews and prepares them in writing. The exact structure and requirements will be announced in the course.

The grade consists of 50% presentation performance and 50% written preparation.

**Prerequisites**

The Summer School is aimed at master students of KIT. Prerequisite is the participation in the selection process.

**Recommendation**

We recommend basic business knowledge, the lecture Entrepreneurship as well as openness and interest in intercultural exchange. Solid knowledge of the English language is an advantage.

**Annotation**

The working language during the Summer School is English. A one-week stay in China is part of the Summer School.

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

**Joint Entrepreneurship School Egypt**  
2500037, SS 2024, 4 SWS, Language: English, Open in study portal  

**Content**

During the Summer School in Egypt and Karlsruhe, students develop a business model of technologies and patents developed at KIT in workshops in German-Egypt tandems over the period of two weeks.

**Organizational issues**

- Briefing: April / May  
- Karlsruhe: Presumably: 29/7 to 2/8 - 2024  
- Cairo: Presumably: 1/9 -5/9 - 2024  
- Deliverables: October 2024
Joint Entrepreneurship School China
2545021, SS 2024, 4 SWS, Language: English, Open in study portal

Content
During the Summer School in Shanghai and Karlsruhe, students develop a business model of technologies and patents developed at KIT in workshops in German-Chinese tandems over the period of two weeks.

Click on our website for detailed information and a video: https://etm.entechnon.kit.edu/english/1095.php

Organizational issues
Dates:
- Briefing: April / May
- Karlsruhe: Presumably: August 05-09.2024
- Shanghai: Presumably: September 23-27.2024
- Deliverables: November 2024
6.175 Course: Judgement and Decision Making [T-WIWI-111099]

- **Responsible:** Prof. Dr. Benjamin Scheibehenne
- **Organisation:** KIT Department of Economics and Management

Part of:
- M-WIWI-105312 - Marketing and Sales Management
- M-WIWI-105923 - Incentives, Interactivity & Decisions in Organizations
- M-WIWI-106258 - Digital Marketing

### Type
- Examination of another type

- **Credits:** 4.5
- **Grading scale:** Grade to a third
- **Recurrence:** Each winter term
- **Expansion:** 1 terms
- **Version:** 2

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), ☐ On-Site, ✗ Canceled

### Competence Certificate

Alternative exam assessment. The grading includes the following aspects:

- a written exam (60 minutes)
- a presentation during the exercise.

The scoring system for the grading will be announced at the beginning of the course.

### Prerequisites

Registration via the WIWI-Portal is required for participation in the Übung. The Übung is a prerequisite for the exam.

### Annotation

The judgments and decisions that we make can have long ranging and important consequences for our (financial) well-being and individual health. Hence, the goal of this lecture is to gain a better understanding of how people make judgments and decisions and the factors that influence their behavior. We will look into simple heuristics and mental shortcuts that decision makers use to navigate their environment, in particular so in an economic context. Following this the lecture will provide an overview into social and emotional influences on decision making. In the second half of the semester we will look into some more specific topics including self-control, nudging, and food choice. The last part of the lecture will focus on risk communication and risk perception. We will address these questions from an interdisciplinary perspective at the intersection of Psychology, Behavioral Economics, Marketing, Cognitive Science, and Biology. Across all topics covered in class, we will engage with basic theoretical work as well as with groundbreaking empirical research and current scientific debates.

The workload of the class is 4.5 ECTS. This consists of 3 ETCS for the lecture and 1.5 ETCS for the Übung. Details about the Übung will be communicated at the first day of the class.

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

**Judgment and Decision Making**

- Code: 2540440, WS 23/24, 3 SWS, Language: English, [Open in study portal](#)
- Lecture (V) Blended (On-Site/Online)

### Content

In this lecture, students will be introduced to fundamental theories and key insights on human judgment and decision making. Topics include decision making under uncertainty, choice biases, simple heuristics, risk perception and -communication, as well as social and emotional influences on decision making, to name but a few. In the Wintersemester 20/21 this class will be held online. The lecture videos will be available for download and there will be regular online meetings to discuss the topics. The lecture will be held in English.

Responsible: Prof. Dr. Christof Weinhardt
Organisation: KIT Department of Economics and Management
Part of:
- M-WIWI-101446 - Market Engineering
- M-WIWI-103118 - Data Science: Data-Driven User Modeling
- M-WIWI-104080 - Designing Interactive Information Systems
- M-WIWI-105923 - Incentives, Interactivity & Decisions in Organizations

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Competence Certificate
Non exam assessment. Grading will be based on a continuous basis throughout the semester. The assessment consists of:

- A written paper, and
- a group presentation with subsequent discussion and question and answer session of 30 minutes.

For particularly active and constructive participation in the discussions of other papers during the final presentation, a bonus of one grade level (0.3 or 0.4) can be achieved on the passed exam. Details on the grading will be announced at the beginning of the event.

Annotation
The number of participants is limited due to laboratory capacity and to ensure optimal supervision of the project groups. Places are allocated on the basis of preferences and suitability for the topics. Previous knowledge in the field of experimental economic research is particularly important.

The course cannot be offered in the summer semester 2024.
6.177 Course: Knowledge Discovery [T-WIWI-102666]

**Responsible:** Dr.-Ing. Michael Färber  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101456 - Intelligent Systems and Services  
- M-WIWI-105366 - Artificial Intelligence  
- M-WIWI-105368 - Web and Data Science

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**Exams**

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**Legend:**  
- Online  
- Blended (On-Site/Online)  
- On-Site  
- C Cancelled

**Competence Certificate**

Instead of a final written exam, the record of achievement will be measured via project work, exercise assignments, and presentations. Specifically, the students will collaborate in groups of 3-4 to complete a comprehensive project which included a project proposal, mid-term report, and final report, cumulatively contributing 50% to their overall grade. Additionally, students will showcase their understanding of course material through the timely submission of three short assignments (totaling 25% of their grade). During the course, students will showcase their proficiency in public speaking and critical analysis by delivering engaging class presentations and discussions (25% of the grade).

**Prerequisites**

None

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

**Knowledge Discovery and Graph Representation Learning**

2511303, WS 23/24, 3 SWS, Language: English, [Open in study portal](#)
Content
The lecture provides a comprehensive overview of various approaches in machine learning and data mining for knowledge extraction. It explores multiple fields, including machine learning, natural language processing, and knowledge representation. The main focus is on discovering patterns and regularities in extensive data sets, particularly unstructured text found in news articles, publications, and social media. This process is known as knowledge discovery. The lecture delves into specific techniques, methods, challenges, as well as current and future research topics within this field.

One part of the lecture is dedicated to understanding large language models (LLMs), such as ChatGPT, by exploring their underlying principles, training methods, and applications. Additionally, the lecture dives into graph representation learning, which involves extracting meaningful representations from graph data. It covers the mathematical foundations of graph and geometric deep learning, highlighting the latest applications in areas like explainable recommender systems.

Moreover, the lecture highlights the integration of knowledge graphs with large language models, known as neurosymbolic AI. This integration aims to combine structured and unstructured data to enhance knowledge extraction and representation. The content of the lecture encompasses the entire machine learning and data mining process. It covers topics on supervised and unsupervised learning techniques, as well as empirical evaluation. Various learning methods are explored, ranging from classical approaches like decision trees, support vector machines, and neural networks to more recent advancements such as graph neural networks.

Learning objectives:
Students
- know fundamentals of Machine Learning, Data Mining and Knowledge Discovery.
- are able to design, train and evaluate adaptive systems.
- conduct Knowledge Discovery projects in regards to algorithms, representations and applications.

Workload:
- The total workload for this course is approximately 135 hours
- Time of presentness: 45 hours
- Time of preparation and postprocessing: 60 hours
- Exam and exam preparation: 30 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
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6.179 Course: Lab Project: Speech Translation [T-INFO-112175]

**Responsible:** Prof. Dr. Jan Niehues  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-105997 - Lab Project: Speech Translation

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Legend: 🖥 Online, 🍷 Blended (On-Site/Online), 🗣️ On-Site, ⌚ Cancelled

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

**Praktikum Speech Translation**

2400150, WS 23/24, 4 SWS, Language: German/English, [Open in study portal](#)

**Practical course (P)** On-Site

**Content**

Through the use of deep learning technologies, the quality of machine translation of text and speech has improved significantly in recent years. In this internship, the students develop a language translation system for a new language pair using state-of-the-art methods.

In the first part of the internship, the students are introduced step-by-step to the development of a translation system and its evaluation. For this, the different subtasks have to be solved. In the second part of the internship, the students should investigate different improvements of the system independently.

**Organizational issues**

Findet im Raum 223 an unserem Institut statt:

Mittwochs, 11:30 - 13:00 Uhr
6.180 Course: Lab: Efficient Parallel C++ [T-INFO-106992]

**Responsible:** Prof. Dr. Peter Sanders  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-103506 - Lab: Efficient Parallel C++

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**Exams**

**Competence Certificate**  
The assessment is carried out as an examination of another type (§ 4 Abs. 2 No. 3 SPO).

**Recommendation**  
At least basic knowledge of the C++ language is necessary for participation in the course. Students should be able to implement given algorithms.
6.181 Course: Lab: Graph Visualization in Practice [T-INFO-106580]

**Responsible:** Dr. rer. nat. Torsten Ueckerdt

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-103302 - Lab: Graph Visualization in Practice

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6.182 Course: Lab: Internet of Things (IoT) [T-INFO-107493]

**Responsible:** Prof. Dr.-Ing. Jörg Henkel  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-103706 - Lab: Internet of Things (IoT)

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**Exams**

| WT 23/24     | 7500183 | Lab: Internet of Things (IoT) |      | Henkel                 |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣️ On-Site, ✗ Cancelled

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

**Internet of Things (IoT) Lab**

2424304, WS 23/24, 4 SWS, Language: English, Open in study portal  
Practical course (P) On-Site
Content
Welcome to the Internet of Things (IoT) world, where millions of connected devices are now involved almost in our everyday life, including our homes, offices, transportation, and our healthcare, from home appliances, vehicles, smartphones to wearable devices like smartwatches. IoT is growing very fast and spreads very quickly.

Overview: This lab aims at providing the student with the practical concept of IoT systems design.

- It provides an overview of the IoT systems' aspects including embedded intelligence, connectivity, interaction with the physical world, etc.
- It covers the main design and implementation issues for IoT devices and their applications. These issues challenge the students to tailor smart techniques to optimize the embedded software on IoT devices to meet the constrained resources.
- The students gain in-depth practical experiences in embedded system design with a focus on IoT applications as well as communication in connected devices.

Lab's Goals:

- The students will understand the main concept of IoT systems including the design objectives, application domains, and their requirements, design challenges, etc.
- The students will gain the ability to develop software programs for the IoT embedded devices, implement the code on the hardware, conduct the tests, find the bugs and errors, and debug the software code on the hardware.
- The students shall be able to implement and apply the concepts that are critical in the IoT domain, e.g. low power design, security, etc.
- The students will be able to develop, integrate and evaluate a small IoT system with its main components: sensors to get data from the physical world, the embedded processor for control the device and process the data, wireless radio to transmit the data from the device to the Internet, storage (on the Internet or on a Smart Phone) to keep the data for further analysis.

Target Audience:

- This lab is also suitable for electrical engineering and informatics' students and those who have an interest in embedded systems design.

Prerequisites:

- The ability to develop software programs in C or C++ is recommended.
- Basic knowledge about other programming languages can be helpful (e.g., Java or Python)

Details:

- The lab manuals and exercises are conducted only in English.
- The lab is split into weekly sessions throughout the semester. Each session is approximately 3-4 hours per week. At the end of the semester, there would be a final project.
- The state-of-the-art low-power IoT boards and the corresponding development software, are used in the lab. Currently, Texas Instrument (TI) CC1350 microcontroller, and the latest version of Code Composer Studio is the base platform.
- The exercises in the lab are based on the TI repository. But for the final projects, the students have the flexibility to design their desired systems.
Content

For registration please use ILIAS too, in order to follow the course!

Welcome to the Internet of Things (IoT) world, where millions of connected devices are now involved almost in our everyday life, including our homes, offices, transportation, and our healthcare, from home appliances, vehicles, smartphones to wearable devices like smartwatches. IoT is growing very fast and spreads very quickly.

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Prerequisites:

- The ability to develop software programs in C or C++ is recommended.
- Basic knowledge about other programming languages can be helpful (e.g., Java or Python)

Details:

- The lab manuals and exercises are available in English.
- The lab is split into weekly sessions throughout the semester. Each session is approximate ~4 hours per week. At the end of the semester, there would be a final project.
- The state-of-the-art low-power IoT boards and the corresponding development software, are used in the lab. Currently, Texas Instrument (TI) CC1350 microcontroller, and the latest version of Code Composer Studio is the base platform.
- The exercises in the lab are based on the TI repository. But for the final projects, the students have the flexibility to design their desired systems.
6.183 Course: Lab: Low Power Design and Embedded Systems [T-INFO-108323]

**Responsible:** Prof. Dr.-Ing. Jörg Henkel

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-104031 - Lab: Low Power Design and Embedded Systems

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**Events**

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<td>Practical course / 🧩</td>
<td>Gonzalez, Khdr, Henkel</td>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled

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

**Low Power Design and Embedded Systems**

2424811, SS 2024, 3 SWS, Language: English, [Open in study portal](#)

**Practical course (P)**

**Blended (On-Site/Online)**

**Content**

**Lab Description**

Nowadays, power and energy consumption are two of the most important criteria in the design of on-chip applications. Other design constraints, such as performance, were dominant in the past, but now it is imperative to optimize for low power, since on-chip temperature and battery life are limiting design factors on modern multi / many core systems.

This lab explores different software and hardware approaches for power and energy reduction on modern embedded systems, considering other relevant metrics and constraints (e.g., temperature, performance, chip area).

**First part: software effects on power and performance**

The first part of the lab consists of an exploration and analysis of the effect of different resource management techniques on a many-core platform, to optimize for a specific metric (e.g., energy, power, temperature) under predefined application constraints (e.g., performance).

**Second part: hardware / software co-design**

The second part of the lab consists of a Hardware/Software Co-design exploration using the High-Level Synthesis (HLS) technique. This technique takes a C/C++ code implementation and produces a hardware accelerator module from a function, which is then synthesized for a Field Programable Gate Array (FPGA) device.

This part explores the trade-off between performance, speed, power and area usage in the design of HW/SW systems.

**Third Part: Demo in Thermal Lab**

As part of the course, there will be access to the CES thermal lab, in which an experiment will be carried out to analyze the effect of power and temperature on a real board setup, using a thermal camera.

Preliminary discussion appointment: it will be announced via email to all registrants.

Note: The lab is given as a full week block.
6.184 Course: Laboratory Course Algorithm Engineering [T-INFO-104374]

**Responsible:** TT-Prof. Dr. Thomas Bläsius
Dr. rer. nat. Torsten Ueckerdt

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-102072 - Laboratory Course Algorithm Engineering

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**Events**

| WT 23/24 | 2424305 | Practical Course in Algorithm Design | 4 SWS | Practical course / 🗣 | Wagner, Sauer, Ueckerdt, Feilhauer, Bläsius, Zündorf |

**Exams**

| WT 23/24 | 7500072 | Practical Course in Algorithm Design | Ueckerdt |

Legend: Online, Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled

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

**Practical Course in Algorithm Design**

2424305, WS 23/24, 4 SWS, Language: German, Open in study portal

**Practical course (P)**

On-Site

Content

In the practical course *Algorithm Engineering* the students are given miscellaneous questions from algorithmics, which they have to implement independently in small working groups. The main focus lies on object oriented programming with Java or C++. Linear programming may also occur.

**Prerequisites:** Knowledge of the lecture Algorithms II is recommended.

**Learning Goals:**

The purpose of the practical course in algorithm design is to make learned knowledge work. The students are given varying topics from algorithmics, which they have to implement in small working groups. Possible Topics are, for example, algorithms for flow problems, shortest path problems, or clustering techniques. In this way students learn to write efficient code.

**Workload:** Praktikum mit 4SWS, 6 LP
6 LP entspricht ca. 180 Arbeitsstunden

**Organizational issues**

Anmeldeverfahren siehe Veranstaltungswebsite
# 6.185 Course: Laboratory in Cryptoanalysis [T-INFO-102990]

- **Responsible:** Prof. Dr. Jörn Müller-Quade
- **Organisation:** KIT Department of Informatics
- **Part of:** M-INFO-101559 - Laboratory in Cryptoanalysis

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗺 On-Site, ❌ Cancelled
6.186 Course: Laboratory in Cryptography [T-INFO-102989]

**Responsible:** Prof. Dr. Jörn Müller-Quade

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-101558 - Laboratory in Cryptography

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), ☑ On-Site, ❌ Cancelled

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

**Laboratory Cryptography and Security**

24301, WS 23/24, 4 SWS, Open in study portal

**Practical course (P)**

**On-Site**

**Content**

The lab covers different areas of computer security and cryptography. The topics are presented theoretically and are implemented afterwards. Covered topics are:

- Historical encryption
- EC-card PINs
- Block ciphers
- Efficient long number arithmetic
- ElGamal encryption / signature
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**Responsible:** Prof. Dr. Jörn Müller-Quade  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101560 - Laboratory in Security
## 6.188 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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### Exams

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Canceled

**Competence Certificate**  
The assessment consists of a written exam (60 minutes). The exam takes place in every semester.

**Prerequisites**  
None.
6.189 Course: Liberalised Power Markets [T-WIWI-107043]

**Responsible:** Prof. Dr. Wolf Fichtner

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

**Part of:** M-WIWI-101451 - Energy Economics and Energy Markets
M-WIWI-102808 - Digital Service Systems in Industry

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**Exams**

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

The assessment consists of a written exam (60 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (alternative exam assessment, following §4(2), 3 of the examination regulation).

**Recommendation**

None

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

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Information Systems M.Sc.
Module Handbook as of 11/04/2024
Content
1. Power markets in the past, now and in future
2. Designing liberalised power markets
   2.1. Unbundling Dimensions of liberalised power markets
   2.2. Central dispatch versus markets without central dispatch
   2.3. The short-term market model
   2.4. The long-term market model
   2.5. Market flaws and market failure
   2.6. Regulation in liberalised markets
3. The power (sub)markets
   3.1 Day-ahead market
   3.2 Intraday market
   3.3 (Long-term) Forwards and futures markets
   3.4 Emission rights market
   3.5 Market for ancillary services
   3.6 The "market" for renewable energies
   3.7 Future market segments
4. Grid operation and congestion management
   4.1. Grid operation
   4.2. Congestion management
5. Market power
   5.1. Defining market power
   5.2. Indicators of market power
   5.3. Reducing market power
6. Future market structures in the electricity value chain
1. Power markets in the past, now and in future
2. Designing liberalised power markets
   2.2. Unbundling Dimensions of liberalised power markets
   2.3. Central dispatch versus markets without central dispatch
   2.4. The short-term market model
   2.5. The long-term market model
   2.6. Market flaws and market failure
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   3.6 The "market" for renewable energies
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   4.2. Congestion management
5. Market power
   5.1. Defining market power
   5.2. Indicators of market power
   5.3. Reducing market power
6. Future market structures in the electricity value chain
Literature
Weiterführende Literatur:
Course: Life Cycle Assessment – Basics and Application Possibilities in an Industrial Context [T-WIWI-113107]

Responsible: Prof. Dr. Frank Schultmann
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101412 - Industrial Production III
M-WIWI-101471 - Industrial Production II

Type: Written examination
Credits: 3.5
Grading scale: Grade to a third
Recurrence: Each winter term
Version: 1

Events

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Exams

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Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Competence Certificate
The assessment consists of an oral (30 minutes) or written exam (60 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (alternative exam assessment, following §4(2), 3 of the examination regulation).

Prerequisites
None.

Recommendation
None

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

Life Cycle Assessment - Basics and Application Possibilities in an Industrial Context
2581995, WS 23/24, 2 SWS, Language: German, Open in study portal

Content
The lecture focuses on the analysis of the environmental impacts of products and processes using Life Cycle Assessment (short: LCA). Structure and steps are conveyed in detail and selected further developments are shown. In order to record the methodology and classify potential environmental impacts, the practical development of what has been learned is also focused on using LCA software and interactive formats.

Topics include:
- Significance and areas of application
- Calculation models
- Attributional/Consequential LCA
- Life Cycle Sustainability Assessment, Social LCA and Life Cycle Costing
- Limitations
- Development of a Case Study

Literature
werden in der Veranstaltung bekannt gegeben
Course: Introduction to Quantum Machine Learning [T-INFO-113556]

**Responsible:** Dr. Max Fischer  
Dr. Eileen Kühn

**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-106742 - Introduction to Quantum Machine Learning

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**Competence Certificate**

The assessment takes the form of a written examination (usually 60 minutes) in accordance with Section 4 (2) No. 1 SPO. Depending on the number of participants, it will be announced six weeks before the examination (§ 6 Para. 3 SPO) whether the assessment will take place

- in the form of an oral examination in accordance with § 4 Para. 2 No. 2 SPO or
- in the form of a written examination in accordance with § 4 Para. 2 No. 1 SPO.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course T-INFO-112571 - Introduction to Hybrid Quantum Machine Learning Algorithms must not have been started.
6.192 Course: Localization of Mobile Agents [T-INFO-101377]

**Responsible:** Prof. Dr.-Ing. Uwe Hanebeck  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100840 - Localization of Mobile Agents

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**Exams**

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*Legend:* 🖥 Online, 🧩 Blended (On-Site/Online), 🔴 On-Site, ❌ Cancelled

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

**Localization of Mobile Agents**

| 24613, SS 2024, 3 SWS, Language: German, [Open in study portal](#) |

**Content**

This module provides a systematic introduction into the topic of localization methods. In order to facilitate understanding, the module is divided into four main topics. Dead reckoning treats the instantaneous determination of a vehicle’s position based on dynamic parameters like velocity or steering angle. Localization with the help of measurements of known landmarks is part of static localization. In addition to the closed-form solutions for particular measurements (distances and angles), the least squares method for fusion of arbitrary measurements is also introduced. Dynamic localization treats the combination of dead reckoning and static localization. The central part of the lecture is the derivation of the Kalman filter, which has been successfully applied in several practical applications. Finally, simultaneous localization and mapping (SLAM) is introduced, which allows localization in case of (partly) unknown landmark positions.

**Organizational issues**

Prüfungsterminvorschläge und das Verfahren dazu sind auf der Webseite der Vorlesung zu finden.

**Literature**

Grundlegende Kenntnisse der linearen Algebra und Stochastik sind hilfreich.
Course: Logical Foundations of Cyber-Physical Systems [T-INFO-112360]


**Responsible:** Prof. Dr. André Platzer

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-106102 - Logical Foundations of Cyber-Physical Systems

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| Events | | | |
| WT 23/24 | 2400161 | Logical Foundations of Cyber-Physical Systems | 4 SWS | Lecture / Plater |

| Exams | | | |
| WT 23/24 | 7500252 | Logical Foundations of Cyber-Physical Systems | Plater |

Legend: Online, Blended [On-Site/Online], On-Site, Cancelled

**Competence Certificate**

Die Erfolgskontrolle erfolgt in Form einer schriftlichen Prüfung im Umfang von i.d.R. 120 Minuten nach § 4 Abs. 2 Nr. 1 SPO.

Durch die erfolgreiche Teilnahme am Übungsbetrieb kann ein Bonus erworben werden. Um einen Bonus zu bekommen, muss man jeweils 50% der Punkte für die Lösungen der Aufgaben in der ersten und 50% Punkte in der zweiten Hälfte erwerben. Liegt die Note der schriftlichen Prüfung zwischen 4,0 und 1,3, so verbessert der Bonus die Note um eine Notenstufe (0,3 oder 0,4).

**Prerequisites**

None.

**Recommendation**

The course assumes prior exposure to basic computer programming and mathematical reasoning. This course covers the basic required mathematical and logical background of cyber-physical systems. You will be expected to follow the textbook as needed: André Platzer. Logical Foundations of Cyber-Physical Systems. Springer 2018. DOI:10.1007/978-3-319-63588-0

**Annotation**

Course web page: https://lfcps.org/course/lfcps.html

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

**Logical Foundations of Cyber-Physical Systems**

2400161, WS 23/24, 4 SWS, Language: English, [Open in study portal]

**Lecture (V)**

On-Site

**Content**

*Cyber-physical systems* (CPSs) combine cyber capabilities (computation and/or communication) with physical capabilities (motion or other physical processes). Cars, aircraft, and robots are prime examples, because they move physically in space in a way that is determined by discrete computerized control algorithms. Designing these algorithms to control CPSs is challenging due to their tight coupling with physical behavior. At the same time, it is vital that these algorithms be correct, since we rely on CPSs for safety-critical tasks like keeping aircraft from colliding. In this course we will strive to answer the fundamental question posed by Jeannette Wing: "How can we provide people with cyber-physical systems they can bet their lives on?"

This course will give you the required skills to formally analyze the CPSs that are all around us -- from power plants to pace makers and everything in between -- so that when you contribute to the design of a CPS, you are able to understand important safety-critical aspects and feel confident designing and analyzing system models. It will provide an excellent foundation for students who seek industry positions and for students interested in pursuing research.

**Organizational issues**

The lectures will be English unless everyone prefers German. English videos, slides, and a textbook are available for most lectures.

**Literature**

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

**Content**

Smart embedded devices driven by advances in fields as diverse as automotive smart home, to high-tech like lithography or battery technology for IoT devices are now omnipresent in our lives. Today's consumers have very high expectations from the embedded devices they own. Many emerging technologies such as virtual reality, robotics and artificial intelligence are limited in scope only by the performance of the underlying embedded devices. Unfortunately, performance of embedded devices is inherently constrained both by their limited cost, size as well as heat dissipating capacity and their limited on-board battery. The fact that all contemporary smartphones have multi-core chips running at low frequencies instead of single-core chips running at high frequencies can be attributed directly to the power consumption constraints imposed on them.

The constraints mandate highly optimized hardware-software co-design techniques for embedded devices that allows extraction of maximum performance with minimal power consumption. A good low power design requires all three building blocks of an embedded device – hardware, software and operating system – to work together synergistically. The lectures cover all the three aspects alongside their interactions from a low power design perspective in depth.

The lecture provides an overview of design methods, synthesis tools, estimation models, software techniques, operating system strategies, scheduling algorithms, etc., with the aim of minimizing the power consumption of embedded devices without compromising their performance. Both the research-relevant and industry-prevalent topics at different level of abstractions (from circuit to system) are discussed in this lecture.

Recommendations: Module "Entwurf und Architekturen für eingebettete Systeme". Basic knowledge from the module "Optimierung und Synthese Eingebetteter Systeme" is helpful but not essential for understanding of this lecture. The lecture is equally suitable for students from both computer science as well as electrical engineering department.

Students are made aware of various low power design optimizations employed in state-of-the-art embedded devices. At the end of the lecture, the students will be able to recognize the challenges involved in crafting efficient low power designs and how to tackle them.

Responsible: Prof. Dr. Gerhard Neumann
Organisation: KIT Department of Informatics
Part of: M-INFO-105778 - Machine Learning - Foundations and Algorithms

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<th>Lecture / Practice ( / )</th>
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Exams

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</table>

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled

Competence Certificate

The success control takes place in the form of a written exam, usually 90 minutes in length, according to § 4 Abs. 2 Nr. 1 SPO.

A bonus can be acquired through successful participation in the exercise as a success control of a different kind (§4(2), 3 SPO 2008) or study performance (§4(3) SPO 2015). The exact criteria for awarding a bonus will be announced at the beginning of the lecture. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by one grade level (0.3 or 0.4). The bonus is only valid for the main and post exams of the semester in which it was earned. After that, the grade bonus expires.

Prerequisites

none.

Recommendation

- Attendance of the lecture “Foundations of Artificial Intelligence” (“Grundlagen der Künstlichen Intelligence”)
- Knowledge in python
- Mathematics-heavy lecture. The basics will be reviewed, but mathematical proficiency is helpful
Course: Machine Learning 1 - Basic Methods [T-WIWI-106340]

**Responsible:** Prof. Dr.-Ing. Johann Marius Zöllner
**Organisation:** KIT Department of Economics and Management
**Part of:** M-WIWI-103356 - Machine Learning

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**Events**

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<th>2 SWS</th>
<th>Lecture / 🗣</th>
<th>Zöllner</th>
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<td>2511501</td>
<td>Exercises to Machine Learning 1 - Fundamental Methods</td>
<td>1 SWS</td>
<td>Practice / 🗣</td>
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**Exams**

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<th>Machine Learning 1 - Basic Methods</th>
<th>Zöllner</th>
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<td>ST 2024</td>
<td>79AIFB_ML1_C4</td>
<td>Machine Learning 1 - Basic Methods (Registration until 15 July 2024)</td>
<td>Zöllner</td>
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**Competence Certificate**

Depending on further pandemic developments, the exam will be offered either as an open-book exam, or as a written exam (60 min):

The exam takes place every semester and can be repeated at every regular examination date.

A grade bonus can be earned by successfully completing practice exercises. If the grade of the written exam 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.

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

**Machine Learning 1 - Fundamental Methods**

<table>
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<th>Lecture (V)</th>
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<tr>
<td>79AIFB_ML1_C5</td>
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**Content**

The course prepares students for the rapidly evolving field of machine learning by providing a solid foundation, covering core concepts and techniques to get started in the field. Students delve into different methods in supervised, unsupervised, and reinforcement learning, as well as various model types, ranging from basic linear classifiers to more complex methods, such as deep neural networks. Topics include general learning theory, support vector machines, decision trees, neural network fundamentals, convolutional neural networks, recurrent neural networks, unsupervised learning, reinforcement learning, and Bayesian learning.

The course is accompanied by a corresponding exercise, where students gain hands-on experience by implementing and experimenting with different machine learning algorithms, helping them to apply machine learning algorithms on real world problems.

By the end of the course, students will have acquired a solid foundation in machine learning, enabling them to apply state-of-the-art algorithms to solve complex problems, contribute to research efforts, and explore advanced topics in the field.

**Learning objectives:**

- Students acquire knowledge of the fundamental methods in the field of machine learning.
- Students can classify, formally describe and evaluate methods of machine learning.
- Students can use their knowledge to select suitable models and methods for selected problems in the field of machine learning.
Literatur
Die Foliensätze sind als PDF verfügbar

Weiterführende Literatur

- Machine Learning - Tom Mitchell
- Deep Learning - Ian Goodfellow, Yoshua Bengio, Aaron Courville
- Pattern Recognition and Machine Learning - Christopher M. Bishop
- Artificial Intelligence: A Modern Approach - Peter Norvig and Stuart J. Russell
- Reinforcement Learning: An Introduction - Richard S. Sutton and Andrew G. Barto

Weitere (spezifische) Literatur zu einzelnen Themen wird in der Vorlesung angegeben.
6 COURSES

Course: Machine Learning 2 – Advanced Methods [T-WIWI-106341]

6.197 Course: Machine Learning 2 – Advanced Methods [T-WIWI-106341]

Responsible: Prof. Dr.-Ing. Johann Marius Zöllner
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101637 - Analytics and Statistics
M-WIWI-103356 - Machine Learning

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<td>Lecture / 🗣</td>
<td>Zöllner, Fechner, Polley</td>
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<td>Exercises for Machine Learning 2 - Advanced Methods</td>
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<td>Practice / 🗣</td>
<td>Zöllner, Fechner, Polley</td>
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Exams

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<td>Machine Learning 2 – Advanced Methods</td>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

Competence Certificate

Depending on further pandemic developments, the exam will be offered either as an open-book exam, or as a written exam (60 min).
The exam takes place every semester and can be repeated at every regular examination date.

Prerequisites
None.

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

Machine Learning 2 - Advanced methods
2511502, SS 2024, 2 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

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 modern advanced methods of machine learning such as semi-supervised, self-supervised and active learning, deep neural networks (deep learning, CNNs, GANs, diffusion models, transformer, adversarial attacks) and hierarchical approaches, e.g. reinforcement learning. 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 (vehicles, robotics, neurorobotics, image processing, etc.).

Learning objectives:

- Students understand extended concepts of machine learning and their possible applications.
- Students can classify, formally describe and evaluate methods of machine learning.
- In detail, methods of machine learning can be embedded and applied in complex decision and inference systems.
- Students can use their knowledge to select suitable models and methods of machine learning for existing problems in the field of machine intelligence.

Recommendations:

Attending the lecture Machine Learning 1 or a comparable lecture is very helpful in understanding this lecture.
Literatur
Die Foliensätze sind als PDF verfügbar

Weiterführende Literatur

- Deep Learning - Ian Goodfellow
- 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

Weitere (spezifische) Literatur zu einzelnen Themen wird in der Vorlesung angegeben.
6.198 Course: Machine Learning and Optimization in Energy Systems [T-WIWI-113073]

**Responsible:** Prof. Dr. Wolf Fichtner

**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>WT 23/24</td>
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<td>ST 2024</td>
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**Exams**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

The assessment of this course is a written examination (60 min) or an oral exam (30 min) depending on the number of participants.

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

**Machine Learning and Optimization in Energy Systems**

**Content**

**Goals:**

Participants should know about the most common optimization and machine learning approaches for the application in energy systems. They should understand the basic principles of the methods and should be able to apply them for solving important problems of future energy systems with high shares of renewable energy sources.

**Content:**

In the beginning, the essential transition of the energy system into a smart grid and the need for methods from the field of optimization and machine learning are explained. The course can be subdivided into an optimization part and a larger machine learning part. In the optimization part, the basics of optimization approaches that are used in energy systems are shown. Further, heuristic methods and approaches from the field of multiobjective optimization are introduced. In the machine learning part, the most important methods from the field of unsupervised learning, supervised learning and reinforcement learning are introduced and their application in future energy systems are investigated.

Amongst the considered applications are power plant dispatch, intelligent heating with heat pumps, charging strategies for electric vehicles, clustering of energy data for energy system models and electricity demand and renewable generation forecasting.

We also offer a voluntary computer exercise that deepens the understanding of the methods and applications covered in the lecture. The students will have the opportunity to solve problems from the energy domain by using optimization and machine learning approaches implemented in the programming language Python.

The course’s general focus is on the application of the methods in the energy field and not on the mathematical details of the different approaches.

The total workload for this course is approximately 105 hours:

- Attendance: 30 hours
- Self-study: 30 hours
- Exam preparation: 45 hours
6.199 Course: Machine Translation [T-INFO-101385]

**Responsible:** Prof. Dr. Jan Niehues

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100848 - Machine Translation

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<td>Each summer term</td>
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Course: Management Accounting 1 [T-WIWI-102800]

**Responsible:** Prof. Dr. Marcus Wouters

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

**Part of:** M-WIWI-101498 - Management Accounting

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### Events

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<td>Grade to a third</td>
<td>Each summer term</td>
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| ST 2024 | 2579900 | Management Accounting 1 | 2 SWS | Lecture / 🖥 | Wouters |
| ST 2024 | 2579901 | Tutorial Management Accounting 1 (Bachelor) | 2 SWS | Practice / 🗣 | Dickemann |
| ST 2024 | 2579902 | Tutorial Management Accounting 1 (Master) | 2 SWS | Practice / 🗣 | Dickemann |

| Exams | | |
|--------|---------|---------------|------------|---------|
| ST 2024 | 79-2579900-B | Management Accounting 1 (Bachelor) | Wouters |
| WT 23/24 | 79-2579900-M | Management Accounting 1 (Mastervorzug und Master) | Wouters |
| ST 2024 | 79-2579900-B | Management Accounting 1 (Bachelor) | Wouters |
| ST 2024 | 79-2579900-M | Management Accounting 1 (Mastervorzug und Master) | Wouters |

**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled

### Competence Certificate

The assessment consists of a written exam (120 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

### Recommendation

We recommend that you take part in our exercise for the lecture.

### Annotation

The exercise is offered separately for Bachelor's students as well as for students in the Master's transfer and Master's program.

Note for exam registration:

- Bachelor students: 79-2579900-B Management Accounting 1 (Bachelor)
- Students in the Master's transfer and Master's program: 79-2579900-M Management Accounting 1 (Master's transfer and Master)

Below you will find excerpts from events related to this course:
Content
The course covers topics in management accounting in a decision-making framework. Some of these topics in the course MA1 are: short-term planning, investment decisions, budgeting and activity-based costing.

We will use international material written in English.

We will approach these topics primarily from the perspective of the users of financial information (not so much from the controller who prepares the information).

The course builds on an introductory level of understanding of accounting concepts from Business Administration courses in the core program. The course is intended for students in Industrial Engineering.

Learning objectives:

- Students have an understanding of theory and applications of management accounting topics.
- They can use financial information for various purposes in organizations.

Examination:

- The assessment consists of a written exam (120 minutes) at the end of each semester (following § 4 (2) No. 1 of the examination regulation).

Workload:

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

Literature

- In addition, several papers that will be available on ILIAS.
6.201 Course: Management Accounting 2 [T-WIWI-102801]

**Responsible:** Prof. Dr. Marcus Wouters  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101498 - Management Accounting

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<td>2 SWS</td>
<td>Lecture / 🖥</td>
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<tr>
<td>WT 23/24 2579904</td>
<td>2 SWS</td>
<td>Practice / 🔗</td>
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<tr>
<td>WT 23/24 2579905</td>
<td>2 SWS</td>
<td>Practice / 🔗</td>
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<td>Management Accounting 2 (Bachelor)</td>
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<td>WT 23/24 79-2579903-M</td>
<td>2 SWS</td>
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**Competence Certificate**
The assessment consists of a written exam (120 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

**Prerequisites**
None

**Recommendation**
It is recommended:
- to take part in the course "Management Accounting1" before this course
- participation in the exercise for the lecture "Management Accounting 2"

**Annotation**
The exercise for the lecture is offered separately for Bachelor's students as well as for students in the Master's transfer and Master's program.

Note for exam registration: Bachelor students:
- 79-2579903-B Management Accounting 2 (Bachelor)
- Students in the Master's transfer and Master's program: 79-2579903-M Management Accounting 2 (Master's transfer and Master)

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

**Management Accounting 2**
2579903, WS 23/24, 2 SWS, Language: English, [Open in study portal](#)
Content
The course covers topics in management accounting in a decision-making framework. Some of these topics in the course MA2 are: cost estimation, product costing and cost allocation, financial performance measures, transfer pricing, strategic performance measurement systems.

We will use international material written in English.

We will approach these topics primarily from the perspective of the users of financial information (not so much from the controller who prepares the information).

The course builds on an introductory level of understanding of accounting concepts from Business Administration courses in the core program. The course is intended for students in Industrial Engineering.

Learning objectives:
• Students have an understanding of theory and applications of management accounting topics. They can use financial information for various purposes in organizations.

Recommendations:
• It is recommended to take part in the course “Management Accounting 1” before this course.

Examination:
• The assessment consists of a written exam (120 min) at the end of each semester (following § 4 (2) No. 1 of the examination regulation).

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

Literature
• Zusätzlich werden Artikel auf ILIAS zur Vergügung gestellt.

**Responsible:** Dr. Roland Schätzle
**Organisation:** KIT Department of Economics and Management
**Part of:** M-WIWI-101477 - Development of Business Information Systems

<table>
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**Events**

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<th>Title</th>
<th>Type</th>
<th>Credits</th>
<th>Lecturer</th>
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<tr>
<td>ST 24</td>
<td>2511214</td>
<td>Management of IT-Projects</td>
<td>Lecture / 🗣</td>
<td>2 SWS</td>
<td>Schätzle</td>
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<tr>
<td>ST 24</td>
<td>2511215</td>
<td>Übungen zu Management von IT-Projekten</td>
<td>Practice / 🗣</td>
<td>1 SWS</td>
<td>Schätzle</td>
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**Exams**

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<tr>
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<td>79AIFB_MvIP_C3</td>
<td>Management of IT-Projects</td>
<td>Lecture (V)</td>
<td>Oberweis</td>
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<tr>
<td>ST 24</td>
<td>79AIFB_MvIP_A1</td>
<td>Management of IT-Projects (Registration until 15 July 2024)</td>
<td>Lecture (V)</td>
<td>Oberweis</td>
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</table>

**Competence Certificate**
The assessment takes place in the form of a written examination (exam) in the amount of 60 minutes. The examination is offered every semester and can be repeated at any regular examination date.

**Prerequisites**
Prerequisite for the participation in the examination is the successful participation in the exercise, which takes place in the summer semester, starting from summer semester 2020. The number of participants in the exercise is limited.

*Below you will find excerpts from events related to this course:*
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 infrastructure
- project controlling
- risk management
- feasibility studies
- decision processes, conduct of negotiations, time management.

Learning objectives:
Students

- explain the terminology of IT project management and typical used methods for planning, handling and controlling,
- apply methods appropriate to current project phases and project contexts,
- consider organisational and social impact factors.

Recommendations:
Knowledge from the lecture Software Engineering is helpful.

Workload:

- Lecture 30h
- Exercise 15h
- Preparation of lecture 24h
- Preparation of exercises 25h
- Exam preparation 40h
- Exam 1h

Literature

- B. Hindel, K. Hörmann, M. Müller, J. Schmied. Basiswissen Software-Projektmanagement. dpunkt.verlag 2004

Übungen zu Management von IT-Projekten
2511215, SS 2024, 1 SWS, Language: German, Open in study portal

Practice (Ü)
On-Site

Content
The general conditions, influencing factors and methods in the planning, execution and control of IT projects are dealt with. In particular, the following topics will be dealt with: Project environment, project organization, project structure plan, effort estimation, project infrastructure, project control, decision-making processes, negotiation, time management. The lecture is accompanied by exercises in the form of tutorials. The date of the exercise will be announced later.
6.203 Course: Managing New Technologies [T-WIWI-102612]

Responsible: Dr. Thomas Reiß
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101488 - Entrepreneurship (EnTechnon)

<table>
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Events

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<th>Lecture / On-Site</th>
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<td>ST 2024</td>
<td>2545003</td>
<td>Managing New Technologies</td>
<td>Reiß</td>
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Exams

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<td>WT 23/24</td>
<td>7900189</td>
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<td>Reiß</td>
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</table>

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🔴 On-Site, ✗ Cancelled

Competence Certificate
Success is assessed in the form of a written examination (60 minutes).

Prerequisites
None

Recommendation
None

Annotation
The course is expected to be offered for the last time in the summer semester 2024.

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

Managing New Technologies
2545003, SS 2024, 2 SWS, Language: German, Open in study portal

Content
This lecture provides an overview of new technologies in the research areas of biotechnology, nanotechnology and neuroscience as well as basic concepts of technology management. Students should be able to present problems of technology assessment and early recognition of new technologies in a structured way and apply formal approaches to technology management issues in an appropriate manner.

Organizational issues
Bitte melden Sie sich für die Prüfung Nr. 7900169 an, das ist die Prüfungs-Nr. für die schriftliche Prüfung.
(Die Prüfungs-Nr. 7900235 ist eine mündliche Prüfung, zu der sich Studierende nur nach Aufforderung durch das EnTechnon Sekretariat anmelden sollen, wenn Studierende eine mündliche Prüfung haben.)

Literature
- Hausschild/Salomo: Innovationsmanagement;
- Borchert et al.: Innovations- und Technologiemanagement;
- Specht/Möhrle: Gabler Lexikon Technologiemanagement

Die relevanten Auszüge und zusätzlichen Quellen werden in der Veranstaltung bekannt gegeben.
6.204 Course: Market Research [T-WIWI-107720]

**Responsible:** Prof. Dr. Martin Klarmann  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
- M-WIWI-101510 - Cross-Functional Management Accounting  
- M-WIWI-101647 - Data Science: Evidence-based Marketing  
- M-WIWI-105312 - Marketing and Sales Management  
- M-WIWI-106258 - Digital Marketing

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**Events**

| ST 2024 | 2571150 | Market Research | 2 SWS | Lecture / 🗣 | Klarmann |
| ST 2024 | 2571151 | Market Research Tutorial | 1 SWS | Practice / 🗣 | Klarmann |

**Exams**

| WT 23/24 | 7900053 | Market Research | Klarmann |
| ST 2024  | 7900015 | Market Research | Klarmann |

Legend: 🖥 Online, ☐ Blended (On-Site/Online), 🗣 On-Site, ✗ Canceled

**Competence Certificate**

The assessment of success takes place through a written exam (70 minutes) with additional aids in the sense of an open book exam. Further details will be announced during the lecture.

**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**

2571150, SS 2024, 2 SWS, Language: English, Open in study portal  

Lecture (V)  
On-Site
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

The aim of this lecture is to give an overview of essential statistical methods. In the lecture students learn the practical use as well as the correct handling of different statistical survey methods and analysis procedures. In addition, emphasis is put on the interpretation of the results after the application of an empirical survey. The derivation of strategic options is an important competence that is required in many companies in order to react optimally to customer needs.

The assessment is carried out (according to §4(2), 3 SPO) in the form of a written open book exam.

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

Please note that this course has to be completed successfully by students interested in master thesis positions at the chair of marketing.

Literature
6.205 Course: Marketing Analytics [T-WIWI-103139]

**Responsible:** Prof. Dr. Martin Klarmann  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101647 - Data Science: Evidence-based Marketing

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<td>Marketing Analytics</td>
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<td>Klarmann</td>
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</table>

**Competence Certificate**
Alternative (according to §4(2), 3 of the examination regulation) exam assessment (working on tasks in groups during the lecture).

**Prerequisites**
The prerequisite for taking the course is the successful completion of the course "Market Research".

**Recommendation**
It is strongly recommended to complete the course "Market Research" prior to taking the "Marketing Analytics" course.

**Annotation**
"Marketing Analytics" is offered as a block course with an alternative exam assessment.
Starting in the winter semester 22/23, the course will be scheduled to be completed after two thirds of the semester. For further information, please contact the Marketing and Sales Research Group (marketing.iism.kit.edu). Exchange students can bypass the requirement of passing Market Research if they can prove that they possess sufficient statistical knowledge based on courses attended at their home institution. This will be examined individually by the Marketing and Sales Research Group.

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

### Marketing Analytics
2572170, WS 23/24, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V) On-Site**

**Content**
In this course various relevant market research questions are addressed, as for example measuring and understanding customer attitudes, preparing strategic decisions and sales forecasting. In order to analyze these questions, students learn to handle social media data, panel data, nested observations and experimental design. To analyze the data, advanced methods, as for example multilevel modeling and return on marketing models are taught. Also, problems of causality are addressed in-depth. The lecture is accompanied by a computer-based exercise, in the course of which the methods are applied practically.

Students
- receive based on the course market research an overview of advanced empirical methods
- learn in the course of the lecture to handle advanced data collection and data analysis methods
- are based on the acquired knowledge able to interpret results and derive strategic implications

Total workload for 4.5 ECTS: ca. 135 hours.
In order to attend Marketing Analytics, students are required to have passed the course Market Research.

Exchange students can bypass the requirement of passing Market Research if they can prove that they possess sufficient statistical knowledge based on courses attended at their home institution. This will be examined individually by the Marketing & Sales Research Group.

For further information please contact the Marketing and Sales Research Group (marketing.iism.kit.edu).
Literature

- Cameron, A. Colin, Trivedi, Pravin K. (2005), Microeconometrics: methods and applications, New York.
- Chapman, Christopher, Feit, Elea M. (2015), R for Marketing Research and Analytics, Cham.

Content

Tasks parallel to the lecture to work on in a group of students.

Organizational issues

Blockveranstaltung: genaue Uhrzeiten und Raum werden noch bekannt gegeben
6.206 Course: Marketing Strategy Business Game [T-WIWI-102835]

**Responsible:** Prof. Dr. Martin Klarmann

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

**Part of:** M-WIWI-101510 - Cross-Functional Management Accounting

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<td>Grade to a third</td>
<td>Irregular</td>
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**Competence Certificate**
The assessment (alternative exam assessment) consists of a group presentation and a subsequent round of questions totalling 20 minutes.

**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.
### 6.207 Course: Master's Thesis [T-WIWI-103142]

| Responsible:                  | Studiendekan der KIT-Fakultät für Informatik  
|                              | Studiendekan des KIT-Studienganges  
| Organisation:                | KIT Department of Economics and Management  
| Part of:                     | M-WIWI-104833 - Module Master's Thesis  

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<td>Grade to a third</td>
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</table>

**Competence Certificate**  
see module description

**Prerequisites**  
see module description

**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
### 6.208 Course: Matching Theory [T-WIWI-113264]

**Responsible:** Prof. Dr. Clemens Puppe  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101500 - Microeconomic Theory

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#### Events

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<td>Matching Theory</td>
<td>3 SWS</td>
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#### Exams

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<td>Matching Theory</td>
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<td>Puppe</td>
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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🔴 On-Site, ✗ Canceled

#### Competence Certificate

Written examination (90 minutes)

---

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

#### Matching Theory

2500042, WS 23/24, 3 SWS, Language: English, [Open in study portal](#)

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#### Content

How should we organize recruitment of students to schools? Could we improve the placement of doctors to hospitals? Why there always seems to be a better roommate to the one you currently have? Matching Theory answers all these questions and more. During the course we will formally study mathematical systems of allocating goods and people, and see their many real life applications from organizing kidney exchange to improving dating apps. The course will cover three main topics in Matching Theory and Market Design: (1) assignment problems (e.g., allocation of social housing), (2) two-sided matching (e.g., allocation of children to schools), (3) transferable-utility matching (e.g., labor market).

The students are expected to:

1. Understand the mathematical properties of allocations and commonly used mechanism
2. Understand the connection between Matching Theory and real-life allocation systems
3. Be able to use their knowledge to propose solutions for novel real-life problems
### Course: Mathematics for High Dimensional Statistics [T-WIWI-111247]

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<tr>
<th>Responsible:</th>
<th>Prof. Dr. Oliver Grothe</th>
</tr>
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<td>KIT Department of Economics and Management</td>
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| Part of:            | M-WIWI-101473 - Mathematical Programming  
                       | M-WIWI-101637 - Analytics and Statistics  
                       | M-WIWI-103289 - Stochastic Optimization |

**Type**  
Oral examination

**Credits**  
4.5

**Grading scale**  
Grade to a third

**Recurrence**  
Irregular

**Version**  
1

**Competence Certificate**  
The assessment consists of an oral exam (approx. 30 min.) taking place in the recess period.

**Prerequisites**  
None

**Recommendation**  
Basic knowledge of mathematics and statistics is assumed. Knowledge in multivariate statistics is an advantage, but not necessary for the course.
6.210 Course: Media Management [T-WIWI-112711]

Responsible: Prof. Dr. Ann-Kristin Kupfer
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-106258 - Digital Marketing

<table>
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<td>Each winter term</td>
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<td>WT 23/24 2572193</td>
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Exams

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<td>WT 23/24 7900149</td>
<td>1 SWS</td>
<td>Grade to a third</td>
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Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Competence Certificate
The control of success is done by the elaboration and presentation of a group task as well as a written exam. Further details on the design of the performance review will be announced during the lecture.

Prerequisites
None

Recommendation
Students are highly encouraged to actively participate in class.

Annotation
The course will take place in the winter term 23/24 for the first time.

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

Media Management
2572192, WS 23/24, 2 SWS, Language: English, Open in study portal

Content
Students learn the theoretical foundations of media management and its most important concepts. They learn both about the key characteristics of both media products and media markets. They further get to know essential business models of media markets. Special emphasis will be given to understanding media consumers and the marketing mix of media products. A tutorial offers the opportunity to apply the key learnings of the lecture.

The learning objectives are as follows:

- Getting to know the theoretical foundations of media management
- Evaluating strategies for media products and services as media-specific marketing mix instruments
- Fostering critical and analytical thinking skills and the application of knowledge to marketing problems
- Improvement of skills and competences in the area of project management within the framework of group work
- Improvement of foreign language skills (business English)

Total time required for 4.5 credit points: approx. 135 hours
Attendance time: 30 hours
Self-study: 105 hours

Organizational issues
Appointments to be announced.
6.211 Course: Meshes and Point Clouds [T-INFO-101349]

**Responsible:** Prof. Dr. Hartmut Prautzsch  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100812 - Meshes and Point Clouds

<table>
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<td>Each term</td>
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**Exams**  
WT 23/24 7500242 Meshes and Point Clouds

**Competence Certificate**  
The assessment is carried out as an oral examination (§ 4 Abs. 2 Nr. 2 SPO) lasting 20 minutes.

**Prerequisites**  
None.
6.212 Course: Methods in Economic Dynamics [T-WIWI-102906]

Responsible: Prof. Dr. Ingrid Ott
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101514 - Innovation Economics

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<td>1 SWS</td>
<td>Lecture / On-Site</td>
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Competence Certificate
Alternative exam assessment.

Prerequisites
None

Recommendation
Basic knowledge of micro- and macroeconomics is assumed, as taught in the courses Economics I [2600012] and Economics II [2600014]. Further, it is assumed that students have interest in using quantitative-mathematical methods.

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

Content
The economic exploitation of inventions is an important part of innovation economics. Intellectual property rights such as patents or trademarks play a central role. Within this workshop, the recording, processing and analysis of such intellectual property rights will be deepened, e.g. considering specific technologies. Students will learn how to work with relational databases, the econometric evaluation of recorded data, and methods for visualising them.

Learning objectives:
The student
- learns to query data sources.
- is able to analyse data with statistical methods.
- visualises and interprets data evaluations (e.g. using dashboards or methods of network analysis).

Recommendations:
An interest in working with data, basic knowledge on databases as well as basic knowledge in economics and statistics are advantageous.

Workload:
The total workload for this course is approximately 45 hours.
- Classes: ca. 5 h
- Self-study: ca. 40 h

Assessment:
Non exam assessment according to § 4 paragraph 3 of the examination regulation (SPO 2015).
Organizational issues
The course is structured along two assignments, the first of which is an individual assignment, whereas the second assignment is a group project. Assignment 1 will be completed within one month's time, whereas assignment 2 will take place on a different date. **Assignment 1** will take place on 24.04.2024 in Building 01.87, B5.25. **Assignment 2** will take place on 10.07.2024 in Building 01.87, B5.25. The exact time will be announced later.

Students are offered the opportunity to participate in this course jointly with the course "Seminar in Economic Policy", within the module “Economics of Innovation”. The work in both courses will be strongly related to each other, as students will work on the same topic from two different perspectives. Students in the course "Seminar in Economic Policy" will be provided with the opportunity to write a paper that addresses the results found by the students in the course "Methods in Economic Dynamics". Taking both courses together will enable the students to earn 4.5 ECTS.

Literature
Relevante Literatur wird in der Vorlesung bekanntgegeben.
(Relevant literature will be announced in the lecture.)
6.213 Course: Methods in Innovation Management [T-WIWI-110263]

**Responsible:** Dr. Daniel Jeffrey Koch

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

**Part of:**
- M-WIWI-101507 - Innovation Management
- M-WIWI-101507 - Innovation Management

<table>
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**Competence Certificate**
Alternative exam assessments (§4(2), 3 SPO). The final grade is composed 75% of the grade of the written paper and 25% of the grade of the presentation.

**Prerequisites**
None.

**Recommendation**
Prior attendance of the course "Innovation Management: Concepts, Strategies and Methods" is recommended.
**Course: Microeconometrics [T-WIWI-112153]**

**Responsible:** Prof. Dr. Fabian Krüger  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-105414 - Statistics and Econometrics II

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**Events**

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<td>2 SWS</td>
<td>Practice / 📰</td>
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<td>ST 2024</td>
<td>2500032</td>
<td>Microeconometrics</td>
<td>Lecture / 📰</td>
<td>2 SWS</td>
<td>Lecture / 📰</td>
<td>Krüger, Eberl</td>
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</table>

**Competence Certificate**  
The assessment consists of a written examination (60 minutes). A bonus can be acquired by successful completion of an assignment (written report + short in-class presentation) during the semester. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by one grade level (0.3 or 0.4).

**Prerequisites**  
None

**Recommendation**  
Students are expected to have a good working knowledge of the linear regression model (e.g. by having attended the course 'Volkswirtschaftslehre III: Einführung in die Ökonometrie', or attending it in the same semester as 'Microeconometrics').

**Annotation**  
The course will be offered in the summer semester 2024.

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

**Microeconometrics**  
2500032, SS 2024, 2 SWS, Language: English, Open in study portal

**Content**  
Microeconometrics is concerned with modeling data from an individual ('micro') unit like a person, household or firm. The response variables of interest are often discrete. For example, a person's type of employment may be coded as a binary variable (e.g. working in IT sector versus not working in IT sector), and a person's choice of transportation mode can be cast as a multinomial variable (e.g. bike, train, car, or other). These examples differ from the basic econometric setting of a continuous response variable, and require nonlinear regression modeling.

The course first introduces maximum likelihood estimation which is particularly useful in microeconometrics. We then discuss econometric models for various types of response variables (binary, ordered, multinomial, censored), as well as methods for estimation and model evaluation. Throughout the course, implementation via R software plays an important role.

**Prerequisites:** Course participants are expected to have a good working knowledge of the linear regression model (e.g. by having attended the course 'Volkswirtschaftslehre III: Einführung in die Ökonometrie', or attending it in the same semester as 'Microeconometrics').

**Literature**  
6.215 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

**Type**  
Written examination  
**Credits**  
4.5  
**Grading scale**  
Grade to a third  
**Recurrence**  
Irregular  
**Version**  
1

### Events

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<th>Recurrence</th>
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**Exams**

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<td>Exercises Mixed Integer Programming I</td>
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<td>Mixed-integer Programming II</td>
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<td>Stein</td>
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</table>

**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 23/24, 2 SWS, Language: German, Open in study portal
Content
Many optimization problems from economics, engineering and natural sciences are modeled with continuous as well as with discrete variables. Examples are the energy minimal design of a chemical process in which several reactors may be switched on or off, portfolio optimization with limitations on the number of securities. For the algorithmic identification of optimal points of such problems an interaction of ideas from discrete as well as continuous optimization is necessary.

The lecture focusses on mixed-integer linear optimization problems and is structured as follows:

- Introduction, solvability, and basic concepts
- LP relaxation and error bounds for roundings
- Branch-and-bound method
- Gomory's cutting plane method
- Benders decomposition

The lecture is accompanied by exercises which, amongst others, offers the opportunity to implement and to test some of the methods on practically relevant examples.

Remark:
The treatment of mixed-integer nonlinear optimization problems forms the contents of the lecture "Mixed-integer Programming II".

Learning objectives:
The student

- knows and understands the fundamentals of linear mixed integer programming,
- is able to choose, design and apply modern techniques of linear mixed integer programming in practice.

Literature

- J. Kalirath: Gemischt-ganzzahlige Optimierung, Vieweg, 2002
- D. Li, X. Sun: Nonlinear Integer Programming, Springer, 2006

Content
Many optimization problems from economics, engineering and natural sciences are modeled with continuous as well as with discrete variables. Examples are the energy minimal design of a chemical process in which several reactors may be switched on or off, portfolio optimization with limitations on the number of securities, the choice of locations to serve customers at minimum cost, and the optimal design of vote allocations in election procedures. For the algorithmic identification of optimal points of such problems an interaction of ideas from discrete as well as continuous optimization is necessary.

The lecture focusses on mixed-integer nonlinear optimization problems and is structured as follows:

- Continuous relaxation and error bounds for roundings
- Branch-and-Bound for convex and nonconvex problems
- Generalized Benders decomposition
- Outer approximation methods
- Lagrange relaxation
- Dantzig-Wolfe decomposition
- Heuristics

The lecture is accompanied by exercises which, amongst others, offers the opportunity to implement and to test some of the methods on practically relevant examples.

Remark:
The treatment of mixed-integer linear optimization problems forms the contents of the lecture "Mixed-integer Programming I".

Learning objectives:
The student

- knows and understands the fundamentals of nonlinear mixed integer programming,
- is able to choose, design and apply modern techniques of nonlinear mixed integer programming in practice.
Literature

- J. Kallrath: Gemischt-ganzzahlige Optimierung, Vieweg, 2002
- D. Li, X. Sun: Nonlinear Integer Programming, Springer, 2006
6.216 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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**Events**

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**Exams**

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<tr>
<td>ST 2024</td>
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<td></td>
<td>Stein</td>
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</tbody>
</table>

**Legend:**
- 🏬 Online
- 🧩 Blended (On-Site/Online)
- 🗣 On-Site
- ✗ Cancelled

**Competence Certificate**
The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation. The successful completion of the exercises is required for admission to the written exam. 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 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).

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

**Mixed-integer Programming II**
2550140, SS 2024, 2 SWS, Language: German, [Open in study portal](#)
Content
Many optimization problems from economics, engineering and natural sciences are modeled with continuous as well as with discrete variables. Examples are the energy minimal design of a chemical process in which several reactors may be switched on or off, portfolio optimization with limitations on the number of securities, the choice of locations to serve customers at minimum cost, and the optimal design of vote allocations in election procedures. For the algorithmic identification of optimal points of such problems an interaction of ideas from discrete as well as continuous optimization is necessary.

The lecture focusses on mixed-integer nonlinear optimization problems and is structured as follows:

- Continuous relaxation and error bounds for roundings
- Branch-and-Bound for convex and nonconvex problems
- Generalized Benders decomposition
- Outer approximation methods
- Lagrange relaxation
- Dantzig-Wolfe decomposition
- Heuristics

The lecture is accompanied by exercises which, amongst others, offers the opportunity to implement and to test some of the methods on practically relevant examples.

Remark:
The treatment of mixed-integer linear optimization problems forms the contents of the lecture "Mixed-integer Programming I".

Learning objectives:
The student

- knows and understands the fundamentals of nonlinear mixed integer programming,
- is able to choose, design and apply modern techniques of nonlinear mixed integer programming in practice.

Literature

- J. Kallrath: Gemischt-ganzzahlige Optimierung, Vieweg, 2002
- D. Li, X. Sun: Nonlinear Integer Programming, Springer, 2006
### 6.217 Course: Mobile Communication [T-INFO-101322]

**Responsible:** Prof. Dr. Oliver Waldhorst  
Prof. Dr. Martina Zitterbart  

**Organisation:** KIT Department of Informatics  

**Part of:** M-INFO-100785 - Mobile Communication

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- **Events**
  - WT 23/24: 24643 Mobile Communications 2 SWS Lecture Waldhorst, Mahrt
  
- **Exams**
  - WT 23/24: 7500015 Mobile Communication Waldhorst, Zitterbart
  - ST 2024: 7500073 Mobile Communication Waldhorst, Zitterbart
6.218 Course: Model Driven Software Development [T-INFO-101278]

**Responsible:** Prof. Dr. Ralf Reussner  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100741 - Model-Driven Software Development

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<td>Grade to a third</td>
<td>Each winter term</td>
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**Events**

| WT 23/24  | 24657 | Model-Driven Software Engineering | 2 SWS | Lecture / 🗣 | Burger |

**Exams**

| WT 23/24  | 7500086 | Model Driven Software Development | Burger |
| ST 2024   | 7500016 | Model Driven Software Development | Burger, Reussner |

Legend: 🖥 Online, 🛠 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
6.219 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-102808 - Digital Service Systems in Industry
- M-WIWI-102832 - Operations Research in Supply Chain Management

**Type**
- Written examination

**Credits**
- 4.5

**Grading scale**
- Grade to a third

**Recurrence**
- Each winter term

**Version**
- 4

**Events**

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<td>WT 23/24</td>
<td>2550490</td>
<td>Modellieren und OR-Software: Fortgeschrittene Themen</td>
<td>Practical course</td>
<td>3 SWS</td>
<td>Pomes, Linner, Nickel</td>
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**Exams**

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<td>Modeling and OR-Software: Advanced Topics</td>
<td>Nickel</td>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**
The assessment is a written examination. The examination is held in every semester. The prerequisite can only be obtained in semesters in which the course exercises are offered.

**Prerequisites**
Prerequisite for admission to the exam is the successful participation in the exercises. This includes the processing and presentation of exercises.

**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 23/24, 3 SWS, Language: German, Open in study portal

**Content**
The advanced course is designated for Master students that already attended the introductory course or gained equivalent experience elsewhere, e.g. during a seminar or bachelor thesis. We will work on advanced topics and methods in OR, among others cutting planes, column generation and constraint programming. The Software used for the exercises is IBM ILOG CPLEX Optimization Studio. The associated modelling programing languages are OPL and ILOG Script.

**Organizational issues**
Link zur Bewerbung:
http://go.wiwi.kit.edu/OR_Bewerbung

Bewerberzeitraum:
01.09.2023 00:00 - 12.10.2023 23:55
6 COURSES

6.220 Course: Modeling and Simulation [T-WIWI-112685]

**Responsible:** Prof. Dr. Sanja Lazarova-Molnar

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

**Part of:** M-WIWI-101456 - Intelligent Systems and Services

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<td>79AIFB_MaS_C6</td>
<td>Modeling and Simulation (Registration until 15 July 2024)</td>
<td>Lazarova-Molnar</td>
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**Competence Certificate**
Depending on the number of participants in the course, the exam will be offered either as an oral exam (20 min), or as a written exam (60 min).

The exam takes place every semester and can be repeated at every regular examination date.

**Prerequisites**
None

**Recommendation**
Some experience in programming and knowledge of basic mathematics and statistics.

**Annotation**
Instruction is in the form of lectures and exercises. A detailed course schedule will be published before the start of the semester.

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

**Modeling and Simulation**
2511100, SS 2024, 2 SWS, Language: English, Open in study portal
Content
Modeling and Simulation is the most widely used operations research / systems engineering technique for designing new systems and optimizing the performance of existing systems. In one way or another, just about every engineering or scientific field uses simulation as an exploration, modeling, or analysis technique. The course is designed to provide students with basic knowledge of modeling and simulation approaches and to provide them with first experience of using a simulation package. The course will focus on modeling and simulation of real-world discrete event systems. Examples of discrete events are customer arrivals at a queue of a service desk, machine failures in manufacturing systems, telephone calls in a call center, etc. Moreover, continuous and hybrid models will be also discussed. Topics include Discrete-Event Simulation, Input Modeling, Output Analysis, Random Number Generation, Verification and Validation, Stochastic Petri Nets and Markov Chains.

Competence Certificate
Depending on the number of participants in the course, the exam will be offered either as an oral exam (20 min), or as a written exam (60 min).

The exam takes place every semester and can be repeated at every regular examination date.

Learning Objectives
Knowledge:
- Demonstrate knowledge about general and specific theories, challenges, algorithms, methods, technologies, and tools related to modelling and simulation
- Demonstrate knowledge of two important classes of simulation:
  - Discrete-event Monte-Carlo simulation,
  - Continuous simulation with ODEs
- Demonstrate knowledge of algorithms necessary to build a simulator

Skills:
- Analyse suitability of an approach/tool for a given modelling problem
- Understand simulation models of various types
- Demonstrate methods and techniques to overcome common challenges in modelling and simulation
- Model simulation input data
- Analyse and model discrete stochastic systems
- Analyse and interpret simulation results

Competences:
- Use different methods to conduct simulation-based analysis of real-world data
- Build and simulate stochastic models
- Use simulation software

Prerequisites
Some experience in programming and knowledge of basic mathematics and statistics

Form of instruction
Lectures and exercises. A detailed course plan will be published before the semester start.

Literature
Discrete-Event System Simulation, 5th Edition
Jerry Banks, John S. Carson, II, Barry L. Nelson and David M. Nicol
Course: Modeling the Dynamics of Financial Markets [T-WIWI-113414]

**Responsible:** Prof. Dr. Maxim Ulrich  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-106660 - Modeling the Dynamics of Financial Markets

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<td>Each summer term</td>
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Events

| ST 2024 | 2600004 | Essentials for Dynamic Financial Machine Learning | Lecture / Practice (V/Ø) | Ulrich |
| ST 2024 | 2600257 | Dynamic Capital Market Theory                        | Lecture / Practice (V/Ø) | Ulrich |

Legend: 🍀 Online, 🕺 Blended (On-Site/Online), 🎤 On-Site, ✗ CANCELLED

**Competence Certificate**

The examination takes the form of a one-hour written comprehensive examination on the two courses “Dynamic Capital Market Theory” and “Essentials for Dynamic Financial Machine Learning”.

**Recommendation**


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

**Essentials for Dynamic Financial Machine Learning**  
2600004, SS 2024, SWS, Language: English, [Open in study portal](#)  
Lecture / Practice (VÜ)  
Blended (On-Site/Online)

**Content**

This course teaches students to work with financial data. Students learn algorithms that are used to learn key quantities of dynamic capital markets, such as time-varying risk premia, volatility and unobserved state variables. The course covers the following concepts:

* Multivariate time series modeling  
* Dynamic volatility modeling  
* Handling big financial data  
* Estimating risk premia  
* Kalman Filtering

Lectures develop all material on the whiteboard. Tutoriums solve and discuss python solutions to selected problems.

**Dynamic Capital Market Theory**  
2600257, SS 2024, SWS, [Open in study portal](#)  
Lecture / Practice (VÜ)  
Blended (On-Site/Online)

**Content**

This course offers an introduction to the dynamics of capital markets. Portfolios and asset prices move dynamically across time. This course teaches state-of-the-art models to help understand why this is the case. Describing and managing dynamic systems in engineering is done via dynamic programming and optimal control. This course develops the theory of dynamic programming in continuous time and applies it to solve portfolio choice and corporate investment decisions. These concepts are key for financial engineering and model-based reinforcement learning.

Students obtain proficiency in the following topics:

* Dynamic Asset Pricing and Portfolio Choice Theory  
* Dynamic modeling in discrete and continuous time  
* Stochastic Calculus  
* Theory of Dynamic Programming  
* Pricing of bond, equity, futures and option markets

Lectures develop all concepts on the whiteboard, while exercises are solved during weekly tutorials.
**6.222 Course: Multicriteria Optimization [T-WIWI-111587]**

**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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**Compatibility Certificate**  
The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation. The successful completion of the exercises is required for admission to the written exam. The examination is held in the semester of the lecture and in the following semester.

**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 course is offered every second winter semester (starting WiSe 22/23). The curriculum of the next three years is available online (www.ior.kit.edu).

**Contents:**  
Multicriteria optimization deals with optimization problems with multiple objective functions. In practice, the minimization or maximization of several objectives often conflict with each other, such as weight and stability of mechanical components, return and risk of stock portfolios, or cost and duration of transports. Various scalarization approaches allow one to formulate single-objective problems that can be solved using nonlinear or global optimization techniques, and whose optimal points have a reasonable interpretation for the underlying multicriteria problem.

However, some seemingly obvious scalarization approaches suffer from various drawbacks, so that regardless of scalarization approaches, it is necessary to clarify what is meant by the solution of a multicriteria optimization problem in the first place. For such Pareto-optimal points, optimality conditions and solution procedures based on them can be formulated. From the usually non-unique Pareto set, decision makers finally choose an alternative based on their subjective preferences.

The lecture gives a mathematically sound introduction to multicriteria optimization and is structured as follows:  
- Introductory examples and terminology  
- Solution concepts  
- Methods for the determination of the Pareto set  
- Selection of Pareto-optimal points under subjective preferences
6.223 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**
Witten examination lasting 60 minutes.

The examination is offered during the examination period of the lecture semester. Only repeaters (and not first-time writers) are admitted to the repeat examination in the examination period of the following semester.

**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.

**Annotation**
The course is offered irregularly. Detailed information can be found on the chair’s website.
**6.224 Course: Natural Language Processing [T-INFO-112177]**

**Responsible:** Prof. Dr. Jan Niehues  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-105999 - Natural Language Processing

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**Exams**

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

**Natural Language Processing**  
2400147, WS 23/24, 4 SWS, Language: English, [Open in study portal](#)  
Lecture (V)  
On-Site

### Content

Summarize today's lecture? When were neural networks invented? An artificial intelligence that can answer these questions is a long dream of mankind. With the help of machine learning and in particular large language models (LLMs), we are seeing the first programs today that can solve these problems. This lecture provides the skills and knowledge to develop solutions to these natural language processing problems using state-of-the-art methods.

After an introduction to the challenges of natural language processing, the different tasks in natural language processing are discussed. A focus of the course is on methods from the field of deep learning and the new possibilities through large language models (ChatGPT). First, sequence classification tasks such as sentiment analysis are dealt with. Then methods of sequence labeling are discussed, such as those used to recognize proper names or determine part-of-speech tags. Afterwards the lecture will discuss sequence-to-sequence methods. These models are used in many natural language processing tasks, such as machine translation, automatic summarization, and automatic question answering.

In this course, the important challenges in the development of systems are covered: the representation of words, neural architectures to model language, methods to train complex models and finding the most likely output.
### 6.225 Course: Natural Language Processing and Software Engineering [T-INFO-101272]

**Responsible:** Prof. Dr.-Ing. Anne Koziolek  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100735 - Natural Language Processing and Software Engineering

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[Legend: 🖥 Online, 🧱 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled]

**Responsible:** Prof. Dr. Martina Zitterbart  
**Organisation:** KIT Department of Informatics  
**Part of:**  
- M-WIWI-104812 - Information Systems: Engineering and Transformation

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**Events**

| ST 2024 | 24601 | Netzsicherheit: Architekturen und Protokolle | 2 SWS | Lecture / 🗣 | Baumgart, Bless, Zitterbart |

**Exams**

| ST 2024 | 7500072 | Network Security: Architectures and Protocols | Zitterbart, Bless, Baumgart |

*Legend: 🖥 Online, 📦 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled*
6.227 Course: Next Generation Internet [T-INFO-101321]

**Responsible:** Dr.-Ing. Roland Bless  
Prof. Dr. Martina Zitterbart

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100784 - Next Generation Internet

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Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

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

### Content

The lecture focuses on current developments in Internet-based network technologies. First, architectural principles of today’s Internet are presented and discussed, subsequently nowadays and future challenges are motivated. Methods for quality-of-service support and transport of multi-media stream as well as newer transport protocols and group communication support are presented. Deployment of the presented technologies in IP-based networks are discussed. The lecture presents advanced approaches such as programmable networks and network virtualization as well as newer approaches and protocols for routing, satellite networking, and peer-to-peer networks.

### Literature


### Weiterführende Literatur

wird in der Vorlesung bekanntgegeben.
Course: Non- and Semiparametrics [T-WIWI-103126]

**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 "Applied Econometrics" [2520020]

**Annotation**

The course takes place every second winter semester: 2018/19 then 2020/21

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

**Non- and Semiparametrics**

2521300, WS 23/24, 2 SWS, Language: German, Open in study portal

**Content**

**Learning objectives:**

The student

- has profound knowledge of non- and semiparametric estimation methods
- is capable of implementing these methods using statistical software and using them to assess empirical problems

**Content:**

Kernel density estimation, local constant and local linear regression, bandwidth choice, series and sieve estimators, additive models, semiparametric models

**Requirements:**

It is recommended to attend the course Applied Econometrics prior to this course.

**Workload:**

Total workload for 4.5 CP: approx. 135 hours

- Attendance: 30 hours
- Preparation and follow-up: 65 hours
- Exam preparation: 40 hours

**Literature**

6.229 Course: Nonlinear Optimization I [T-WIWI-102724]

**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 consists of a written exam (60 minutes) according to Section 4(2), 1 of the examination regulation. The successful completion of the exercises is required for admission to the written exam. 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 II [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:*

### Nonlinear Optimization I

2550111, WS 23/24, 2 SWS, Language: German, [Open in study portal](#)  

**Lecture (V) On-Site**

**Content**

The lecture treats the minimization of smooth nonlinear functions without constraints. For such problems, which occur very often in economics, engineering, and natural sciences, optimality conditions are derived and, based on them, solution algorithms are developed. The lecture is structured as follows:

- Introduction, examples, and terminology  
- Existence results for optimal points  
- First and second order optimality conditions  
- Algorithms (line search, steepest descent method, variable metric methods, Newton method, Quasi Newton methods, CG method, trust region method)

The lecture is accompanied by exercises which, amongst others, offers the opportunity to implement and to test some of the methods on practically relevant examples.

**Remark:**

The treatment of optimization problems with constraints forms the contents of the lecture "Nonlinear Optimization II". The lectures "Nonlinear Optimization I" and "Nonlinear Optimization II" are held consecutively in the same semester.

**Learning objectives:**

The student

- knows and understands fundamentals of unconstrained nonlinear optimization,  
- is able to choose, design and apply modern techniques of unconstrained nonlinear optimization in practice.
Literature
Weiterführende Literatur:

- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993
6.230 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-101473 - Mathematical Programming

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**Type:** Written examination

**Credits:** 9

**Grading scale:** Grade to a third

**Recurrence:** Each winter term

**Version:** 6

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**Events**

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**Legend:** Online, Blended (On-Site/Online), On-Site, C C Cancelled

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**Competition Certificate**

The assessment consists of a written exam (120 minutes) according to Section 4(2), 1 of the examination regulation. The successful completion of the exercises is required for admission to the written exam.

The exam takes place in the semester of the lecture and in the following semester.

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**Prerequisites**

None.

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**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 23/24, 2 SWS, Language: German, Open in study portal

**Lecture (V)**

On-Site

---

**Content**

The lecture treats the minimization of smooth nonlinear functions without constraints. For such problems, which occur very often in economics, engineering, and natural sciences, optimality conditions are derived and, based on them, solution algorithms are developed. The lecture is structured as follows:

- Introduction, examples, and terminology
- Existence results for optimal points
- First and second order optimality conditions
- Algorithms (line search, steepest descent method, variable metric methods, Newton method, Quasi Newton methods, CG method, trust region method)

The lecture is accompanied by exercises which, amongst others, offers the opportunity to implement and to test some of the methods on practically relevant examples.

---

**Remark:**

The treatment of optimization problems with constraints forms the contents of the lecture "Nonlinear Optimization II". The lectures "Nonlinear Optimization I" and "Nonlinear Optimization II" are held consecutively in the same semester.

---

**Learning objectives:**

The student

- knows and understands fundamentals of unconstrained nonlinear optimization,
- is able to choose, design and apply modern techniques of unconstrained nonlinear optimization in practice.
Literature

Weiterführende Literatur:
- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993

Nonlinear Optimization II
2550113, WS 23/24, 2 SWS, Language: German, Open in study portal

Lecture (V) On-Site

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, optimality conditions are derived and, based on them, solution algorithms are developed. 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
- Algorithms (penalty method, multiplier method, barrier method, interior point method, SQP method, quadratic optimization)

The lecture is accompanied by exercises which, amongst others, offers the opportunity to implement and to test some of the methods on practically relevant examples.

Remark:
The treatment of optimization problems without constraints forms the contents of the lecture "Nonlinear Optimization I". The lectures "Nonlinear Optimization I" and "Nonlinear Optimization II" are held consecutively in the same semester.

Learning objectives:
The student
- knows and understands fundamentals of constrained nonlinear optimization,
- is able to choose, design and apply modern techniques of constrained nonlinear optimization in practice.

Literature

Weiterführende Literatur:
- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993
6.231 Course: Nonlinear Optimization II [T-WIWI-102725]

**Responsible:** Prof. Dr. Oliver Stein  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101473 - Mathematical Programming

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**Events**

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<th>Type/On-Site</th>
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<tbody>
<tr>
<td>WT 23/24</td>
<td>2550112</td>
<td>Exercises Nonlinear Optimization I + II</td>
<td>Practice / On-Site</td>
<td>Stein, Schwarze</td>
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<tr>
<td>WT 23/24</td>
<td>2550113</td>
<td>Nonlinear Optimization II</td>
<td>Lecture / On-Site</td>
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**Exams**

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<td>Nonlinear Optimization II</td>
<td>On-Site</td>
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<td>ST 2024</td>
<td>7900203_SS2024_NK</td>
<td>Nonlinear Optimization II</td>
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<td>Stein</td>
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</table>

**Competence Certificate**

The assessment consists of a written exam (60 minutes) according to Section 4(2), 1 of the examination regulation. The successful completion of the exercises is required for admission to the written exam.

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 I [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 23/24, 2 SWS, Language: German, [Open in study portal]

**Lecture (V)**

On-Site

**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, optimality conditions are derived and, based on them, solution algorithms are developed. 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
- Algorithms (penalty method, multiplier method, barrier method, interior point method, SQP method, quadratic optimization)

The lecture is accompanied by exercises which, amongst others, offers the opportunity to implement and to test some of the methods on practically relevant examples.

**Remark:**

The treatment of optimization problems without constraints forms the contents of the lecture "Nonlinear Optimization I". The lectures "Nonlinear Optimization I" and "Nonlinear Optimization II" are held consecutively in the same semester.

**Learning objectives:**

The student

- knows and understands fundamentals of constrained nonlinear optimization,
- is able to choose, design and apply modern techniques of constrained nonlinear optimization in practice.
Literature

Weiterführende Literatur:

- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993
6.232 Course: Online Concepts for Karlsruhe City Retailers [T-WIWI-111848]

**Responsibility:** Prof. Dr. Martin Klarmann

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

**Part of:**
- M-WIWI-101510 - Cross-Functional Management Accounting
- M-WIWI-105312 - Marketing and Sales Management
- M-WIWI-106258 - Digital Marketing

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</table>

**Events**

| ST 2024 | 2571184 | Online concepts for Karlsruhe city retailers | 2 SWS | Others (sons / 📣) | Kupfer |

**Events Legend:**
- Online: 🖥
- Blended (On-Site/Online): 🖥
- On-Site: 📣
- Cancelled: ⏸️

**Competence Certificate**

Alternative exam assessment:
- presentations in teams (in each case to the extent of approx. 15 minutes per team with subsequent discussion)
- delivery of a written elaboration per team.

**Annotation**

Please note that an application is required to participate in this workshop. The application phase usually takes place at the beginning of the lecture period in the summer semester. More information on the application process is usually available on the Marketing and Sales Research Group website (marketing.iism.kit.edu) shortly before the start of the lecture period in the summer semester.

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

**Online concepts for Karlsruhe city retailers**

2571184, SS 2024, 2 SWS, Language: German, [Open in study portal]

**Content**

**Content**

As part of a practical project in cooperation with the city marketing department of KME Karlsruhe Marketing und Event GmbH, students will have the opportunity to directly interact with retailers in Karlsruhe. Challenges of the digitalization of brick-and-mortar retailing will be analyzed and solutions will be developed and implemented.

In a theoretical part at the beginning of the event, students will gain an insight into the theoretical foundations of specific online marketing instruments. In cooperation with Karlsruhe City Marketing, students are taught application-oriented skills in online marketing tools, such as content management systems, social media platforms, search engine optimization or Google Ads campaigns.

In the practical part of the course, student teams cooperate with a real retailer in Karlsruhe's city center and learn how to analyze and optimize online presences and digital solutions based on key performance indicators. Possible use cases range from social media communication and website optimization to the introduction of innovative pricing and payment methods. In this way, students are given the tools for developing, maintaining and optimizing individual websites and digital solutions in stationary retailing.

Learning objectives result accordingly as follows:
- Learning of theoretical basics of central, application-oriented tools of online marketing
- Application and practical deep-dive of the acquired knowledge in a real case
- Concise and structured presentation of results

Total time required for 3 credit points: approx. 90.0 hours

**Attendance time:** 12 hours

**Preparation and wrap-up of the course:** 58 hours

**Exam and exam preparation:** 20 hours
### 6.233 Course: Operations Research in Health Care Management [T-WIWI-102884]

**Responsible:** Prof. Dr. Stefan Nickel  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-102805 - Service Operations

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#### Events

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<td>Operations Research in Health Care Management</td>
<td>Lecture</td>
<td>2 SWS</td>
<td>Graß</td>
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<td>Übungen zu OR im Health Care Management</td>
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#### Exams

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<td>Operations Research in Health Care Management</td>
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**Legend:** Online, Blended (On-Site/Online), On-Site, Cancelled

**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.

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

**Operations Research in Health Care Management**  
2550495, SS 2024, 2 SWS, Language: English, Open in study portal

**Literature**
**Weiterführende Literatur:**
- Fleßa: Grundzüge der Krankenhausbetriebslehre, Oldenbourg, 2007
- Fleßa: Grundzüge der Krankenhaussteuerung, Oldenbourg, 2008
**6.234 Course: Operations Research in Supply Chain Management [T-WIWI-102715]**

**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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<td>ST 2024</td>
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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 SCM 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.
### Course: Optimization and Synthesis of Embedded Systems (ES1) [T-INFO-101367]

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<th>Prof. Dr.-Ing. Jörg Henkel</th>
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6.236 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 examination will take place for the last time in the winter semester 2020/2021.
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 delivery sheets. Details will be announced at the beginning of the course.

**Prerequisites**
None.

**Annotation**
The course will take place for the last time in the winter semester 20/21.
6.237 Course: Optimization under Uncertainty [T-WIWI-106545]

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

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**Exams**

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Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**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.
6.238 Course: Panel Data [T-WIWI-103127]

**Responsible:** apl. Prof. 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**

| ST 2024 | 2520320 | Panel Data | 2 SWS | Lecture | Heller |
| ST 2024 | 2520321 | Übungen zu Paneldaten | 2 SWS | Practice | Heller |

**Competence Certificate**

The performance assessment is an alternative exam assessment in the form of a one-hour examination comprising a written and an oral part. The examination takes place as an individual examination or in groups of two.

**Prerequisites**

None

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

**Panel Data**

2520320, SS 2024, 2 SWS, Language: German, [Open in study portal](#)

**Content**

Content:

Fixed-Effects-Models, Random-Effects-Models, Time-Demeaning

**Workload:**

Total workload for 4.5 CP: approx. 135 hours  
Attendance: 30 hours  
Preparation and follow-up: 65 hours  
Exam preparation: 40 hours  
Exam preparation: 40 hours

**Literature**

Course: Parallel Algorithms [T-INFO-101333]

**Responsible:** Prof. Dr. Peter Sanders

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100796 - Parallel Algorithms

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**Events**

| WT 23/24 | 2400053 | Parallel Algorithms | 2/1 SW5 | Lecture / 🗣 | Sanders, Hübner, Uhl |

**Exams**

| WT 23/24 | 75489 | Parallel Algorithms | Sanders |

**Legend:** ⚫ Online, ⬤ Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

The lecture consists of two partial achievements:
- an oral examination lasting 20 minutes.
- an exercise carried out as an examination of another type.

Final grade: 80% oral examination, 20% exercise

**Recommendation**

Knowledge from lectures such as Algorithms I/II is recommended.

**Responsible:** Prof. Dr. Peter Sanders

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100796 - Parallel Algorithms

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**Exams**

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<th>Exam Name</th>
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<td>Parallel Algorithms Pass</td>
<td>Sanders</td>
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**Competence Certificate**
The lecture consists of two partial achievements:
- an oral examination lasting 20 minutes.
- an exercise carried out as an examination of another type.
Final grade: 80% oral examination, 20% exercise

**Recommendation**
Knowledge from lectures such as Algorithms I/II is recommended.
### 6.241 Course: Parallel Computer Systems and Parallel Programming [T-INFO-101345]

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<tr>
<th>Responsible</th>
<th>Prof. Dr. Achim Streit</th>
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#### Events

| ST 2024 | 24617 | Parallel computer systems and parallel programming | 2 SWS | Lecture | Streit, Raffeiner, Barthel |

#### Exams

| WT 23/24 | 7500241 | Parallel computer systems and parallel programming | Streit |
6.242 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 successful completion of the exercises is required for admission to the written exam.  
The examination is held in the semester of the lecture and in the following semester.

**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).

Responsible: Patric Werner
Organisation: KIT Department of Informatics
Part of: M-INFO-101215 - Intellectual Property Law

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<td>2 SWS</td>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled
6.244 Course: Pattern Recognition [T-INFO-101362]

Responsible: Prof. Dr.-Ing. Jürgen Beyerer
Tim Zander

Organisation: KIT Department of Informatics

Part of: M-INFO-100825 - Pattern Recognition

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Events

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

**Pattern Recognition**

24675, SS 2024, 4 SWS, Language: German, [Open in study portal](#)

**Organizational issues**

Vorlesung: montags 15:45 bis 16:30 Uhr und mittwochs 14:00 bis 15:30 Uhr

Übung: montags 16:30 bis 17:15 Uhr

**Literature**

**Weiterführende Literatur**

# 6.245 Course: Penetration Testing Lab [T/INFO-109929]

**Responsible:** Dr.-Ing. Ingmar Baumgart  
Prof. Dr. Jörn Müller-Quade

**Organisation:** KIT Department of Informatics  
**Part of:** M/INFO-104895 - Penetration Testing Lab

<table>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
# 6.246 Course: Photorealistic Rendering [T-INFO-101268]

**Responsible:** Prof. Dr.-Ing. Carsten Dachsbacher  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100731 - Photorealistic Rendering

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**Exams**

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Legend: 🕵️ Online, 📚 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled
6.247 Course: Planning and Management of Industrial Plants [T-WIWI-102631]

**Responsible:** Prof. Dr. Frank Schultmann

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

**Part of:** M-WIWI-101471 - Industrial Production II

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**Exams**

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**Competence Certificate**
The assessment consists of a written exam (90 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (alternative exam assessment, following §4(2), 3 of the examination regulation).

**Prerequisites**
None

**Recommendation**
None

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

**Planning and Management of Industrial Plants**

2581952, WS 23/24, 2 SWS, Language: German, [Open in study portal](#)

**Content**

Industrial plant management incorporates a complex set of tasks along the entire life cycle of an industrial plant, starting with the initiation and erection up to operating and dismantling.

During this course students will get to know special characteristics of industrial plant management. Students will learn important methods to plan, realize and supervise the supply, start-up, maintenance, optimisation and shut-down of industrial plants. Alongside, students will have to handle the inherent question of choosing between technologies and evaluating each of them. This course pays special attention to the specific characteristics of plant engineering, commissioning and investment.

**Literature**

Wird in der Veranstaltung bekannt gegeben.

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

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

**Part of:**
- M-WIWI-101409 - Electronic Markets
- M-WIWI-101446 - Market Engineering
- M-WIWI-101453 - Applied Strategic Decisions
- M-WIWI-102754 - Service Economics and Management
- M-WIWI-104813 - Information Systems: Internet-Based Markets and Services

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<td>Lecture / 🗣️</td>
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<td>Übungen zu Platform &amp; Market Engineering: Commerce, Media, and Digital Democracy</td>
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**Exams**

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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) up to 6 bonus points can be obtained. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by max. one grade level (0.3 or 0.4).

**Prerequisites**

None

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

<table>
<thead>
<tr>
<th>V</th>
<th>Platform &amp; Market Engineering: Commerce, Media, and Digital Democracy</th>
<th>Lecture (V)</th>
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<td>On-Site</td>
<td>&quot;Market Engineering: Information in Institutions&quot;</td>
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**Literature**

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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**Competence Certificate**
The assessment of this course consists of a written examination (following §4(2), 1 SPOs, 180 min.).

**Prerequisites**
None

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

**Portfolio and Asset Liability Management**
2520357, SS 2024, 2 SWS, Language: English, [Open in study portal](#)

**Content**

**Learning objectives:**
Knowledge of various portfolio management techniques in the financial industry.

**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:**
Total workload for 4.5 CP: approx. 135 hours
Attendance: 30 hours
Preparation and follow-up: 65 hours
Exam preparation: 40 hours

**Organizational issues**
Blockveranstaltung, Termine werden über Ilias bekanntgegeben

**Literature**
To be announced in the lecture
### 6.250 Course: Practical Course Applied Telematics [T-INFO-103585]

**Responsible:** Prof. Dr. Martina Zitterbart  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101889 - Practical Course Applied Telematics

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<td>7500019</td>
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6.251 Course: Practical Course Automatic Speech Recognition [T-INFO-104775]

**Responsible:** Prof. Dr. Alexander Waibel

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-102411 - Practical Course Automatic Speech Recognition

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**Exams**

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<td>Waibel</td>
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Below you will find excerpts from events related to this course:

**Praktikum Automatische Spracherkennung**

24298, WS 23/24, 2 SWS, Language: German, [Open in study portal](#)

**Content**

- In a number of experiments different systems for automatic speech recognition will be built step-by-step
- The use of different tools and techniques from the area will be practiced

**Literature**

Weiterführende Literatur

- A. Waibel, K.F. Lee: Readings in Speech Recognition
- F. Jelinek: Statistical Methods of Speech Recognition
- Schukat-Talamazzini: Automatische Spracherkennung
6.252 Course: Practical Course Computer Vision for Human-Computer Interaction [T-INFO-105943]

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<th>Prof. Dr.-Ing. Rainer Stiefelhagen</th>
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**Type**  
Examination of another type

**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each summer term

**Version**  
3

### Events

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6.254 Course: Practical Course Digital Design & Test Automation Flow [T-INFO-105565]

**Responsible:** Prof. Dr. Mehdi Baradaran Tahoori  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-102570 - Practical Course: Digital Design & Test Automation Flow

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**Exams**

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**Competence Certificate**
The assessment is carried out in form of course work (German Studienleistung, § 4 Abs. 3 SPO). Students must give a presentation.

**Prerequisites**
None.

**Recommendation**
Knowledge of "Dependable Computing" and "Fault Tolerant Computing" and Computer Architecture is helpful.

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

**Digital Design & Test Automation Flow**

24318, WS 23/24, 4 SWS, Language: German/English, [Open in study portal](https://campus.studium.kit.edu/exams/index.php)

**Content**

Electronic Design Automation (EDA) is used to develop nearly all novel electronic systems that we use in our daily lives, such as smartphones or laptops. In order to manage the high complexity of these systems, all steps in the design and verification phases are done automatically with the help of EDA tools.

The objective of this lab is to have a hands-on practice on major steps in digital design and test automation flow, from system-level specification to physical design and verification, using industrial EDA toolsets which are predominantly used in the industry and academia. The students will work on some sample designs and go through all major design and test steps, one by one, in different sessions of the lab. So, by the end of this lab, they become familiar with the steps and tool chain in the digital design and test automation flow. The topics include system-level specification and simulation; high-level synthesis; logic-level synthesis and simulation; design for testability; test pattern generation and fault simulation; physical design and verification; timing analysis and closure; area, delay, and power estimation and analysis.

**Organizational issues**

Ab 31.10.2023, alle 2 Wochen dienstags 14:00-15:30, Geb. 07.21, Gebäudeteil B, 2.OG, Praktikumsraum B.312.4

There are limited slots and the registration is handled in a first-come, first-served manner. So make sure you sign-up as early as possible. We can only consider registrations with the correct documents or from the online system (https://campus.studium.kit.edu/exams/index.php)
## 6.255 Course: Practical Course Engineering Approaches to Software Development [T-INFO-108791]

**Responsible:** Prof. Dr. Ralf Reussner  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-104254 - Practical: Course Engineering Approaches to Software Development

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### Exams

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6.256 Course: Practical Course FPGA Programming [T-INFO-105576]

**Responsible:** Prof. Dr. Mehdi Baradaran Tahoori

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-102661 - Practical Course FPGA Programming

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**Legend:** 🖥 Online, 🗑 Blended (On-Site/Online), 🗣 On-Site, ✗ Canceled

### Competence Certificate

The assessment is carried out in form of course work (German Studienleistung, § 4 Abs. 3 SPO). Students must give a presentation.

### Prerequisites

None.

### Recommendation

Knowledge of “Dependable Computing” and “Fault Tolerant Computing” and Computer Architecture is helpful.

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

**FPGA Programming**

2400106, WS 23/24, 4 SWS, Language: German/English, Open in study portal

**Practical course (P)**

**On-Site**

### Content

This lab emphasizes on the practical aspects of Field Programmable Gate Arrays (FPGAs). In the beginning, a short background discussion of FPGAs is given, followed by a tutorial on the workflow of configuring and programming an FPGA. This lab includes FPGA design using schematic layouts as well as several example of VHDL/Verilog programming to implement some sample digital circuits. Students will be exposed to the processes used to design and simulate FPGAs as well as compile their design and see it run on an actual FPGA.

**Organizational issues**

Ab 25.10.2023, alle 2 Wochen mittwochs 14:00-17:15, Geb. 07.21, Gebäudeteil B, 2.OG, Praktikumsraum B.312.4

Since the number of seats is limited, a registration for this laboratory in the campussystem is necessary.

**FPGA Programming**

2400106, SS 2024, 4 SWS, Language: English, Open in study portal

**Practical course (P)**

**On-Site**

### Content

This lab emphasizes on the practical aspects of Field Programmable Gate Arrays (FPGAs). In the beginning, a short background discussion of FPGAs is given, followed by a tutorial on the workflow of configuring and programming an FPGA. This lab includes FPGA design using schematic layouts as well as several example of VHDL/Verilog programming to implement some sample digital circuits. Students will be exposed to the processes used to design and simulate FPGAs as well as compile their design and see it run on an actual FPGA. The lab is designed around the DE2-115 prototyping board, which provides a programmer, program memory, and array of switches, buttons, LEDs, an LCD, and several I/O ports.

**Organizational issues**

ab 17.04.2024, alle 2 Wochen mittwochs 14:00-17:15, Geb. 07.21, Gebäudeteil B, 2.OG, Praktikumsraum B.312.4

Since the number of seats is limited, a registration for this laboratory in the campussystem is necessary.
**6.257 Course: Practical Course Model-Driven Software Development [T-INFO-103029]**

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
### 6.258 Course: Practical Course Natural Language Dialog Systems [T-INFO-104780]

- **Responsible:** Prof. Dr. Jan Niehues
- **Organisation:** KIT Department of Informatics
- **Part of:** M-INFO-102414 - Natural Language Dialog Systems

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Legend: 🖥 Online, 🟠 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
### 6.259 Course: Practical Course on Network Security Research [T-INFO-110938]

**Responsible:** Mario Hock  
Prof. Dr. Martina Zitterbart

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-105413 - Practical Course on Network Security Research

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**Exams**

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6.261 Course: Practical Course Software Defined Networking [T-INFO-103587]

**Responsible:** Prof. Dr. Martina Zitterbart

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-101891 - Practical Course Software Defined Networking

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**Exams**

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Legend: ☑ Online, ☐ Blended (On-Site/Online), ☒ On-Site, ✗ Cancelled

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

**Projektpraktikum: Software Defined Networking**

2424899, SS 2024, 4 SWS, Language: German/English, Open in study portal

**Practical course (P)**

Blended (On-Site/Online)

**Content**

Software-defined networking (SDN) is an emerging approach for controlling and managing network infrastructures. All control functionality (such as routing) is implemented in software and executed with the help of a centralized controller. As part of this practical course, we now want to find out how such SDN applications can be developed.
**6.262 Course: Practical Course: Advanced Topics in High Performance Computing, Data Management and Analytics [T-INFO-111803]**

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**Competence Certificate**

The assessment is carried out as an examination of another type (§ 4 Abs. 2 No. 3 SPO). The examination can consist of experiments or projects, each with a concluding presentation. Students may redraw from the assigned topic during the first two weeks after the topic has been communicated.

**Prerequisites**

none.

**Recommendation**

Knowledge in the area of databases, data management, data analytics, parallel computing is helpful.
## Course: Practical Course: Biologically Inspired Robots [T-INFO-111039]

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### Events

| WT 23/24 | 2400079 | Practical Course: Biologically Inspired Robots | 4 SWS | Practical course / 🧩 | Rönnau |

### Exams

| WT 23/24 | 7500322 | Practical Course: Biologically Inspired Robots | Rönnau |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
6.264 Course: Practical Course: Current Topics of Quantum Computing [T-INFO-112741]

**Responsible:** Prof. Dr.-Ing. Ina Schaefer  
Prof. Dr. Achim Streit  

**Organisation:** KIT Department of Informatics  

**Part of:** M-INFO-106286 - Practical Course: Current Topics of Quantum Computing

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**Competence Certificate**

The assessment is carried out as an examination of another type (§ 4 Abs. 2 No. 3 SPO).

The overall impression is evaluated. The grading is based on a term paper and a presentation. Students may redraw from the examination during the first two weeks after the topic has been communicated.

**Recommendation**

- Knowledge of linear algebra is recommended  
- Programming experience is helpful.

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

**Current Topics of Quantum Computing**

2400203, SS 2024, 3 SWS, Language: German/English, [Open in study portal](#)  

**Practical course (P)**

**Content**

This practical course focuses on the theoretical analysis and practical implementation of current topics in quantum computing. The introduction covers necessary mathematical foundations of quantum systems and their representation by qubits and quantum circuits before delving into the specifics of the topics offered. Possible topics include quantum algorithms, optimization of quantum systems, quantum software engineering, or quantum machine learning.

There are fixed dates for topic assignment and lectures to introduce the topic of quantum computing. Additional face-to-face meetings to discuss individual progress are coordinated individually between the participants and supervisors. Participants work on separate tasks that are defined on the basis of current research work and thus offer realistic problems from practice and research. Assignments are graded individually, group work is possible. Prior knowledge and areas of interest of the participants are taken into account when assigning the topics.

**Organizational issues**

Die Themenvergabe findet in der Auftaktveranstaltung statt:

- 18.04., 14:00-15:30 Uhr, Gebäude 20.21 (SCC), Raum 314

Falls Themen nicht vergeben wurden und Sie nicht an der Auftaktveranstaltung teilnehmen konnten, treten Sie gern direkt mit uns in Kontakt.

---

Available topics are assigned during our kick off meeting:

- 18.04., 14:00-15:30, Building 20.21 (SCC), Room 314

In case not all topics are assigned, and you did not manage to join the kick off meeting, please get in contact directly.
### 6.265 Course: Practical Course: Customized Embedded Processor Design [T-INFO-111457]

**Responsible:** Prof. Dr.-Ing. Jörg Henkel

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-105740 - Practical Course: Customized Embedded Processor Design

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#### Exams

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<th>Henkel</th>
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Below you will find excerpts from events related to this course:

**Customized Embedded Processor Design**

2424302, WS 23/24, 4 SWS, Language: German/English, [Open in study portal](#)
Content

Anwendungsspezifische Befehlsatzprozessoren (Application Specific Instruction Set Processors, ASIP) sind kundenspezifische Prozessoren mit einem spezifischen Befehlsatz, der auf eine bestimmte Anwendung ausgerichtet ist, um eine optimale Lösung für die oben genannten Anforderungen zu erreichen. Diese Anpassung kann auf verschiedenen architektonischen Ebenen erfolgen, indem kundenspezifische Befehle definiert werden, vordefinierte Hardwareblöcke einbezogen oder ausgeschlossen werden oder die Parameter des Prozessors eingestellt werden.

Der Schwerpunkt dieses Praktikums liegt darin, praktische Erfahrungen mit der modernen ASIP Tool-Suite zu sammeln und optimiertes Prozessordesign für Embedded-Anwendungen zu üben. Wir wählen eine Beispielapplikation aus, erstellen ein Profil, entwerfen einen ASIP mit dem Ziel der Leistungs-/Flächen-/Geschwindigkeitseffizienz und nutzen dann unsere Infrastruktur zum Benchmarking des entworfenen ASIPs, um Kosten und Nutzen in Bezug auf Leistung, Stromverbrauch, Fläche usw. zu vergleichen.

Der ASIP-Entwurfsablauf umfasst die Analyse und das Profiling der angestrebten Anwendung, die entsprechende Definition eines ASIPs, die Erstellung der speziellen Anweisung, die Einbettung der erforderlichen Hardwareblöcke oder die Konfiguration verschiedener Architekturparameter. Die synthetisierbaren Hardware-Beschreibung und die komplette Compiler-Werkzeugkette werden automatisch generiert, und dann wird der kundenspezifische Prozessor auf einer FPGA-Plattform implementiert. Dieser Prozessor kann mit den Werkzeugen QuestaSim/ModelSim und Xilinx Vivado auf Leistung, Fläche und Stromverbrauch getestet werden.

Für dieses Labor sind die Laborhandbücher und alle Übungen in englischer Sprache verfügbar.

Aufbau des Labors:
- Kick-off: zu Beginn des Semesters nach gemeinsamer Absprache
- Wöchentliche Sitzungen: Acht 2-3-stündige Sitzungen pro Woche
- Labor-Gruppen: Gruppen von 2-3 Studenten zur Bearbeitung von Aufgaben

Labor-Infrastruktur:
Die verfügbare Infrastruktur für einen ASIP-Entwurfsablauf basiert auf:
- ASIPmeister: wird verwendet, um ASIP mit neuen Anweisungen zu entwerfen und eine Compiler-Toolkette zu erstellen
- Dlxsim: wird für das Instruktionsprofiling verwendet
- QuestaSim: verwendet zum Testen des entworfenen ASIPs
- Vivado: wird zur Messung von Fläche, Leistung und Timing verwendet
- Diese Werkzeuge werden automatisch über das Makefile integriert.

Lernen:
- Erlernen der Grundlagen in Embedded Systems und ASIP.
- Erlernen des Standes der Technik in den Embedded Prozessor Tool-Suiten wie (QuestaSim/ModelSim und Xilinx Vivado/ISE).
- Arbeiten auf einer FPGA-Plattform.

Organizational issues
Additionally please subscribe at http://ces.itec.kit.edu/1033.php
### 6.266 Course: Practical Course: Data Science [T-INFO-111262]

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<tr>
<th>Responsible</th>
<th>Prof. Dr.-Ing. Klemens Böhm</th>
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### 6.267 Course: Practical Course: Data Science for Scientific Data [T-INFO-112844]

**Responsible:** Prof. Dr.-Ing. Klemens Böhm  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-106329 - Practical Course: Data Science for Scientific Data

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| ST 2024 | 242424 | Data Science for Scientific Data | 2 SWS | Practical course / 🗣 | Böhm, Matteucci, Cribeiro Ramallo |

#### Exams

| ST 2024 | 75751 | Practical Course: Data Science for Scientific Data | Böhm |

**Legend:**  
🖥 Online,  
🧩 Blended (On-Site/Online),  
🗣 On-Site,  
🗙 Cancelled
### 6.268 Course: Practical Course: Database Systems [T-INFO-103201]

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**Legend:** 🖥 Online, 🟢 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
### 6.269 Course: Practical Course: Discrete Freeform Surfaces [T-INFO-103208]

**Responsible:** Prof. Dr. Hartmut Prautzsch  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101667 - Practical Course: Discrete Freeform Surfaces

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**Legend:**  
🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

#### Competence Certificate

The assessment is carried out as an examination of another type (§ 4 Abs. 2 No. 3 SPO).  
The overall impression is evaluated. Solutions to assignments and their presentations will be included in the grading. Implementations and their presentation

#### Prerequisites

None.
## 6.270 Course: Practical Course: General-Purpose Computation on Graphics Processing Units [T-INFO-109914]

**Responsible:** Prof. Dr.-Ing. Carsten Dachsbacher

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100724 - Practical Course: General-Purpose Computation on Graphics Processing Units

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
### 6.271 Course: Practical Course: Geometric Modeling [T-INFO-103207]

**Responsible:**  Prof. Dr. Hartmut Prautzsch  
**Organisation:**  KIT Department of Informatics  
**Part of:**  M-INFO-101666 - Practical Course: Geometric Modeling

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**Competence Certificate**

The assessment is carried out as an examination of another type (§ 4 Abs. 2 No. 3 SPO). The overall impression is evaluated. Solutions to assignments and their presentations will be included in the grading.
### 6.272 Course: Practical Course: Graphics and Game Development [T-INFO-110872]

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**Responsible:** Prof. Dr.-Ing. Carsten Dachsbacher  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-105384 - Practical Course: Graphics and Game Development

| Events | | |
|--------|-----------------|-----------------|------------|---------|
| WT 23/24 | 24287 | Praktikum Graphics and Game Development | 4 SWS | Practical course / Dereviannykh, Grauer |

| Exams | | |
|--------|-----------------|-----------------|------------|---------|
| WT 23/24 | 7500291 | Praktikum: Graphics and Game Development | Dachsbacher |

**Recommendation**
Knowledge of basics or algorithms of computer graphics are recommended.

**Responsible:** Prof. Dr.-Ing. Carsten Dachsbacher

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-104699 - Practical Course: Hot Research Topics in Computer Graphics

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## 6.275 Course: Practical Course: Neural Network Exercises [T-INFO-106259]

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<th>Responsible</th>
<th>Prof. Dr. Alexander Waibel</th>
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### Exams

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### 6.276 Course: Practical Course: Programme Verification [T-INFO-102953]

**Responsible:** Prof. Dr. Bernhard Beckert  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101537 - Practical Course: Programme Verification

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6.277 Course: Practical Course: Scientific Data Management [T-INFO-112810]

**Responsibility:** Prof. Dr.-Ing. Klemens Böhm

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-106312 - Practical Course: Scientific Data Management

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**Exams**

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**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course T-INFO-112689 - Practical Course: Graph Databases must not have been started.
# Course: Practical Course: Smart Data Analytics [T-INFO-106426]

**Responsible:** Prof. Dr.-Ing. Michael Beigl  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-103235 - Practical Course: Smart Data Analytics

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### Exams

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Legend: 🌐 Online, 🤝 Blended (On-Site/Online), 🔰 On-Site, ✗ Cancelled
## 6.279 Course: Practical Course: Smart Energy System Lab [T-INFO-112030]

- **Responsible:** Dr.-Ing. Simon Waczowicz
- **Organisation:** KIT Department of Informatics
- **Part of:** M-INFO-105955 - Practical Course: Smart Energy System Lab

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
### 6.280 Course: Practical Course: Visual Computing [T-INFO-103000]

**Responsible:** Prof. Dr.-Ing. Carsten Dachsbacher  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101567 - Practical Course: Visual Computing

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<th></th>
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<tbody>
<tr>
<td>WT 23/24</td>
<td>7500110</td>
<td>Practical Course GPU-Computing</td>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
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### Events

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<th>24873</th>
<th>Practical Course: Microservice2Go (II)</th>
<th>2 SWS</th>
<th>Practical course / 🗣</th>
<th>Abeck, Schneider, Sänger, Throner</th>
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### Exams

<table>
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<th>Practical Course: Web Applications and Service-Oriented Architectures (II)</th>
<th></th>
<th>Abeck</th>
</tr>
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</table>

Legend: 🗣 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
### 6.282 Course: Practical Introduction to Hardware Security [T-INFO-108920]

**Responsible:** Prof. Dr. Mehdi Baradaran Tahoori  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-104357 - Practical Introduction to Hardware Security

<table>
<thead>
<tr>
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<th>Type</th>
<th>Grading</th>
<th>Lecture / Practice (VÜ)</th>
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<tbody>
<tr>
<td>WT 23/24</td>
<td>4 SWS</td>
<td>Practical Introduction in Hardware Security</td>
<td>4 SWS</td>
<td>Lecture / Practice (VÜ)</td>
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<td>Practical Introduction in Hardware Security</td>
<td>4 SWS</td>
<td>Lecture / Practice (VÜ)</td>
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<tr>
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<th>Credits</th>
<th>Type</th>
<th>Grading</th>
<th>Lecture / Practice (VÜ)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Practical Introduction to Hardware Security</td>
<td>4 SWS</td>
<td>Lecture / Practice (VÜ)</td>
</tr>
<tr>
<td>ST 2024</td>
<td>4 SWS</td>
<td>Practical Introduction to Hardware Security</td>
<td>4 SWS</td>
<td>Lecture / Practice (VÜ)</td>
</tr>
</tbody>
</table>

**Competence Certificate**  
The assessment is carried out as an examination of another type (§ 4 Abs. 2 No. 3 SPO). 4 topics will be covered in this lecture. After each topic the student will receive an assignment. The quality of his tasks will be evaluated afterwards of its correctness.

**Prerequisites**  
None.

**Recommendation**  
Knowledge of Digital Design (lecture TI)  
Practical Course ”FPGA Programming”

---

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

#### Practical Introduction in Hardware Security

<table>
<thead>
<tr>
<th>V</th>
<th>Lecture / Practice (VÜ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2400033, WS 23/24, 4 SWS, Language: English, Open in study portal</td>
<td>On-Site</td>
</tr>
</tbody>
</table>

**Content**  
4 SWS / 6 ECTS = 180h

**Organizational issues**  
Ab 26.10.2023 - 1x wöchentlich donnerstags: Vorlesung von 14:00-15:30, im Anschluß Übung von 15:30-17:15, Geb. 07.21, Gebäudeteil B, 2.OG, Seminarraum B316.4

There are limited slots and the registration is handled in a first-come, first-served manner. So make sure you sign-up as early as possible. We can only consider registrations with the correct documents or from the online system (https://campus.studium.kit.edu/exams/index.php)

---

#### Practical Introduction in Hardware Security

<table>
<thead>
<tr>
<th>V</th>
<th>Lecture / Practice (VÜ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2400009, SS 2024, 4 SWS, Language: English, Open in study portal</td>
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</tr>
</tbody>
</table>
Content
4 SWS / 6 ECTS = 180h
1. Hardware security primitives (PUF, TRNG)
2. Hardware Implementation of encryption modules (AES)
3. Passive Attack with side channel (on AES)
4. Active fault attack (on simple circuits, if feasible also on AES)

Security is a major concern for a variety of domains like embedded and cyber-physical systems in which threats in hardware and software components may pose catastrophic consequences. Software security has been studied extensively, since the majority of security attacks were typically at the software level. However, currently hardware becomes the Achilles heel for on-chip system security as recent events show. There is evidence of hardware security breaches and hence, there is a growing emphasize in hardware security from academic, industry, and government sectors. In this regard, physical attacks, side-channel analysis and fault-injection attacks for security-enabled application domains is becoming a real-world challenge.

Organizational issues
Ab 18.04.2024 - 1x wöchentlich donnerstags: Vorlesung von 14:00-15:30, im Anschluß Übung von 15:45-17:15, Geb. 07.21, Gebäudeteil B, 2.OG, Seminarraum B316.4

There are limited slots and the registration is handled in a first-come, first-served manner. So make sure you sign-up as early as possible. We can only consider registrations with the correct documents or from the online system (https://campus.studium.kit.edu/exams/index.php)
### 6.283 Course: Practical Project Robotics and Automation I (Software) [T-INFO-104545]

**Responsible:** Prof. Dr.-Ing. Björn Hein  
Prof. Dr.-Ing. Thomas Längle  

**Organisation:** KIT Department of Informatics  

**Part of:** M-INFO-102224 - Practical Project Robotics and Automation I (Software)

<table>
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#### Events

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<th>Type</th>
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<td>4 SWS</td>
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#### Exams

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<td>Hein, Längle</td>
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*Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ☑️ Cancelled*

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

#### Robotics and Automation I (Software)

24282, SS 2024, 4 SWS, Language: German, [Open in study portal](#)

**Organizational issues**

Information zur Prüfungsanmeldung - später im ILIAS-Portal

#### 6.283.1

**Literature**

Nach Themenstellung.
<table>
<thead>
<tr>
<th>Course: Practical Project Robotics and Automation II (Hardware) [T-INFO-104552]</th>
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</table>
| **Responsible:** | Prof. Dr.-Ing. Björn Hein  
Prof. Dr.-Ing. Thomas Längle |
| **Organisation:** | KIT Department of Informatics |
| **Part of:** | M-INFO-102230 - Practical Project Robotics and Automation II (Hardware) |

<table>
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<td>24290</td>
<td>Robotics and Automation II (Hardware)</td>
<td>4</td>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣️ On-Site, ❌ Cancelled
6.285 Course: Practical SAT Solving [T-INFO-105798]

**Responsible:** Dr. Tomas Balyo  
Dr. Markus Iser  
Prof. Dr. Peter Sanders  
Dr. Dominik Schreiber

**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-102825 - Practical SAT Solving

<table>
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<td>Irregular</td>
<td>3</td>
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**Events**

| ST 2024       | 2400115 | Practical SAT Solving | 3 SWS | Lecture / Practice (Sanders, Iser, Schreiber) |

**Competence Certificate**
The assessment is carried out as an oral examination (§ 4 Abs. 2 Nr. 2 SPO) usually lasting 30 minutes.

**Prerequisites**
none.

**Recommendation**
Relevant literature will be announced in the lecture.
Course: Practical Seminar Digital Service Systems [T-WIWI-106563]

**Responsible:** Prof. Dr. Gerhard Satzger

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

**Part of:** M-WIWI-102808 - Digital Service Systems in Industry

<table>
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**Events**

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<tr>
<td>WT 23/24 2540554</td>
<td>3 SWS</td>
<td>Practical Seminar: Information Systems &amp; Service Design</td>
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<td>Mädche</td>
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**Exams**

| ST 2024 7900341 | Practical Seminar: Information Systems and Service Design | Mädche |
| ST 2024 7900262 | Practical Seminar: Human-Centered Systems | Mädche |
| ST 2024 7900307 | Service Design Thinking | Satzger |
| ST 2024 7900312 | Practical Seminar Service Innovation | Satzger |

**Legend:** Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

The assessment consists of a seminar paper, a presentation of the results and the contribution to the discussion (according to §4(2), 3 of the examination regulation). The final grade is based on the evaluation of each component (seminar paper, oral presentation, and active participation).

**Prerequisites**

None

**Recommendation**

None

**Annotation**

New course title starting summer term 2017: "Practical Seminar Digital Service Systems".

The current range of seminar topics is announced on the KSRI website www.ksri.kit.edu.

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

**Practical Seminar: Information Systems & Service Design**

2540554, WS 23/24, 3 SWS, Language: English, Open in study portal

Lecture (V)
Blended (On-Site/Online)
6.287 Course: Practical Seminar: Advanced Analytics [T-WIWI-108765]

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

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

**Part of:** M-WIWI-103118 - Data Science: Data-Driven User Modeling

<table>
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<th>Version</th>
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<td>Grade to a third</td>
<td>Each term</td>
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</table>

**Competence Certificate**

The assessment consists of practical work in the field of advanced analytics, a seminar paper, a presentation of the results and the contribution to the discussion (according to §4(2), 3 of the examination regulation). The final grade is based on the evaluation of each component (seminar paper, oral presentation, and active participation).

**Prerequisites**

None

**Recommendation**

At least one module offered by the institute should have been chosen before attending this seminar.

**Annotation**

The course is held in English. The course is not offered regularly.

**Responsible:** Prof. Dr. Gerhard Satzger
**Organisation:** KIT Department of Economics and Management
**Part of:** M-WIWI-101506 - Service Analytics

<table>
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<table>
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<tr>
<th>Exams</th>
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<th>Practical Seminar Service Innovation</th>
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</thead>
<tbody>
<tr>
<td>ST 2024</td>
<td></td>
<td>Satzger</td>
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</tbody>
</table>

**Competence Certificate**
The assessment of this course is 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 (such as a survey or an implementation of an application) 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).

**Prerequisites**
None.

**Recommendation**
Knowledge in the field of Artificial Intelligence in Service Systems is assumed. Therefore, it is recommended to attend the course Artificial Intelligence in Service Systems [2595650] beforehand.
Course: Practical Seminar: Data-Driven Information Systems [T-WIWI-106207]

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

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

**Part of:** M-WIWI-103117 - Data Science: Data-Driven Information Systems

<table>
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<th>Version</th>
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<td>Grade to a third</td>
<td>Irregular</td>
<td>1</td>
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**Competence Certificate**
The assessment consists of a seminar paper, a presentation of the results and the contribution to the discussion (according to §4(2), 3 of the examination regulation). The final grade is based on the evaluation of each component (seminar paper, oral presentation, and active participation).

**Prerequisites**
None

**Recommendation**
At least one module offered by the institute should have been chosen before attending this seminar.

**Annotation**
The course is held in english. The course is not offered regularly.
**6.290 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

<table>
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<tr>
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<th>Grading scale</th>
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<th>Version</th>
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<td>Each term</td>
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**Events**

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<tr>
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<th>2500008</th>
<th>Practical seminar: Health Care Management</th>
<th>3 SWS</th>
<th>Others (sons / 🗣)</th>
<th>Nickel, Mitarbeiter</th>
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<tbody>
<tr>
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<td>2550498</td>
<td>Practical seminar: Health Care Management</td>
<td>3 SWS</td>
<td>Seminar / 🧩</td>
<td>Nickel, Mitarbeiter</td>
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</table>

**Exams**

| WT 23/24 | 7900105 | Practical Seminar: Health Care Management (with Case Studies) | Nickel |

**Competence Certificate**

Due to a research semester of Professor Nickel in WS 19/20, the courses Location Planning and Strategic SCM and Practice Seminar: Health Care Management do NOT take place in WS 19/20. Please also refer to the information at https://doi.iort.kit.edu/Lehrveranstaltungen.php for further details.

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 Introduction 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.
#### Competence Certificate

The assessment of this course is in the form of a different type of examination. The assessment is carried out by a practical component, preparing written documentation and actively participating in the discussions. A total of 60 points can be achieved, of which:

- a maximum of 25 points for the written documentation
- a maximum of 25 points for the practical component
- a maximum of 10 points for active participation in the discussions

At least 30 points must be achieved to pass the performance assessment. Please note that a practical component such as conducting a survey or implementing an application is also part of the regular scope of the course in addition to the written documentation. The respective tasks can be found in the announcement on the institute’s website [https://h-lab.iism.kit.edu](https://h-lab.iism.kit.edu).

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

**Practical Seminar: Human-Centered Systems**

2540554, SS 2024, 3 SWS, Language: English, [Open in study portal](#)

**Content**

In this practical seminar, students get an individual assignment and develop a running software prototype. Beside the software prototype, the students also deliver a written documentation.

Please find the current open offerings on our website: [https://h-lab.iism.kit.edu/thesis.php](https://h-lab.iism.kit.edu/thesis.php)

**Prerequisites**

Profound skills in software development are required

**Literature**

Further literature will be made available in the seminar.

**Responsible:** Prof. Dr. Gerhard Satzger

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

**Part of:**
- M-WIWI-101410 - Business & Service Engineering
- M-WIWI-102806 - Service Innovation, Design & Engineering

<table>
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<th>Grading scale</th>
<th>Recurrence</th>
<th>Version</th>
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<td>Grade to a third</td>
<td>Irregular</td>
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</table>

**Exams**

| ST 2024 | 7900307 | Service Design Thinking | Satzger |
| ST 2024 | 7900312 | Practical Seminar Service Innovation | Satzger |

**Competence Certificate**

Success is assessed through the preparation of written documentation, a presentation of the results of the practical components carried out and active participation in the discussions (in accordance with §4(2), 3 SPO).

Please note that a practical component such as conducting a survey or implementing an application is also part of the regular scope of the course in addition to the written documentation. Please refer to the course description for the respective tasks.

The overall grade is made up of the weighted components (e.g. documentation, oral presentation, practical work and active participation). The weighting of these components for the grade will be announced at the beginning of the course.

**Recommendation**

Knowledge of Service Innovation Methods is assumed. Therefore it is recommended (but not mandatory) to attend the course Service Innovation [2540468] beforehand.

**Annotation**

Due to the project work, the number of participants is limited and participation requires knowledge about models, concepts and approaches that are taught in the Service Innovation lecture. Having taken the Service Innovation lecture or demonstrating equivalent knowledge is a prerequisite for participating in this Practical Seminar. Details for registration will be announced on the web pages for this course.

The seminar is not offered regularly.
6.293 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-101453 - Applied Strategic Decisions
- M-WIWI-101505 - Experimental Economics

<table>
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<th>Version</th>
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**Events**

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<tbody>
<tr>
<td>WT 23/24</td>
<td>2520402</td>
<td>Predictive Mechanism and Market Design</td>
<td>2</td>
<td>Lecture</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**
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.
6.294 Course: Predictive Modeling [T-WIWI-110868]

**Responsible:** Prof. Dr. Fabian Krüger

**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**

| ST 2024 | 2521311 | Predictive Modeling | 2 SWS | Lecture / On-Site | Krüger, Koster |
| ST 2024 | 2521312 | Predictive Modeling (Tutorial) | 2 SWS | Practice / On-Site | Koster, Krüger |

**Exams**

| WT 23/24 | 7900014 | Predictive Modeling | Krüger |

**Competence Certificate**

The assessment of this course is a written examination (90 minutes) according to §4(2), 1 of the examination regulation. A bonus can be acquired by successful completion of an assignment (written report + short in-class presentation) during the semester. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by one grade level (0.3 or 0.4).

**Prerequisites**

None

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

**Predictive Modeling**

2521311, SS 2024, 2 SWS, Language: English, Open in study portal

**Content**

**Contents**

This course presents methods for making and evaluating statistical predictions based on data. We consider various types of predictions (mean, probability, quantile, and full distribution), all of which are practically relevant. In each case, we discuss selected modeling approaches and their implementation using R software. We consider various economic case studies. Furthermore, we present methods for absolute evaluation (assessing whether a given model is compatible with the data) and relative evaluation (comparing the predictive performance of alternative models).

**Learning objectives**

Students have a good conceptual understanding of statistical prediction methods. They are able to implement these methods using statistical software, and can assess which method is suitable in a given situation.

**Prerequisites**

Students should know econometrics on the level of the course 'Applied Econometrics' [250020]

**Literature**

- Weitere Literatur wird in der Vorlesung bekanntgegeben.

**Predictive Modeling (Tutorial)**

2521312, SS 2024, 2 SWS, Language: English, Open in study portal
# Course: Price Management [T-WIWI-105946]

**Responsible:** Prof. Dr. Andreas Geyer-Schulz  
Dr Paul Glenn  

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

**Part of:** M-WIWI-101409 - Electronic Markets  

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**Events**  
| ST 2024 | 2540529 | Price Management | 2 SWS | Lecture / 🗣 Glenn |
| ST 2024 | 2540530 | Exercise Price Management | 1 SWS | Practice / 🗣 Glenn |

**Exams**  
| WT 23/24 | 7900170 | Price Management (Nachklausur SS 2023) | Geyer-Schulz |
| ST 2024 | 7900139 | Price Management | Geyer-Schulz |

**Competence Certificate**  
Lecture and exam will not be offered in summer semester 2019. The next examination is in the summer semester 2020.  
Written examination (60 minutes) according to §4(2), 1 SPO. The exam is considered passed if at least 50 out of a maximum of 100 possible points are achieved. The grades are graded in five steps (best grade 1.0 from 95 points). Details of the grade formation and scale will be announced in the course.  
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 one grade level (0.3 or 0.4). The exact criteria for awarding a bonus will be announced at the beginning of the course.  

**Prerequisites**  
None  

**Recommendation**  
None  

**Annotation**  
The lecture is offered for the first time in summer term 2016.  

---  

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

### Price Management  
2540529, SS 2024, 2 SWS, Language: German, [Open in study portal](#)  

#### Organizational issues  
**Termine:**  
Samstags von 9:00 - 19:00 Uhr  
18.05.2024 => Termin 1  
08.06.2024 => Termin 2  
29.06.2024 => Termin 3  
20.07.2024 => Termin 4  

#### Literature  
6.296 Course: Pricing [T-WIWI-102883]

**Responsible:** Prof. Dr. Martin Klarmann

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

**Part of:** M-WIWI-105312 - Marketing and Sales Management

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**Exams**

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<td>Klarmann</td>
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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ⚡ Cancelled

**Competence Certificate**

Alternative exam assessment. The examination (and thus the grade) is composed of three parts:

1. The design and execution of your own small experimental study around the topic of behavioral pricing (as group work).
2. The processing and presentation of a case study on pricing (as group work).
3. The execution of a simulated price negotiation based on a systematic preparation (usually in teams of two).

**Prerequisites**

Since the earlier course (a) "Pricing Excellence" and (b) "Price Negotiations and Sales Presentations" become parts of the Pricing course, Pricing cannot be taken if (a) and/or (b) have already been completed.

**Recommendation**

Students are highly encouraged to actively participate in class.

**Annotation**

A small application is required for participation in this class. The application phase usually takes place at the beginning of the lecture period in the winter semester. More information on the application process will be made available on the Marketing and Sales Research Group website (marketing.iism.kit.edu) shortly before the start of the winter semester lecture period. This course is limited to 24 participants.

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

**Pricing**

2572199, WS 23/24, 3 SWS, Language: English, [Open in study portal](#)
Content
At the Pricing lecture, students learn about current research and best practices in price management. Delivered in workshop format, the lecture has three key elements:

1. "Behavioral Pricing" workshop
   In this part of the course, central concepts and findings from behavioral pricing research (e.g. price information processing, reference prices, price fairness and mental accounting) are presented and discussed on the basis of important behavioral theories (e.g. prospect theory and information economics). After a brief introduction to experimental research, participants will then conduct their own small experimental study in the form of group work on a hypothesis they have developed on pricing behavior, analyze the data, and present it.

2. "Pricing Excellence" workshop
   In a theory section at the beginning of the course, students are taught theoretical principles of pricing. This includes an introduction to (1) pricing of product prices as well as (2) pricing of net customer prices (development of discount systems). Furthermore, theoretical basics of price enforcement and price monitoring are discussed. This will be followed by a practical application of what has been learned by working on a case study in small groups with a concluding presentation.

3. "Price Negotiation" workshop
   After an introduction to key theories and concepts of negotiation, students prepare and then conduct a simulated price negotiation in small groups with guidance.

Learning Objectives:
Students...

- are familiar with central theories explaining behavioral phenomena regarding consumers dealing with prices
- are able to describe and explain central phenomena of behavioral science with regard to price behavior and derive implications from them
- can formulate their own hypotheses on price behavior and design, conduct and evaluate a suitable experimental study for this purpose
- learn theoretical basics of pricing behavior
- learn the theoretical basics of price enforcement and price monitoring
- apply the acquired knowledge in a practical case study
- know important conceptual basics on the subject of price negotiations
- can prepare and competently conduct price negotiations
- present the results of their group work in a concise and structured manner

All events will take place in presence with compulsory attendance at all dates.

Total time required for 4.5 credit points: approx. 135 hours
Attendance time: 30 hours
Self-study: 105 hours

Organizational issues
Dates will be announced.
### Course: Probabilistic Time Series Forecasting Challenge [T-WIWI-111387]

**Responsible:** Prof. Dr. Fabian Krüger

**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**
Alternative exam assessment. Necessary conditions to pass the course:

1. Weekly submission of statistical forecasts during the semester (excluding the Christmas break),
2. Submission of a final report (10-15 pages) at the end of the semester, describing the forecasting methods and their statistical evaluation.

Grading is based on the final report.

**Prerequisites**
Good methodological knowledge in statistics and data science.
Good knowledge in applied data analysis, incl. programming skills in R, Python or similar.
Knowledge of time series analysis is helpful, but not required.

**Annotation**
The course is limited in participation. Participants will be selected via the WIWI portal.

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

#### Probabilistic Time Series Forecasting Challenge
2500081, WS 23/24, SWS, Language: English, [Open in study portal](#)

**Project (PRO)**
Blended (On-Site/Online)

**Content**
Statistical forecasts are relevant across all fields of society. In this data science project, students make, evaluate and communicate their own statistical forecasts in a real-time setting. We consider probabilistic forecasts that involve a measure of uncertainty in addition to a point forecast. Students are asked to make forecasts of several real-world time series (including weather variables and the DAX stock market index). Historical data on all series are available from public sources that are updated as time proceeds. While the time series differ from each other in important ways, statistical methods can meaningfully be used for prediction in all cases. We focus on quantile forecasts which are useful to measure forecast uncertainty in a relatively simple way.
Organizational issues

Short description
In this data science project, students make and evaluate statistical forecasts in a realistic setup (involving real-time predictions and real-world time series data). A kick-off meeting will take place in mid October. During the semester, there will be a weekly meeting in which students and instructors discuss the current state of the forecasting challenge.

Prerequisites
Students should have a good working knowledge of statistics and data science, including proficiency in a programming language like R, Python, or Matlab. Knowledge of time series analysis is helpful but not strictly required. Motivation and curiosity are particularly important in this course format that requires regular, active participation over the whole semester.

Please note that the number of participants is limited due to the interactive course format. Application takes place via the Wiwi portal, where further information is available.

Examination rules
The project seminar counts for 4.5 credit points (Leistungspunkte). Examination is via an alternative exam assessment (§4(2), 3 SPO). Necessary conditions to pass the course: 1) Weekly submission of statistical forecasts during the semester (excluding the Christmas break), 2) Submission of a final report (10-15 pages) at the end of the semester, describing the forecasting methods and their statistical evaluation. Grading is based on the final report.
**6.298 Course: Probability and Computing [T-INFO-113082]**

**Responsible:** TT-Prof. Dr. Thomas Bläsius  
Dr. Maximilian Katzmann  
Prof. Dr. Peter Sanders  

**Organisation:** KIT Department of Informatics  

**Part of:** M-INFO-106469 - Probability and Computing

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**Legend:** Online, Blended (On-Site/Online), On-Site, Cancelled

**Prerequisites**

None.

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

**Probability and Computing**

2400153, WS 23/24, 3 SWS, Language: German/English, [Open in study portal](#)  

**Lecture / Practice (VÜ)**  
On-Site

**Content**

Randomized algorithms and data structures rely on random experiments. While the design of deterministic algorithms is often driven by a pessimistic view of worst-case behavior, randomized algorithms employ approaches that occasionally fail but perform much better most of the time.

The running time of such algorithms, as well as the solution quality (in the case of optimization problems) and sometimes correctness (in the case of computation problems), are subject to randomness. Therefore, a formal analysis focuses on expected values and success probabilities. We will explore both classical examples and current research topics in the areas of hashing and graph theory. Specialised design methods (such as probability amplification) and advanced analysis tools from probability theory (such as coupling, Poissonization, and concentration bounds) will be applied. We will often see that randomized approaches are more efficient or simpler than all (or at least all known) deterministic approaches.

We will briefly address, on the theory side, how randomized complexity classes relate to well-known classes such as P and NP and, on the the practical side, how to implement randomized algorithms on common (essentially deterministic) computers using pseudo-randomness.

**Competence Goals:**

Students will be able to:
- understand when and why randomization is useful or necessary to solve an algorithmic problem,
- explain central design methods and analysis tools in the context of randomized algorithms,
- design and explain simple randomized algorithms and data structures to solve a given problem,
- determine which tools are suitable for analyzing a given randomized algorithm or data structure, and apply them.
**6.299 Course: Product and Innovation Management [T-WIWI-109864]**

**Responsible:** Prof. Dr. Martin Klarmann

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

**Part of:**
- M-WIWI-101510 - Cross-Functional Management Accounting
- M-WIWI-101514 - Innovation Economics
- M-WIWI-105312 - Marketing and Sales Management

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<td>Klarmann</td>
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**Competence Certificate**
The assessment of success takes place through a written exam with additional aids in the sense of an open book exam. Further details will be announced during the lecture.

**Prerequisites**
None

**Annotation**
For further information, please contact Marketing & Sales Research Group (marketing.iism.kit.edu).
6.300 Course: Production and Logistics Management [T-WIWI-102632]

**Responsible:** Prof. Dr. Frank Schultmann  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101412 - Industrial Production III

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**Exams**

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣️ On-Site, ✗ Canceled

**Competence Certificate**
The assessment consists of a written exam (90 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (alternative exam assessment, following §4(2), 3 of the examination regulation).

**Prerequisites**
None

**Recommendation**
None

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

**Production and Logistics Management**
2581954, SS 2024, 2 SWS, Language: German, [Open in study portal]

**Content**
This course covers central tasks and challenges of operative production and logistics management. Students get to know the set-up and mode of planning systems such as production planning and control systems, enterprise resource planning systems and advanced planning systems to cope with the accompanying planning tasks in supply chain management. Methods to solve these tasks from the field of operational research will be explored with respect to manufacturing program planning, material requirement planning, lot size problems and scheduling. Alongside to MRP II (Manufacturing Resources Planning), students will be introduced to integrated supply chain management approaches. Finally, commercially available planning systems will be presented and discussed.

**Literature**
Wird in der Veranstaltung bekannt gegeben.
6.301 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-103356 - Machine Learning
- M-WIWI-106491 - Project Lab Applied Machine Learning

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<td>Each winter term</td>
<td>Zöllner, Daaboul</td>
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**Exams**

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ☑️ Cancelled

**Competence Certificate**

The alternative exam assessment 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

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

**V**

**Practical Course Cognitive automobiles and robots (Master)**

2512501, WS 23/24, 3 SWS, Language: German/English, Open in study portal

**Practical course (P)**

Blended (On-Site/Online)

**Content**

The lab is intended as a practical supplement to courses such as "Machine Learning 1/2". Scientific topics, mostly in the area of autonomous driving and robotics, will be addressed in joint work with ML/KI methods. The goal of the internship is for participants to design, develop, and evaluate ML Software system.

In addition to the scientific goals, such as the study and application of methods, the aspects of project-specific teamwork in research (from specification to presentation of results) are also worked on in this internship.

The individual projects require the analysis of the set task, selection of appropriate methods, specification and implementation and evaluation of the solution approach. Finally, the selected solution is to be documented and presented in a short lecture.

**Learning Objectives:**

- Students will be able to practically apply theoretical knowledge from lectures on machine learning to a selected area of current research.
- Students will be proficient in analyzing and solving thematic problems.
- Students will be able to evaluate, document, and present their concepts and results.

**Recommendations:**

- Theoretical knowledge of machine learning and/or AI.
- Python knowledge
- Initial experience with deep learning frameworks such as PyTorch/Jax/Tensorflow may be beneficial.

**Workload:**

The workload of 5 credit points consists of practical implementation of the selected solution, as well as time for literature research and planning/specification of the selected solution. In addition, a short report and presentation of the work performed will be prepared.
Organizational issues
Anmeldung und weitere Informationen sind im WiWi-Portal zu finden.
Registration and further information can be found in the WiWi-portal.
### 6.302 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-103356 - Machine Learning  
- M-WIWI-106491 - Project Lab Applied Machine Learning

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**Events**

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<td>Practical course</td>
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**Exams**

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</table>

**Competence Certificate**

The alternative exam assessment 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

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

![Project Lab Machine Learning](image-url)

**Content**

The lab is intended as a practical supplement to lectures such as "Machine Learning". The theoretical basics are applied in the lab course. The aim of the lab course is that the participants work together to design, develop and evaluate a subsystem from the field of robotics and cognitive systems using one or more procedures from the field of AI/ML.

In addition to the scientific objectives involved in the investigation and application of the methods, aspects of project-specific teamwork in research (from specification to presentation of the results) are also developed in this practical course.

The individual projects require the analysis of the task at hand, selection of suitable procedures, specification and implementation and evaluation of the approach taken. Finally, the chosen solution has to be documented and presented in a short presentation.

**Learning objectives:**

- Students can practically apply knowledge from the Machine Learning lecture in a selected field of current research in robotics or cognitive automobiles.
- Students master the analysis and solution of corresponding problems in a team.
- Students can evaluate, document and present their concepts and results.

**Recommendations:**

Attendance of the lecture machine learning, C/C++ knowledge, Python knowledge

**Workload:**

The workload of 5 credit points consists of the time spent in the lab for practical implementation of the selected solution, as well as the time spent on literature research and planning/specifying the proposed solution. In addition, a short report and a presentation of the work carried out will be prepared.
Organizational issues
Anmeldung und weitere Informationen sind im Wiwi-Portal zu finden.
Registration and further information can be found in the WiWi-portal.
6.303 Course: Project Lab: Image Analysis and Fusion [T-INFO-104746]

**Responsible:** Prof. Dr.-Ing. Jürgen Beyerer
**Organisation:** KIT Department of Informatics
**Part of:** M-INFO-102383 - Project Lab: Image Analysis and Fusion

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

**Organizational issues**

Die Erfolgskontrolle erfolgt durch Bewertung der Projektdokumentation sowie der Präsentation der Projektergebnisse als Erfolgskontrolle anderer Art nach § 4 Abs. 2 Nr. 3 der SPO.

Die Note setzt sich zusammen aus der Note der schriftlichen Ausarbeitung und den Präsentationen.

Das Projektpraktikum Bildauswertung und-fusion findet im Fraunhofer IOSB, Fraunhoferstr. 1, 76131 KA statt.

Treffpunkt ist im Foyer.

Die 4 offiziellen Pflichttermine sowie der Termin für die Abschlusspräsentation werden noch bekanntgegeben.

Der Anmeldezeitraum steht noch nicht fest, voraussichtlich November-Dezember 2023.

Weitere Infos folgen.

**Literature**

Empfehlungen:

Hilfreich sind:

- Kenntnisse der Grundlagen der Stochastik und Signal- und Bildverarbeitung
- Kenntnisse der Vorlesungen Einführung in die Informationsfusion [IN4INEIF], Automatische Sichtprüfung und Bildverarbeitung [IN4INASB], Mustererkennung [IN4INME], Probabilistische Planung.
6.304 Course: Project Management [T-WIWI-103134]

**Responsible:** Prof. Dr. Frank Schultmann  
**Organisation:** KIT Department of Economics and Management  
**Part of:**  
M-WIWI-101412 - Industrial Production III  
M-WIWI-101471 - Industrial Production II

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

The assessment consists of a written exam (60 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (examination of another type, following §4(2), 3 of the examination regulation).

**Prerequisites**

None

**Recommendation**

None

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

**Project Management**

2581963, WS 23/24, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**

On-Site

**Content**

1. Introduction
2. Principles of Project Management
3. Project Scope Management
4. Time Management and Resource Scheduling
5. Cost Management
6. Quality Management
7. Risk Management
8. Stakeholder
9. Communication, Negotiation and Leadership
10. Project Controlling
11. Agile Project Management

**Literature**

Wird in der Veranstaltung bekannt gegeben.
Course: Public International Law [T-INFO-113381]

6.305 Course: Public International Law [T-INFO-113381]

Organisation: KIT Department of Informatics
Part of: M-INFO-101217 - Public Business Law

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Exams

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Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Competence Certificate
The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 60 minutes.
Depending on the number of participants, it will be announced six weeks before the examination (§ 6 (3) SPO) whether the performance assessment is carried out
- as an oral examination (duration approx. 20 mins.) (§ 4 Abs. 2 Nr. 2 SPO) or
- as a written examination (lasting 60 mins.) (§ 4 Abs. 2 No. 1 SPO).

Prerequisites
None.

Recommendation
- General knowledge of (public) law (eg, through participating in public law or EU law modules) is helpful but not necessary.
- Interest in international affairs and politics is welcomed.

Annotation
Competency Goals:
- Participating students will be able to navigate the plethora of multilateral treaties to detect relevant international law for specific cases.
- They can develop solutions for legal problems based on case law of international courts and tribunals.
- Students will be able to read and comprehend international treaties and case law.
- They will have a fundamental understand of the interplay between various subfields of public international law.
- Students can identify and explain current issues in public international law.

Content:
The lecture is designed to provide participating students with a general understanding of the foundations, subjects, and sources of public international law, its interplay with national legal regimes, and more detailed knowledge of particular subfields of public international law.
Since the lecture targets students of information systems, particular focus will be given to economic topics in international law, such as investment and trade law aspects. Due to the general importance of climate change for todays (economic) law, international climate change law and environmental law will form further focus areas.
In addition, a concise overview on human rights law, the law on State responsibility, and the peaceful settlement of disputes will be provided.
Throughout the lecture, important case law will be referenced and students are expected to read relevant cases in part to facilitate a discussion of such cases and their relevance for a subject field. Although the United Nations, including its principal judicial organ, the International Court of Justice, is one of the, if not the, key international organization in public international law, further international organizations (eg, Council of Europe, World Trade Organization) and their respective law(s) will also be touched.
Students are advised to have a statute book at hand that includes the most important international treaties and conventions (eg, Evans, Blackstone's International Law Documents, currently 15th ed 2021).
Conducting the lecture in English intends to facilitate students to link their ideas and arguments to current debates in international law.
### 6.306 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
- M-WIWI-101511 - Advanced Topics in Public Finance

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#### Events

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#### Exams

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**Legend:**
- 🖥 Online
- 🧩 Blended (On-Site/Online)
- 🗣 On-Site
- 🗑 Cancelled

**Competence Certificate**
Depending on the further pandemic development the assessment will consist either of an open book exam (following Art. 4, para. 2, clause 3 of the examination regulation), or of an 1.5h written exam (following Art. 4, para. 2, clause 1 of the examination regulation).

**Prerequisites**
None

**Recommendation**
Basic knowledge of Public Finance is required.

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

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<tbody>
<tr>
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</table>

**Organizational issues**
Die Vorlesung wird im WS 23/24 in Hybrid-Modus angeboten: in der ersten Vorlesungswoche sowie im zweiwöchigen Rhythmus danach findet sie in Präsenz im entsprechend angegebenen Vorlesungsraum statt; in der zweiten Vorlesungswoche sowie alle zwei Wochen danach findet sie online über im ILIAS-Kurs angegebenen Zoom-Vorlesungsraum statt.

**Literature**
Weiterführende Literatur:

6.307 Course: Public Revenues [T-WIWI-102739]

**Responsible:** Prof. Dr. Berthold Wigger  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101511 - Advanced Topics in Public Finance

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**Exams**

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**Competence Certificate**

Depending on the further pandemic development the assessment will consist either of an open book exam (following Art. 4, para. 2, clause 3 of the examination regulation), or of an 1h written exam (following Art. 4, para. 2, clause 1 of the examination regulation).

**Prerequisites**

None

**Recommendation**

Basic knowledge of Public Finance is required.

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

**Public Revenues**

2560120, SS 2024, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
On-Site

**Content**

The Public Revenues lecture is concerned with the theory and policy of taxation and public dept. In the first chapter, fundamental concepts of taxation theory are introduced, whereas the second chapter deals with key elements of the German taxation system. The allocative and distributive effects of different taxation types are examined in chapter three and four. Chapter five integrates both allocative and distributive components in order to derive a theory of optimal taxation. The core of the sixth chapter is represented by international aspects of taxation. The debt part begins with a description of the extent and structure of public dept in chapter seven. In the following chapter, macroeconomic theories of national dept are evolved, while chapter nine is concerned with its long term consequences when employed as a regular instrument of budgeting. Finally, the tenth chapter deals with constitutional limits to public debt-incurring.

**Learning goals:**

See German version.

**Workload:**

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

**Literature**

6.308 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

**Type:** Examination of another type

**Credits:** 4,5

**Grading scale:** Grade to a third

**Recurrence:** Each winter term

**Version:** 3

**Competence Certificate**

The examination takes the form of an alternative exam assessment. The alternative exam assessment consists of a Python-based "Takehome Exam". At the end of the third week of January, the student is given a "Takehome Exam" which he processes and sends back independently within 4 hours using Python. Precise instructions will be announced at the beginning of the course. The alternative exam assessment can be repeated a maximum of once. A timely repeat option takes place at the end of the third week in March of the same year. More detailed instructions will be given at the beginning of the course.

**Prerequisites**

None.

**Recommendation**

Good knowledge of statistics and basic programming skills

Responsible: Dr. Patrick Plötz
Organisation: KIT Department of Economics and Management

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<td>Übungen zu Quantitative Methods in Energy Economics</td>
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Exams

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

Competence Certificate
The assessment consists of an oral (30 minutes) exam (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (alternative exam assessment, following §4(2), 3 of the examination regulation).

Prerequisites
None

Recommendation
None

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

Quantitative Methods in Energy Economics
2581007, WS 23/24, 2 SWS, Language: English, Open in study portal

Lecture (V) On-Site

Content
Energy economics makes use of many quantitative methods in exploration and analysis of data as well as in simulations and modelling. This lecture course aims at introducing students of energy economics into the application of quantitative methods and techniques as taught in elementary courses to real problems in energy economics. The focus is mainly on regression, simulation, time series analysis and related statistical methods as applied in energy economics.

Learning Goals:
The student
- knows and understands selected quantitative methods of energy economics
- is able to use selected quantitative methods of energy economics
- understands they range of usage, limits and is autonomously able to adress new problems by them.

Literature
Wird in der Vorlesung bekannt gegeben.
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<thead>
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**Responsible:** Prof. Dr. Hartmut Prautzsch

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-101853 - Rationale Splines
# 6.311 Course: Rationale Splines [T-INFO-103544]

- **Responsible:** Prof. Dr. Hartmut Prautzsch
- **Organisation:** KIT Department of Informatics
- **Part of:** M-INFO-101857 - Rationale Splines

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# 6.312 Course: Real-Time Systems [T-INFO-101340]

**Responsible:** Prof. Dr.-Ing. Thomas Längle  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100803 - Real-Time Systems

<table>
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<td>Each summer term</td>
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**Exams**

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**Legend:**  
- Online  
- Blended (On-Site/Online)  
- On-Site  
- Cancelled
6.313 Course: Recommender Systems [T-WIWI-102847]

**Responsible:** Prof. Dr. Andreas Geyer-Schulz

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

**Part of:**
- M-WIWI-101410 - Business & Service Engineering
- M-WIWI-104814 - Information Systems: Analytical and Interactive Systems
- M-WIWI-105661 - Data Science: Intelligent, Adaptive, and Learning Information Services

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**Events**

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), ⟨⟩ On-Site, × Cancelled

**Competence Certificate**

Written examination (60 minutes) according to §4(2), 1 SPO. The exam is considered passed if at least 50 out of a maximum of 100 possible points are achieved. The grades are graded in five steps (best grade 1.0 from 95 points). Details of the grade formation and scale will be announced in the course.

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 one grade level (0.3 or 0.4). The exact criteria for awarding a bonus will be announced at the beginning of the course.

**Prerequisites**

None

**Recommendation**

None

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

**V Recommender Systems**

2540506, WS 23/24, 2 SWS, Language: German, Open in study portal
Content
At first, an overview of general aspects and concepts of recommender systems and its relevance for service providers and customers is given. Next, different categories of recommender systems are discussed. This includes explicit recommendations like customer reviews as well as implicit services based on behavioral data. Furthermore, the course gives a detailed view of the current research on recommender systems at the Chair of Information Services and Electronic Markets.

Learning objectives:
The student
- is proficient in different statistical, data-mining, and game theory methods of computing implicit and explicit recommendations
- evaluates recommender systems and compares these with related services

Workload:
The total workload for this course is approximately 135 hours (4.5 credits):

Time of attendance
- Attending the lecture: 15 x 90min = 22h 30m
- Attending the exercise classes: 7 x 90min = 10h 30m
- Examination: 1h 00m

Self-study
- Preparation and wrap-up of the lecture: 15 x 180min = 45h 00m
- Preparing the exercises: 25h 00m
- Preparation of the examination: 31h 00m

Sum: 135h 00m

Exam:
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.

The course is considered successfully taken, if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 10) from exercise work will be added.

Grade: Minimum points
- 1.0: 95
- 1.3: 90
- 1.7: 85
- 2.0: 80
- 2.3: 75
- 2.7: 70
- 3.0: 65
- 3.3: 60
- 3.7: 55
- 4.0: 50
- 5.0: 0
Literature
Weiterführende Literatur:
6.314 Course: Regulation Theory and Practice [T-WIWI-102712]

Responsible:    Prof. Dr. Kay Mitusch
Organisation:   KIT Department of Economics and Management
Part of:        M-WIWI-101406 - Network Economics

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Competence Certificate
The lecture is not offered for an indefinite period of time.
Result of success is made by a 20-30 minutes oral examination. Examination is offered every semester and can be retried at any regular examination date.

Prerequisites
None

Recommendation
Basic knowledge and skills of microeconomics from undergraduate studies (bachelor’s degree) are expected.
Particularly helpful but not necessary: Industrial Economics and Principal-Agent- or Contract theories. Prior attendance of the lecture Competition in Networks [26240] is helpful in any case but not considered a formal precondition.

Annotation
The lecture is not offered for an indefinite period of time.
6.315 Course: Reliable Computing I [T-INFO-101387]

**Responsible:** Prof. Dr. Mehdi Baradaran Tahoori  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100850 - Reliable Computing I

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled

**Competence Certificate**

The assessment is carried out as an oral examination (§ 4 Abs. 2 Nr. 2 SPO) lasting 20 minutes.

**Prerequisites**

None.

**Recommendation**

Knowledge of Digital Design and Computer Architecture is helpful.

---

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

**Reliable Computing I**

24071, WS 23/24, 2 SWS, Language: English, [Open in study portal](#)
# 6.316 Course: Research Focus Class: Blockchain & Cryptocurrencies [T-INFO-113400]

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### Responsible
Prof. Dr. Hannes Hartenstein

### Organisation
KIT Department of Informatics

### Part of
M-INFO-106654 - Research Focus Class: Blockchain & Cryptocurrencies

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**Legend:**
- 🖥 Online
- 🧩 Blended (On-Site/Online)
- ⌚ On-Site
- ✗ Cancelled
### 6.317 Course: Research Focus Class: Blockchain & Cryptocurrencies - Seminar [T-INFO-113401]

**Responsible:** Prof. Dr. Hannes Hartenstein  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-106654 - Research Focus Class: Blockchain & Cryptocurrencies

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
**6.318 Course: Research Practical Course: Interactive Learning [T-INFO-112772]**

**Responsible:** TT-Prof. Dr. Rudolf Lioutikov  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-106300 - Research Practical Course: Interactive Learning

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**Legend:** Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

The assessment is carried out as an examination of another type (§ 4 Abs. 2 No. 3 SPO). Presentation on the chosen topic at the end of the semester and written elaboration.

**Prerequisites**

none.

**Recommendation**

We highly recommend to take this research project in combination with the "Interactive Learning" seminar.

It is highly recommended to attend the "Explainable Artificial Intelligence" lecture in parallel or prior to this project.

- Experience in Machine Learning is recommended, e.g. through prior coursework.
- The Computer Science Department offers several great lectures e.g., "Maschinelles Lernen - Grundlagen und Algorithmen" and "Deep Learning"
- A good mathematical background will be beneficial
- Python experience is recommended
- We might use the PyTorch deep learning library in the exercises. Some prior knowledge in this is helpful but not necessary.
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Legend: 🖥 Online, ☑ Blended (On-Site/Online), ☑ On-Site, ✗ Cancelled
### 6.321 Course: Research Project (Project, 1st Semester) - Project Proposal [T-INFO-110220]

**Responsible:** Prof. Dr. Bernhard Beckert  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-105037 - Research Project (Project, 1st Semester)

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ☑ Cancelled
### 6.322 Course: Research Project (Project, 2nd Semester) - Oral Exam [T-INFO-110221]

**Responsible:** Prof. Dr. Bernhard Beckert  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-105038 - Research Project (Project, 2nd Semester)

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 👤 On-Site, ✗ Cancelled
### Course: Research Project (Project, 2nd Semester) - Presentation [T-INFO-110222]

- **Responsible:** Prof. Dr. Bernhard Beckert
- **Organisation:** KIT Department of Informatics
- **Part of:** M-INFO-105038 - Research Project (Project, 2nd Semester)

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- ❌ Cancelled
### 6.324 Course: Research Project (Project, 2nd Semester) - Scientific Report [T-INFO-110223]

| Responsible: | Prof. Dr. Bernhard Beckert |
| Organisation: | KIT Department of Informatics |
| Part of: | M-INFO-105038 - Research Project (Project, 2nd Semester) |

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#### Events

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<td>2400070</td>
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<td>6.5 SWS</td>
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#### Exams

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<td>Research Project (Project, 2nd Semester) - Written Exam</td>
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<td>Research Project (Project, 2nd Semester) - Scientific Report</td>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
6.325 Course: Research Project Autonomous Learning Robots [T-INFO-110861]

**Responsible:** Prof. Dr. Gerhard Neumann

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-105378 - Research Project Autonomous Learning Robots

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**Events**

| ST 2024 | 2400112 | Research Laboratory Autonomous Learning Robots | 4 SWS | Practical course / 🧩 | Neumann, Freymuth, Hoang, Jia |

Legend: 📱 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled

**Competence Certificate**
- The discussed algorithms have to be implemented successfully.
- The experiments need to be conducted scientifically and need to be well documented.
- The final report is well written and well structured

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

**Research Laboratory Autonomous Learning Robots**

2400112, SS 2024, 4 SWS, Language: German/English, Open in study portal

**Practical course (P) Blended (On-Site/Online)**

**Content**

Each student has to choose one of the offered topics from the area of robot learning / reinforcement learning / imitation learning or deep learning for robotics. The students will conduct a literature survey to acquire an understanding of the field and then implement one or several algorithms. The algorithms need to be evaluated against available baselines on standard benchmark tasks as well as on (custom-made) physically realistic simulations and/or a real robot platform. The experiments have to be documented in a report.

Experience in Machine Learning is recommended

**Organizational issues**

Ein Rücktritt ist innerhalb von zwei Wochen nach Vergabe des Themas möglich.

Arbeitsaufwand 180h
6.326 Course: Responsible Artificial Intelligence [T-WIWI-111385]

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

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

**Part of:**
- M-WIWI-103117 - Data Science: Data-Driven Information Systems
- M-WIWI-103118 - Data Science: Data-Driven User Modeling
- M-WIWI-105923 - Incentives, Interactivity & Decisions in Organizations

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<td>Lecture / 🗣️</td>
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**Exams**

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**Competence Certificate**
The final grade is based on an examination of other type according to § 4 Par. 2 No. 3. It consists of:

- The completion of an exercise including a short presentation (15 min)(max. 30 points)
- The completion of a case study including an oral exam (max. 60 points).

Further details are explained during the lecture.

**Prerequisites**
Prior to the start of the lecture, introductory materials will be provided for self-study. The lecture has a limitation of participants. Therefore, prior registration via the Wiwi-Portal is mandatory.
Course: Risk Management in Industrial Supply Networks [T-WIWI-102826]

**Responsible:** Prof. Dr. Frank Schultmann

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

**Part of:**
- M-WIWI-101412 - Industrial Production III
- M-WIWI-101471 - Industrial Production II

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**Exams**

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<td>Lecture (V)</td>
<td>English</td>
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</table>

**Competence Certificate**

The assessment consists of an oral (30 minutes) or written exam (60 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (examination of another type, following §4(2), 3 of the examination regulation).

**Prerequisites**

None

**Recommendation**

None

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

**Risk Management in Industrial Supply Networks**

2581992, WS 23/24, 2 SWS, Language: English, Open in study portal

**Content**

Students learn methods and tools to manage risks in complex and dynamically evolving supply chain networks. Students learn the key terms and concepts of risk management and decision theory, in particular expected utility theory. Based on the theoretic prerequisites, students are able to determine and analyze risk diversification, risk pooling, insurance mechanisms and get an overview on statistical risk measures and real options. These approaches are adapted to analyze supply chain risks in a network context. In this manner, students gain knowledge in basic notions of network theory, network metrics and network-strategies for supply chain decisions.

- Introduction
- Risks in decisions under uncertainty: Expected Utility Theory & risk preferences
- The newsvendor model: multivariate risks and insurance
- Risk measures & evaluation techniques: Value-at-Risk, Conditional Value at Risk, Monte Carlo and Real Options
- Transparency in complex supply chains
- Network risk: network basics and criticality
- Risk in supply networks: empirical approaches and insights

**Literature**

Wird in der Veranstaltung bekannt gegeben.
6.328 Course: Roadmapping [T-WIWI-102853]

Responsible: Dr. Daniel Jeffrey Koch
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101488 - Entrepreneurship (EnTechnon)
M-WIWI-101507 - Innovation Management
M-WIWI-101507 - Innovation Management

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Competence Certificate

Prerequisites
None

Recommendation
Prior attendance of the course Innovation Management is recommended.

Annotation
See German version.
6 COURSES

6.329 Course: Robotics - Practical Course [T-INFO-105107]

<table>
<thead>
<tr>
<th>Responsible:</th>
<th>Prof. Dr.-Ing. Tamim Asfour</th>
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<td>Part of:</td>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

Competence Certificate
The assessment is carried out as an examination of another type (§ 4 Abs. 2 No. 3 SPO). It is composed of several sub-tasks.

Prerequisites
Knowledge of the programming language C++ is required.

Recommendation

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

Robotic - Practical Course
24870, SS 2024, 4 SWS, Language: German, Open in study portal

Practical course (P)
On-Site

Content
The practical course is offered as an accompanying course to the lectures Robotics I-III. Every week, a small team of students will work on solving a given robotics problem. The list of topics includes robot modeling and simulation, inverse kinematics, robot programming via statecharts, collision-free motion planning, grasp planning, robot vision and robot learning.

Learning Objectives:
The student knows concrete solutions for different problems in robotics. He/she uses methods of inverse kinematics, grasp and motion planning, and visual perception. The student can implement solutions in the programming languages C++ and Python with the help of suitable software frameworks.

Organizational issues
Die Erfolgskontrolle erfolgt in Form einer Prüfungsleistung anderer Art nach § 4 Abs. 2 Nr. 3 SPO und besteht aus mehreren Teilaufgaben.

Arbeitsaufwand: 180 h

Voraussetzungen: Kenntnisse in der Programmiersprache C++ werden vorausgesetzt.


Zielgruppe: Modul für Master Maschinenbau, Mechatronik und Informationstechnik, Elektrotechnik und Informationstechnik
6.330 Course: Robotics I - Introduction to Robotics [T-INFO-108014]

**Responsible:** Prof. Dr.-Ing. Tamim Asfour  
**Organisation:** KIT Department of Informatics  
**Part of:**  
M-INFO-100893 - Robotics I - Introduction to Robotics

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<td>ST 2024</td>
<td>7500218</td>
<td>Robotik I - Einführung in die Robotik</td>
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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled

**Competence Certificate**

The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 60 minutes.

**Prerequisites**

none.
T 6.331 Course: Robotics II - Humanoid Robotics [T-INFO-105723]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Organisation: KIT Department of Informatics
Part of: M-INFO-102756 - Robotics II - Humanoid Robotics

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Events

| ST 2024 | 2400074 | Robotics II: Humanoid Robotics | 2 SWS | Lecture / 🗣 | Asfour |

Exams

| WT 23/24 | 7500211 | Robotics II: Humanoid Robotics | Asfour |
| ST 2024  | 7500086 | Robotics II: Humanoid Robotics | Asfour |

Legend: Online; Blended (On-Site/Online); 🗣 On-Site; X Cancelled

Competence Certificate
The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 60 minutes.

Recommendation
Having visited the lectures on Robotics I - Introduction to Robotics and Mechano-Informatics and Robotics is recommended.

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

V Robotics II: Humanoid Robotics
2400074, SS 2024, 2 SWS, Language: English, Open in study portal

Content
The lecture presents current work in the field of humanoid robotics that deals with the implementation of complex sensorimotor and cognitive abilities. In the individual topics different methods and algorithms, their advantages and disadvantages, as well as the current state of research are discussed.

The topics addressed are: Applications and real world examples of humanoid robots; biomechanical models of the human body, biologically inspired and data-driven methods of grasping, imitation learning and programming by demonstration; semantic representations of sensorimotor experience as well as cognitive software architectures of humanoid robots.

Learning Objectives:
The students have an overview of current research topics in autonomous learning robot systems using the example of humanoid robotics. They are able to classify and evaluate current developments in the field of cognitive humanoid robotics.

The students know the essential problems of humanoid robotics and are able to develop solutions on the basis of existing research.

Organizational issues
Die Erfolgskontrolle erfolgt in Form einer schriftlichen Prüfung im Umfang von i.d.R. 60 Minuten nach § 4 Abs. 2 Nr. 1 SPO.
Arbeitsaufwand: 90 h

Empfehlungen: Der Besuch der Vorlesungen Robotik I – Einführung in die Robotik und Mechano-Informatic in der Robotik wird empfohlen
Zielgruppe: Modul für Master Informatik, Master Maschinenbau, Mechatronik und Informationstechnik, Elektrotechnik und Informationstechnik

Literature
Weiterführende Literatur
Wissenschaftliche Veröffentlichungen zum Thema, werden auf der VL-Website bereitgestellt.
6.332 Course: Robotics III - Sensors and Perception in Robotics [T-INFO-109931]

**Responsible:** Prof. Dr.-Ing. Tamim Asfour

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-104897 - Robotics III - Sensors and Perception in Robotics

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Legend: 📱 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 60 minutes.

**Prerequisites**

none.

**Recommendation**

Attending the lecture Robotics I – Introduction to Robotics is recommended.

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

**Content**

The lecture supplements the lecture Robotics I with a broad overview of sensors used in robotics. The lecture focuses on visual perception, object recognition, semantic scene interpretation and (inter-)active perception. The lecture is divided into two parts:

In the first part a comprehensive overview of current sensor technologies is given. A basic distinction is made between sensors for the perception of the environment (exteroceptive) and sensors for the perception of the internal state (proprioceptive).

The second part of the lecture concentrates on the use of exteroceptive sensors in robotics. The topics covered include tactile exploration and visual data processing, including advanced topics such as feature extraction, object localization, semantic scene interpretation and (inter-)active perception.

**Learning Objectives:**

Students know the main sensor principles used in robotics and understand the data flow from physical measurement through digitization to the use of the recorded data for feature extraction, state estimation and environmental modeling.

Students are able to propose and justify suitable sensor concepts for common tasks in robotics.

**Organizational issues**

Die Erfolgskontrolle erfolgt in Form einer schriftlichen Prüfung im Umfang von i.d.R. 60 Minuten nach § 4 Abs. 2 Nr. 1 SPO.

Modul für Master Maschinenbau, Mechatronik und Informationstechnik, Elektrotechnik und Informationstechnik

Empfehlungen: Der Besuch der Vorlesung *Robotik I – Einführung in die Robotik* wird empfohlen

Zielgruppe: Die Vorlesung richtet sich an Studierende der Informatik, der Elektrotechnik und des Maschinenbaus sowie an alle Interessenten an der Robotik.

Arbeitsaufwand: 90 h
Literature
Eine Foliensammlung wird im Laufe der Vorlesung angeboten.
Begleitende Literatur wird zu den einzelnen Themen in der Vorlesung bekannt gegeben.
6.333 Course: Scientific Methods to Design and Analyze Secure Decentralized Systems [T-INFO-111568]

**Responsible:** Prof. Dr. Hannes Hartenstein

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-105780 - Scientific Methods to Design and Analyze Secure Decentralized Systems

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<td>2400009</td>
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**Exams**

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<th>Course Title</th>
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<td>WT 23/24</td>
<td>7500050</td>
<td>Scientific Methods to Design and Analyze Secure Decentralized Systems</td>
<td></td>
<td>Hartenstein</td>
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</table>

**Recommendation**

Prior knowledge on the abstract concepts as well as concrete use cases of decentralized systems is strongly recommended. The "Decentralized Systems: Fundamentals, Modeling, and Applications" lecture covers all necessary aspects, but equivalent lectures and / or self-study can also be sufficient.

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

<table>
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<th>Course Title</th>
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<td>V</td>
<td>2400009</td>
<td>Scientific Methods to Design and Analyze Secure Decentralized Systems</td>
<td>Lecture / Practice (VÜ) / On-Site</td>
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Content

Decentralized Systems (like peer-to-peer- or blockchain-based systems) are systems controlled by multiple parties who make their own independent decisions to reach a common goal. However, not knowing which parties are trustworthy and which are betrayers requires a radically different way of thinking. Based on the lecture “Decentralized Systems: Fundamentals, Modeling, and Applications”, in this lecture, we cover the necessary scientific methods to analyze existing and to create new decentralized systems. We treat both, selected empirical and formal methods and their tradeoffs, as well as the overarching philosophy of science behind the research process. Together with its practical parts, this lecture provides the foundational scientific toolbox to work on the decentralized systems of the future.

Competency Goals:

1. Philosophy of Science: The student understands epistemological principles like the scientific and mathematical process, within the context of networked and decentralized systems. The student knows about the current limits of scientific research, especially in regards to the security of a given decentralized system.
2. Empirical Methods: Observation / Monitoring: The student is able to construct setups to monitor system properties related to performance or security. The student knows how to observe a decentralized system like an overlay network without interference, i.e., without impact on the behavior to measure as well as the overall system functionality.
3. Combined Empirical / Formal Methods: The student has a fundamental understanding of Discrete Event Simulations, as well as stochastic modelling and random number generation. The student is able to conduct a simulation study consisting of observation, modelling, simulation, validation, and result analysis.
4. Formal Methods: The student knows how to apply formal methods like formal verification / model checking and model comparison / simulation-based proofs to decentralized systems. The student understands tradeoffs between empirical and formal methods, and can choose suitable methods for given research tasks.
5. Applications in Research: The student understands how the methods of this lecture are applied to practical examples, and knows how to apply the methods on problems of a researcher’s everyday life.

Workload

Lecture workload:
1. Attendance time (Course, exercise): 3 SWS: 15 x 3h = 45h
2. Self-study (e.g. independent review of course material, work on homework assignments)
   Weekly preparation and follow-up of the lecture/exercise: 15 x 3 SWS x 1.5h = 67.5h
3. Preparation for the exam: 37.5h
Σ = 150h = 5 ECTS

Competency certificate:
- The assessment is carried out as an oral examination (§ 4 Abs. 2 Nr. 2 SPO) lasting 20 minutes.

Depending on the number of participants, it will be announced six weeks before the examination (§ 6 Abs. 3 SPO) whether the success control
   - in the form of an oral examination pursuant to § 4 Abs. 2 Nr. 2 SPO or
   - in the form of a written examination in accordance with § 4 Abs. 2 Nr. 1 SPO

takes place.
### 6.334 Course: Selected Legal Issues of Internet Law [T-INFO-108462]

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<td>Each summer term</td>
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**Responsible:** N.N.  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101215 - Intellectual Property Law

#### Events

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#### Exams

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**Legend:** Online, Blended (On-Site/Online), On-Site, Cancelled
6.335 Course: Semantic Web Technologies [T-WIWI-110848]

**Responsible:** Dr.-Ing. Tobias Christof Käfer

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

**Part of:**
- M-WIWI-101455 - Web Data Management
- M-WIWI-101456 - Intelligent Systems and Services
- M-WIWI-105366 - Artificial Intelligence

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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 2024, 2 SWS, Language: English, [Open in study portal](#)
Content
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.

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

Learning objectives:
The student

- understands the motivation and foundational ideas behind Semantic Web and Linked Data technologies, and is able to analyse and realise systems
- demonstrates basic competency in the areas of data and system integration on the web
- masters advanced knowledge representation scenarios involving ontologies

Recommendations:
Lectures on Informatics of the Bachelor on Information Systems (Semester 1-4) or equivalent are required. Knowledge of modeling with UML is required.

Workload:

- The total workload for this course is approximately 135 hours
- Time of presentness: 45 hours
- Time of preparation and postprocessing: 60 hours
- Exam and exam preparation: 30 hours

Literature


Weitere Literatur


Exercises to Semantic Web Technologies
2511311, SS 2024, 1 SWS, Language: English, Open in study portal
Content
The exercises are related to the lecture Semantic Web Technologies.

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.

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

Learning objectives:
The student

- understands the motivation and foundational ideas behind Semantic Web and Linked Data technologies, and is able to analyse and realise systems
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- masters advanced knowledge representation scenarios involving ontologies

Recommendations:
Lectures on Informatics of the Bachelor on Information Systems (Semester 1-4) or equivalent are required. Knowledge of modeling with UML is required.

Organizational issues
Die Übungen finden im Rahmen der Termine der Blockvorlesung statt.

Literature


Weitere Literatur

### 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-102736 - Seminar Module Economic Sciences

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Information Systems M.Sc.
Module Handbook as of 11/04/2024

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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/](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:**

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<thead>
<tr>
<th>Date</th>
<th>Code</th>
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<td>ST 2024</td>
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<td>Entrepreneurship Research</td>
<td>Terzidis</td>
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<tr>
<td>ST 2024</td>
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<td>Mädche</td>
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<tr>
<td>ST 2024</td>
<td>7900233</td>
<td>Seminar in Marketing and Sales (Master)</td>
<td>Klarmann</td>
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<tr>
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<td>Mädche</td>
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<tr>
<td>ST 2024</td>
<td>7900307</td>
<td>Service Design Thinking</td>
<td>Satzger</td>
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<tr>
<td>ST 2024</td>
<td>7900312</td>
<td>Practical Seminar Service Innovation</td>
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<tr>
<td>ST 2024</td>
<td>79-2579909-M</td>
<td>Seminar Management Accounting - Special Topics (Master)</td>
<td>Wouters</td>
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<tr>
<td>ST 2024</td>
<td>792581030</td>
<td>Seminar Energy Economics IV</td>
<td>Fichtner</td>
<td>On-Site</td>
</tr>
<tr>
<td>ST 2024</td>
<td>792581031</td>
<td>Seminar Energy Economics V</td>
<td>Plötz</td>
<td>On-Site</td>
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<tr>
<td>ST 2024</td>
<td>7981976</td>
<td>Seminar in Production and Operations Management I</td>
<td>Schultmann</td>
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<tr>
<td>ST 2024</td>
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<td>Seminar in Production and Operations Management III</td>
<td>Schultmann</td>
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<tr>
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<td>7981979</td>
<td>Seminar Energy Economics I</td>
<td>Fichtner</td>
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<td>Seminar Energy Economics III</td>
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<td>On-Site</td>
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</tbody>
</table>

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled
Content
Within this seminar eLearning videos are produced to different topics out of the contents of our lectures. The student gets in touch with scientific work. Through profound working on a specific scientific topic the student is meant to learn the foundations of scientific research and reasoning in particular in finance. Through conduction of the video the student becomes familiar with the fundamental techniques for presentations and foundations of scientific reasoning. In addition, the student earns rhetorical skills.

The success is monitored by the development of an eLearning video and by the writing of a project report (according to §4(2), 3 SPO).

The overall grade is made up of these partial performances.

Recommendations:
Knowledge of the content of the modules Essentials of Finance [WW3BWLFBV1] (for bachelor students) and F1 (Finance) [WW4BWLFBV1] (for master students) is assumed.

The total workload for this course is approximately 90 hours. For further information see German version.

Organizational issues
Zwischenpräsentation am 11.12.23, 16 Uhr und Abschlusspräsentation am 23.01.24, 17:30 Uhr, beides am Campus B (Geb. 09.21), Raum 209

Business Data Analytics
2540473, WS 23/24, 2 SWS, Language: German/English, Open in study portal

Content
wird auf deutsch und englisch gehalten

Organizational issues
Blockveranstaltung, siehe WWW

Master Seminar in Data Science and Machine Learning
2540510, WS 23/24, 2 SWS, Language: German, Open in study portal

Content
The topics are redefined each semester on basis of current research topics. The topics will be announced on the website of the Wiwi-Portal.

Aim
The student
- looks critically into current research topics in the fields of Human Resource Management and Personnel Economics.
- trains his/her presentation skills.
- learns to get his/her ideas and insights across in a focused and concise way, both in oral and written form, and to sum up the crucial facts.
- cultivates the discussion of research approaches.

Workload
The total workload for this course is: approximately 90 hours.

Lecture: 30h
Preparation of lecture: 45h
Exam preparation: 15h

Literature
Selected journal articles and books.

Organizational issues
Blockveranstaltung siehe Homepage
Seminar Human Resources and Organizations (Master)

Content
The topics are redefined each semester on basis of current research topics. The topics will be announced on the website of the Wiwi-Portal.

Aim
The student
- looks critically into current research topics in the fields of human resources and organizations.
- trains his / her presentation skills.
- learns to get his / her ideas and insights across in a focused and concise way, both in oral and written form, and to sum up the crucial facts.
- cultivates the discussion of research approaches.

Workload
The total workload for this course is: approximately 90 hours.
Lecture: 30h
Preparation of lecture: 45h
Exam preparation: 15h

Literature
Selected journal articles and books.

Organizational issues
Blockveranstaltung siehe Homepage

Seminar Management Accounting - Special Topics

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 several meetings that are spread throughout the semester.

Learning objectives:
- Students are largely independently able to identify a distinct topic in Management Accounting,
- Students are capable to research the topic, analyze the information, to conceptualize and deduct fundamental principles and relationships from relatively unstructured information,
- Students can afterwards logically and systematically present the results in writing and as an oral presentation, following a scientific approach (structuring, terminology, sources.

Examination:
- The performance review is carried out in the form of a "Prüfungsleistung anderer Art" (following § 4 (2) No. 3 of the examination regulation), which in this case is an essay the seminar participants prepare in group work.
- The final grade of the course is the grade awarded to the paper.

Required prior Courses:
- The LV "Betriebswirtschaftslehre: Finanzwirtschaft und Rechnungswesen" (2600026) must have been completed before starting this seminar.

Workload:
- The total workload for this course is approximately 90 hours. For further information see German version.

Note:
- Maximum of 12 students.

Organizational issues
Ort und Zeit werden noch bekannt gegeben bzw. über ILIAS
Seminar Management Accounting - Sustainability Topics

2579919, WS 23/24, 2 SWS, Language: English, Open in study portal

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 several meetings that are spread throughout the semester.

Learning objectives:
- Students are largely independently able to identify a distinct topic in Management Accounting,
- Students are capable to research the topic, analyze the information, to conceptualize and deduct fundamental principles and relationships from relatively unstructured information,
- Students can afterwards logically and systematically present the results in writing and as an oral presentation, following a scientific approach (structuring, terminology, sources).

Examination:
- The performance review is carried out in the form of a “Prüfungsleistung anderer Art” (following § 4 (2) No. 3 of the examination regulation), which in this case is an essay the seminar participants prepare in group work.
- The final grade of the course is the grade awarded to the paper.

Required prior Courses:
- The LV "Betriebswirtschaftslehre: Finanzwirtschaft und Rechnungswesen" (2600026) must have been completed before starting this seminar.

Workload:
- The total workload for this course is approximately 90 hours. For further information see German version.

Note:
- Maximum of 8 students.

Organizational issues
Ort und Zeit werden noch bekannt gegeben bzw. über ILIAS

Literature
Will be announced in the course.

Interactive Analytics Seminar

2400121, SS 2024, 2 SWS, Language: English, Open in study portal

Content
Providing new and innovative ways for interacting with data is becoming increasingly important. In this seminar, an interdisciplinary team of students engineers a running software prototype of an advanced interactive system leveraging state-of-the-art hardware and software focusing on an analytical use case. The seminar is carried out in cooperation between Teco/Chair of Pervasive Computing Systems (Prof. Beigl) and the Institute of Information Systems and Marketing (Research Group ISSD, Prof. Mädche). This seminar follows an interdisciplinary approach. Students the fields of computer science, information systems and industrial engineering work together in teams.

Learning Objectives
- Explore and specify a data-driven interaction challenge
- Suggest and evaluate different design solutions for addressing the identified problem
- Build interactive analytics prototypes using advanced interaction concepts and pervasive computing technologies

Prerequisites
Strong analytic abilities and profound skills in SQL as well as Python and/or R are required.

Literature
Further literature will be made available in the seminar.
Organizational issues
nach Vereinbarung

Design Seminar: Digital Citizen Science
2500027, SS 2024, 2 SWS, Open in study portal

Affective User Research for Human-AI Interaction
2500036, SS 2024, 2 SWS, Language: English, Open in study portal

Content
User research aims to understand users' needs, behaviors, and attitudes to effectively inform the design and development of products or services. It is a key endeavor to learn how users experience digital technologies, what is working well and what is not, and identify gaps and future needs in order to personalize and improve the user experience. To design for positive user experiences, investigating affective user reactions (e.g., emotions, stress, flow) is of particular interest. Therefore, affective user research collects and analyzes behavioral data and affective reactions of users when engaging with products or services. With the growing amount of data and computing capabilities, artificial intelligence (AI) technologies are increasingly used in user research for the prediction of affective user states when interacting with digital technology.

The recent advances in artificial intelligence (AI), however, may not only support affective user research as a method of inquire, but it also has found its way into our daily lives as humans interact with it every day, for example, in form of recommendation engines on social media, in health applications, or as personal assistants based on large language models (LLMs) to receive text output for code completion, ideation, or writing. Interacting with AI-based digital technologies also triggers affective user reactions. However, these affective user reactions in Human-AI Interactions are yet to be understood.

In this seminar, participants will apply methods for affective user research on a particular type of Human-AI Interaction, the prompting of LLMs. LLM prompting is expected to become the up-and-coming form of interacting with AI in the future. To receive output from an LLM, users must send a prompt to the LLM. Given a prompt, an LLM responds incrementally with “tokens” (e.g., groups of letters, numbers, punctuation) which build the output. Structuring the prompt and receiving output influences the affective reactions of the user. Precisely, these user reactions should be investigated by the students participating in this seminar.

In the “Affective User Research for Human-AI Interaction” seminar, participating students will learn how to apply AI-based user research methods with a specific emphasis on the affective dimension when interacting with AI-based digital technologies. The goal of this seminar is to provide students with a unique set of skills in (1) quantitative data analysis, (2) knowledge about Human-AI Interaction and, in particular, LLM prompting, and (3) prediction of affective user states (e.g., emotions, stress) using state-of-the-art machine learning (ML) techniques. Students will leverage a dataset on Human-AI Interaction and gain in-depth knowledge from it as part of the seminar. The seminar emphasizes the importance of applying the aforementioned affective user research methods in an ethically compliant form. The core activities include:

- Learn the fundamentals of AI-based affective user research methods.
- Explore a dataset on Human-AI Interaction with the specific focus on the interplay of user behavior and affective user reactions.
- Developing AI-based supervised machine learning techniques for predicting user activities and affective user states.
- Present findings and insights to the seminar audience and discuss the results.

The seminar is held by Dr. Ivo Benke in cooperation with Dr. Lennard Schmidt. Both are experts from industry in the fields of affective user research, quantitative data analysis, and Human-AI Interaction.

Learning Objectives

- Understand the potential of combining user behavior and affective user reaction data for affective user research.
- Develop hands-on knowledge by applying AI-based affective user research methods on a real-world dataset.
- Develop a deeper understanding of a prominent form of Human-AI Interaction (e.g., LLM prompting).
- Deliver a presentation in a scientific context in front of an auditorium.

Human-Centered Systems Seminar: Engineering
2500125, SS 2024, 3 SWS, Language: English, Open in study portal

Content
Formerly known as "Current Topics in Digital Transformation"

With this seminar, we aim to provide students with the possibility to independently work on state-of-the-art research topics in addition to the knowledge gained in the lectures of the human-centered systems lab (Prof. Mädche). Students will work on a dedicated topic in the context of human-centered systems and apply a pre-defined research method. A broad spectrum of topics is offered every semester, topics may range from creating an experimental design, analyzing collected data, or systematically comparing existing software prototypes in a specific field of interest.
### Content

User-adaptive systems collect and analyze biosignals from users to recognize user states as a basis for adaptation. Thermic, mechanical, electric, acoustic, and optical signals are collected using sensors which are integrated in wearables, e.g., glasses, earphones, belts, or bracelets. The collected data is processed with analytics and machine learning techniques in order to determine short-term, evolving over time, and long-term user states in the form of user characteristics, affective-cognitive states, or behavior. Finally, the recognized user states are leveraged for realizing user-centric adaptations.

In this seminar, interdisciplinary teams of students design, develop, and evaluate a user-adaptive system prototype leveraging state-of-the-art hard- and software. This seminar follows an interdisciplinary approach. Students from the fields of computer science, information systems and industrial engineering & management collaborate in the prototype design, development, and evaluation.

The seminar is carried out in cooperation between Teco/Chair of Pervasive Computing Systems (Prof. Beigl) and the Institute of Information Systems and Marketing (h-lab, Prof. Mädche). It is offered as part of the DFG-funded graduate school "KD2School: Designing Adaptive Systems for Economic Decisions" (https://kd2school.info/)

### Learning objectives of the seminar

- Explain what a user-adaptive system is and how it can be conceptualized
- Suggest and evaluate different design solutions for addressing the identified problem
- Build a user-adaptive system prototype using state-of-the-art hard- and software
- Perform a user-centric evaluation of the user-adaptive system prototype

### Prerequisites

Strong analytical abilities and profound software development skills are required.

### Organizational issues

Termine werden bekannt gegeben

### Literature

Required literature will be made available in the seminar.
Content
Formerly known as “Information Systems and Service Design Seminar”

With this seminar, we aim to provide students with the possibility to independently work on state-of-the-art research topics in addition to the knowledge gained in the lectures of the research group IS I (Prof. Mädeche). The research group “Information Systems I” (IS I) headed by Prof. Mädeche focuses in research, education, and innovation on designing interactive intelligent systems. It is positioned at the intersection of Information Systems and Human-Computer Interaction (HCI).

In the seminar, participants will get deeper insights in a contemporary research topic in the field of information systems, specifically interactive intelligent systems.

The actual seminar topics will be derived from current research activities of the research group. Our research assistants offer a rich set of topics from our research clusters (digital experience and participation, intelligent enterprise systems, or digital services design & innovation). Students can select among these topics individually depending on their personal interests. The seminar is carried out in the form of a literature-based thesis project. In the seminar, students will acquire the important methodological skills of running a systematic literature review.

Learning Objectives
- focus on a contemporary topic at the intersection of Information Systems and Human-Computer Interaction (HCI), specifically interactive intelligent systems
- carry out a structured literature search for a given topic
- aggregate the collected information in a suitable way to present and extract knowledge
- write a seminar thesis following academic writing standards
- deliver a presentation in a scientific context in front of an auditorium

Prerequisites
No specific prerequisites are required for the seminar.

Literature
Further literature will be made available in the seminar.

Organizational issues
Termine werden bekannt gegeben

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<tr>
<th>Entrepreneurship Research</th>
<th>2545002, SS 2024, 2 SWS, Language: English, Open in study portal</th>
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<tr>
<td>Seminar (S)</td>
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</tbody>
</table>

Content

In this course, the students choose from various relevant and current research topics in entrepreneurship and independently develop a topic that suits them in small teams. Initially, there is an introduction to standard methods such as systematic literature review, design science, qualitative and quantitative data analysis, and more. The seminar topic must be scientifically prepared and presented in 15-20 pages as part of a written elaboration. The seminar results are presented in a block event at the end of the semester (20 min + 10 min open discussion).

Learning Objectives

The foundations of independent scholarly work (literature review, argumentation + discussion, citation of literature sources, application of qualitative, quantitative, and simulation methods) are developed as part of the written elaboration. The competencies acquired in the seminar can be utilized in preparing for a potential master’s thesis. Therefore, the seminar is mainly aimed at students who intend to write their thesis at the Chair of Entrepreneurship and Technology Management and wish to gain substantial experience in entrepreneurship research.

Organizational issues

Monday, 17.06.2024, 10.00-17.00
Thursday, 27.06.2024, 10.00-17.00
Thursday, 25.07.2024, 10.00-17.00

Registration is via the Wiwi-Portal.

Literature

Will be announced in the seminar.

Information Systems M.Sc.
Module Handbook as of 11/04/2024
Hospital Management
2550493, SS 2024, 2 SWS, Language: German, Open in study portal

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.

The assessment consists of attendance and a presentation or a case study.

Organizational issues
Das Seminar wird als Blockveranstaltung stattfinden. Die Termine werden bei der Anmeldung über das Wiwi-Portal bekanntgegeben.

Seminar Management Accounting - Special Topics
2579909, SS 2024, 2 SWS, Language: English, Open in study portal

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.

Learning objectives:
- Students are largely independently able to identify a distinct topic in Management Accounting.
- Students are capable to research the topic, analyze the information, to conceptualize and deduct fundamental principles and relationships from relatively unstructured information.
- Students can afterwards logically and systematically present the results in writing and as an oral presentation, following a scientific approach (structuring, terminology, sources).

Workload:
- The total workload for this course is approximately 90 hours. For further information see German version.

Examination:
- The performance review is carried out in the form of a “Prüfungsleistung anderer Art” (following § 4 (2) No. 3 of the examination regulation), which in this case is an essay the seminar participants prepare in group work.
- The final grade of the course is the grade awarded to the paper.

Note:
- Maximum of 16 students.

Organizational issues
Geb.05.20, 2A-12.1; Termine werden bekannt gegeben

Literature
Will be announced in the course.
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 several meetings that are spread throughout the semester.

Learning objectives:

- Students are largely independently able to identify a distinct topic in Management Accounting,
- Students are capable to research the topic, analyze the information, to conceptualize and deduct fundamental principles and relationships from relatively unstructured information,
- Students can afterwards logically and systematically present the results in writing and as an oral presentation, following a scientific approach (structuring, terminology, sources).

Workload:

- The total workload for this course is approximately 90 hours. For further information see German version.

Examination:

- The performance review is carried out in the form of a "Prüfungsleistung anderer Art" (following § 4 (2) No. 3 of the examination regulation), which in this case is an essay the seminar participants prepare in group work.
- The final grade of the course is the grade awarded to the paper.

Note:

- Maximum of 8 students.

Organizational issues
Geb.05.20, 2A-12.1; Termine werden bekannt gegeben

Literature
Will be announced in the course.
### 6.337 Course: Seminar in Economic Policy [T-WIWI-102789]

**Responsible:** Prof. Dr. Ingrid Ott  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101514 - Innovation Economics

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<td>Grade to a third</td>
<td>Each term</td>
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**Exams**

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<td>7900212</td>
<td>Seminar in Economic Policy</td>
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<tr>
<td>ST 2024</td>
<td>7900051</td>
<td>Seminar in Economic Policy</td>
<td>Ott</td>
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</table>

**Competence Certificate**

The assessment is carried out through a term paper within the range of 12 to 15 pages, a presentation of the results of the work in a seminar meeting, and active participation in the discussions of the seminar meeting (§ 4 (2), 3 SPO).

The final grade is composed of the weighted scored examinations (Essay 50%, 40% oral presentation, active participation 10%).

**Prerequisites**

None

**Recommendation**

At least one of the lectures “Theory of Endogenous Growth” or “Innovation Theory and Policy” should be attended in advance, if possible.
## 6.338 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-102736 - Seminar Module Economic Sciences

<table>
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<th>Grading scale</th>
<th>Recurrence</th>
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<tr>
<td>Examination of another type</td>
<td>3</td>
<td>Grade to a third</td>
<td>Each term</td>
<td>1</td>
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</tbody>
</table>

### Events

- **WT 23/24**  
  - **2500024**: Wirtschaftstheoretisches Seminar IV (Master)  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Puppe, Kretz, Ammann

- **WT 23/24**  
  - **2500032**: Disruption and the Digital Economy: Markets, Strategies, and Society (Master)  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Rosar

- **WT 23/24**  
  - **2500051**: The Challenges of the Mobility Transition in Urban Areas - Which Contributions Can Be Expected from the Serious Game “MobileCityGame”?  
    - Type: Seminar  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Szimba

- **WT 23/24**  
  - **2500052**: Seminar on Topics in Digital Economics  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Reiß, Hillenbrand, Potarca

- **WT 23/24**  
  - **2520367**: Strategische Entscheidungen  
    - Type: Seminar  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Ehrhart

- **WT 23/24**  
  - **2520405**: Topics in Experimental Economics  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Reiß, Peters

- **WT 23/24**  
  - **2520500**: Workshop on Economics, Finance and Statistics  
    - Type: Seminar  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Puppe, Brumm, Nieken, Ott, Reiß, Ruckes, Schienle, Szech, Uhrig-Homburg, Wigger, Krüger

- **WT 23/24**  
  - **2520563**: Wirtschaftstheoretisches Seminar III (Master)  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Puppe, Ammann, Kretz

- **WT 23/24**  
  - **2521310**: Topics in Econometrics  
    - Type: Seminar  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Schienle, Rüter

- **WT 23/24**  
  - **2560130**: Seminar Public Finance  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Wigger, Setio, Schmelzer

- **WT 23/24**  
  - **2560142**: Lying and Cheating in Economic Experiments (Master)  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Rau

- **WT 23/24**  
  - **2560143**: AI and Digitization for Society (Master)  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Zhao

- **WT 23/24**  
  - **2560282**: Seminar in Economic Policy  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Ott, Assistenten

- **WT 23/24**  
  - **2560400**: Seminar in Macroeconomics I  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Brumm, Krause, Pegorari, Hußmann

- **WT 23/24**  
  - **2560401**: Seminar in Macroeconomics II  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Brumm, Krause, Pegorari, Hußmann

- **WT 23/24**  
  - **2561208**: Selected aspects of European transport planning and -modelling  
    - Type: Seminar  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Szimba

- **ST 2024**  
  - **2500004**: Predictive Data Analytics - An Introduction to Statistical Machine Learning  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Schienle, Lerch

- **ST 2024**  
  - **2520367**: Strategische Entscheidungen  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Ehrhart

- **ST 2024**  
  - **2520536**: Seminar in Economic Theory II  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Ammann, Kretz, Okulicz

- **ST 2024**  
  - **2520563**: Wirtschaftstheoretisches Seminar III  
    - Type: Seminar / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Ammann, Kretz, Okulicz

- **ST 2024**  
  - **2521310**: Advanced Topics in Econometrics  
    - Type: Seminar  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Schienle, Krüger, Buse, Rüter, Bracher

- **ST 2024**  
  - **2560130**: Seminar Public Finance  
    - Type: Block / 🧩  
    - Credits: 2 SWS  
    - Grading scale: Grade to a third  
    - Recurrence: Each term  
    - Responsible: Wigger, Schmelzer
ST 2024 2560282 Seminar in economic policy 2 SWS Seminar / 🤵 Ott, Assistenten
ST 2024 2560400 Seminar in Macroeconomics I 2 SWS Seminar / 🧵 Brumm, Krause, Pegorari
ST 2024 2560552 Seminar Shaping AI and Digitization for Society (Master) 2 SWS Seminar / 🧵 Zhao

Exams
WT 23/24 7900015 Seminar Disruption in the Digital Economy (Master) Puppe
WT 23/24 7900139 Selected Aspects of European Transport Planning and Modelling Mitusch
WT 23/24 7900140 Seminar Lying and Cheating in Economic Experiments (Master) Puppe
WT 23/24 7900296 Seminar AI and Digitization for Society (Master) Puppe
WT 23/24 7900354 Die Herausforderungen der Mobilitätswende im urbanen Bereich – welche Beiträge kann das Serious Game "MobileCityGame" liefern? Mitusch
WT 23/24 7900361 Seminar on Topics in Digital Economics Reiß, Hillenbrand
WT 23/24 79100005 Topics in Experimental Economics Reiß
ST 2024 7900051 Seminar in Economic Policy Ott
ST 2024 7900131 Shaping AI and Digitization for Society (Master) Puppe
ST 2024 7900164 Seminar in Economics (Bachelor) Mitusch
ST 2024 79100005 Topics in Experimental Economics Reiß

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

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:

### Disruption and the Digital Economy: Markets, Strategies, and Society (Master)
2500032, WS 23/24, 2 SWS, Language: English, Open in study portal

#### Content
For Master students of the fields Industrial Engineering and Management, Information Engineering and Management, Economics Engineering, Economathematics or Digital Economics.

Objective: The student investigates a market that was (or might be) disrupted from a strategic perspective. Students work in groups. For more information, see http://polit.econ.kit.edu or https://portal.wiwi.kit.edu/Seminare

Seminar Papers of 8–10 pages are to be handed in.

Recommendation: Knowledge in the field of microeconomics and game theory may be helpful.
Organizational issues
Application is possible via https://portal.wiwi.kit.edu/Seminare
Kick-off: 27.10.2023, 14.00 - 15.30 Uhr, Geb. 01.85, KD2Lab (1. OG über Außentreppe), Teamraum
Präsentationen: 15.01.2024 14.00 - 18.00 Uhr, Geb. 01.85, KD2Lab (1. OG über Außentreppe), Teamraum

Topics in Experimental Economics
2520405, WS 23/24, SWS, Language: English, Open in study portal

Organizational issues
(Im WS2021/22 online; sonst Blockseminar; Blücherstraße 17); Termine werden separat bekannt gegeben

Literature
Als Pflichtliteratur dienen ausgewählte Paper.

Topics in Econometrics
2521310, WS 23/24, 2 SWS, Language: German, Open in study portal

Organizational issues
Blockveranstaltung. Termine werden auf Homepage und über Ilias bekannt gegeben

Lying and Cheating in Economic Experiments (Master)
2560142, WS 23/24, 2 SWS, Language: German, Open in study portal

Content
For Master students of the fields Industrial Engineering and Management, Information Engineering and Management, Economics Engineering or Economathematics.

Objective: The student develops an own idea for an economic experiment in this research direction. Students work in groups. Changing topics each semester. For current topics, see http://polit.econ.kit.edu or https://portal.wiwi.kit.edu/Seminare

Seminar Papers of 8–10 pages are to be handed in.

Recommendation: Knowledge in the field of experimental economic research or behavioral economics as well as in the field of microeconomics and game theory may be helpful.

Organizational issues
Application is possible via https://portal.wiwi.kit.edu/Seminare
Kick-off: 24.10.23, 15.00 - 16.30 h, Geb. 01.85, KD2Lab (1. OG über Außentreppe), Teamraum
Präsentationen: 08.01.2024, 14.00 - 18.00 h, Geb. 01.85, KD2Lab (1. OG über Außentreppe), Teamraum

AI and Digitization for Society (Master)
2560143, WS 23/24, 2 SWS, Language: English, Open in study portal

Content
For Master students of the fields Industrial Engineering and Management, Information Engineering and Management, Economics Engineering or Economathematics.

The student develops an own idea for an economic experiment in this research direction. Students work in groups. Changing topics each semester. For current topics, see http://polit.econ.kit.edu or https://portal.wiwi.kit.edu/Seminare

Seminar Papers of 8–10 pages are to be handed in.

Recommendation: Knowledge in the field of experimental economic research or behavioral economics as well as in the field of microeconomics and game theory may be helpful.

Organizational issues
Application is possible via https://portal.wiwi.kit.edu/Seminare
Kick-off: 25.10.2023, 11.00 - 12.00 (online)
Presentations: 12.01.2024, 14.00 - 18.00, Geb. 01.85, KD2Lab (1. OG über Außentreppe), Teamraum

Predictive Data Analytics - An Introduction to Statistical Machine Learning
2500004, SS 2024, 2 SWS, Language: German/English, Open in study portal
Organizational issues
Blockveranstaltung, Termine werden bekannt gegeben

**Advanced Topics in Econometrics**
Course: Seminar in Economics A (Master) [T-WIWI-103478]
Information Systems M.Sc.
Module Handbook as of 11/04/2024

Organizational issues
Blockveranstaltung, Termine werden bekannt gegeben

**Seminar Public Finance**
Course: Seminar in Economics A (Master) [T-WIWI-103478]
Information Systems M.Sc.
Module Handbook as of 11/04/2024

Organizational issues
Blockveranstaltung, Termine werden bekannt gegeben

**Seminar Shaping AI and Digitization for Society (Master)**
Course: Seminar in Economics A (Master) [T-WIWI-103478]
Information Systems M.Sc.
Module Handbook as of 11/04/2024

Organizational issues
Blockveranstaltung, Termine werden bekannt gegeben

### Content

- Participation will be limited to 12 students.
- For Master students of the fields Industrial Engineering and Management, Information Engineering and Management, Economics Engineering or Economathematics.
- Objective: The student develops an own idea for an economic experiment in this research direction. Students work in groups. Changing topics each semester. For current topics, see [http://polit.econ.kit.edu](http://polit.econ.kit.edu) or [https://portal.wiwi.kit.edu/Seminare](https://portal.wiwi.kit.edu/Seminare).
- The acceptance of students for the seminar via the platform [https://portal.wiwi.kit.edu/Seminare](https://portal.wiwi.kit.edu/Seminare) is based on preferences and suitability for the topics. This includes theoretical and practical experience with Behavioral Economics as well as English skills.
- Grading: Seminar Papers of 8–10 pages are to be handed in.
- Students' grades will be based on the quality of presentations in the seminar (40%) and the seminar paper (60%). Students can improve their grades by actively participating in the discussions of the presentations.
- Recommendation: Knowledge in the field of experimental economic research or behavioral economics as well as in the field of microeconomics and game theory may be helpful.

Organizational issues
Registration via WiWi-Portal
Blockveranstaltungen:
- Introductory Meeting April 17, 11.00 - 12.00 Uhr (online)
- Seminar Presentations June 14, 2024, 14.00 - 18.30 Uhr (in person)
## 6.339 Course: Seminar in Informatics B (Master) [T-WIWI-103480]

**Responsible:** Professorenschaft des Instituts AIFB  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-INFO-102822 - Seminar Module Informatics

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### Events

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<th>Type</th>
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<td>2500044</td>
<td>Machine Learning on Graphs (Master)</td>
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<td>Shao, Färber</td>
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<td>3 SWS</td>
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<td>Seminar Emerging Trends in Digital Health (Master)</td>
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<td>Beckert, Müller-Quade, Volkamer, Kirsten, Hilt, Dörre</td>
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### Exams

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<th>Title</th>
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<td>WT 23/24</td>
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<td>Seminar: Energy Informatics</td>
<td>Wagner, Ueckerdt</td>
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<td>WT 23/24</td>
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<td>Seminar Data-driven Simulation for Industrial Systems (Master)</td>
<td>Lazarova-Molnar</td>
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<tr>
<td>WT 23/24</td>
<td>7900040</td>
<td>Machine Learning on Graphs (Master)</td>
<td>Färber</td>
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<td>WT 23/24</td>
<td>7900094</td>
<td>Seminar Selected Issues in Critical Information Infrastructures (Master)</td>
<td>Sunyaev</td>
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<td>WT 23/24</td>
<td>7900102</td>
<td>Advanced Lab Information Service Engineering (Master)</td>
<td>Sack</td>
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<td>WT 23/24</td>
<td>7900119</td>
<td>Seminar Cognitive Automobiles and Robots</td>
<td>Zölleer</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/](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/](https://portal.wiwi.kit.edu/)

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

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<tr>
<th>WT 23/24</th>
<th>7900121</th>
<th>Security and Privacy Awareness</th>
<th>Volkamer</th>
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<td>WT 23/24</td>
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<td>Vinel</td>
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<tr>
<td>WT 23/24</td>
<td>7900304</td>
<td>Seminar Linked Data and the Semantic Web (Master)</td>
<td>Käfer</td>
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<td>Seminar Real-World Challenges in Data Science and Analytics (Master)</td>
<td>Sure-Vetter, Färber</td>
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</table>
**Course: Seminar in Informatics B (Master) [T-WIWI-103480]**

**6 COURSES**

**Machine Learning on Graphs (Master)**
2500044, WS 23/24, SWS, Language: English, [Open in study portal](#)

**Seminar Linked Data and the Semantic Web (Master)**
2513313, WS 23/24, 3 SWS, Language: German/English, [Open in study portal](#)

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**Content**

Within the framework of this interdisciplinary seminar, the topics security awareness and privacy awareness are to be considered from different perspectives. It deals with legal, information technology, psychological, social as well as philosophical aspects.

**Note:** The link to enrol is for every student, regardless of the study background!

**Dates:**
- Kick-Off: 23.10.23 14:00 o'clock, Room 1C-03, building 5.20
- First version: 07.01.24
- Final version: 17.02.24
- Presentation: CW 12

Topics will be assigned after the kick-off.

**Consider that legal-focused topics require you to speak and understand German legal texts.**

**Topics:**

1. Literature review on reporting obligations / information security incidents (literature - seminar)
2. Privacy Awareness with electronic patient file
4. Ethical analysis of so-called attacker studies that gather security awareness data in public space.
5. Collecting data: The boundaries of consent

**Further Topics TBA!**

**ATTENTION:** The seminar is only for MASTER students!

**Machine Learning on Graphs (Master)**

**Seminar Linked Data and the Semantic Web (Master)**

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**Content**

Graph representation learning deals with capturing and understanding the complex relationships and patterns inherent in graph-structured data. It focuses on developing techniques and algorithms to extract meaningful representations from graphs, enabling tasks such as node classification, link prediction, community detection, and graph generation.

This seminar will cover the fundamental concepts of graph representation learning, such as knowledge graphs, graph theory, and graph spectral theory. Additionally, you will have the chance to engage in collaborative reading of recent technical reports and research papers with your peers, encompassing machine learning algorithms pertaining to large language models, knowledge embedding, and social attribute prediction.

**Seminar Linked Data and the Semantic Web (Master)**

**Content**

Linked Data is a way of publishing data on the web in a machine-understandable fashion. The aim of this practical seminar is to build applications and devise algorithms that consume, provide, or analyse Linked Data.

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'.

**Topics of interest include, but are not limited to:**
- Travel Security
- Geo data
- Linked News
- Social Media

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

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725
Seminar Real-World Challenges in Data Science and Analytics (Bachelor)
2513314, WS 23/24, 3 SWS, Language: German/English, [Open in study portal]

Content
In the seminar, various Real-World Challenges in Data Science and Analytics will be worked on.
During this seminar, groups of students work on a case challenge with data provided. Here, the typical process of a data science project is depicted: integration of data, analysis of these, modeling of the decisions and visualization of the results.
During the seminar, solution concepts are worked out, implemented as a software solution and presented in an intermediate and final presentation. The seminar “Real-World Challenges in Data Science and Analytics” is aimed at students in master’s programs. The exact dates and information for registration will be announced at the course page.

Seminar Real-World Challenges in Data Science and Analytics (Master)
2513315, WS 23/24, 3 SWS, Language: German/English, [Open in study portal]

Content
In the seminar, various Real-World Challenges in Data Science and Analytics will be worked on.
During this seminar, groups of students work on a case challenge with data provided. Here, the typical process of a data science project is depicted: integration of data, analysis of these, modeling of the decisions and visualization of the results.
During the seminar, solution concepts are worked out, implemented as a software solution and presented in an intermediate and final presentation. The seminar “Real-World Challenges in Data Science and Analytics” is aimed at students in master’s programs. The exact dates and information for registration will be announced at the course page.

Seminar Cognitive Automobiles and Robots (Master)
2513500, WS 23/24, 2 SWS, Language: German/English, [Open in study portal]

Content
The seminar is intended as a theoretical supplement to lectures such as "Machine Learning". The theoretical basics will be deepened in the seminar. The aim of the seminar is that the participants work individually to analyze a subsystem from the field of robotics and cognitive systems using one or more procedures from the field of AI/ML.

The individual projects require the analysis of the task at hand, selection of suitable procedures, specification and theoretical evaluation of the approach taken. Finally, the chosen solution has to be documented and presented in a short presentation.

Learning objectives:

- Students can apply knowledge from the Machine Learning lecture in a selected field of current research in robotics or cognitive automobiles for theoretical analysis.
- Students can evaluate, document and present their concepts and results.

Recommendations:
Attendance of the lecture machine learning

Workload:
The workload of 3 credit points consists of the time spent on literature research and planning/specifying the proposed solution. In addition, a short report and a presentation of the work carried out will be prepared.

Organizational issues
Anmeldung und weitere Informationen sind im WiWi-Portal zu finden.
Registration and further information can be found in the WiWi-portal.

Seminar Digital Twins (Master)
2513103, SS 2024, 2 SWS, Language: English, [Open in study portal]
Content

Name: Digital Twins (Master)

Size: 10 students (with 10 different topics)

Workload:

- 2 Lectures
- One presentation delivered + attendance of the other students' presentations
- One report

Responsible Persons: Michelle Jungmann, Sanja Lazarova-Molnar

Deliverables for Grade:

- 1 report per student and topic (7-8 pages, IEEE Template, usage of Reference Manager – Zotero or EndNote)
- 25 min presentation per student plus 20 min discussion (focus on the presentation topic + presentation skills) = 45 minutes for each student

Credits: 3 credits

Format/Structure of the Seminar:

- 2 lectures on beginning of semester
- Students have 1 week time to provide a priority list of 5 presentation topics, distribution will be decided based on first come – first serve, ensuring that core topics are covered
- Students have time to work on the report and presentation during the semester
- Submission of all reports will be required 2 months after the intro lecture
- Presentations are done in blocks of 2 students per class, starting mid-June, presentations will be submitted at the day of the scheduled presentation

Description:

The seminar focuses on Digital Twins and data-driven modeling, with an additional goal of improving scientific research and presentation skills for Master students. The seminar targets different topics around the structure and function of Digital Twins as well as their use cases in areas like manufacturing, energy systems, healthcare and others. Additional aspects that we consider in this seminar are cognitive Digital Twins, as well as how data and human expertise can be combined in Digital Twins.

The seminar is structured as a literature review seminar so that each student can select a topic out of a predefined set. The student then writes a paper, as well as delivers a presentation on that topic, based on the provided starting literature and additional research.

Topics:

1. What is a Digital Twin? (core topic)

References:


2. Digital Twins Architectures (core topic)

References:


3. Validation of Digital Twins (core topic)

References:


4. Modeling Formalisms for Digital Twins (core topic)

References:

5. Digital Twins Data Requirements (core topic)

References:

6. Digital Twins for Manufacturing Systems

References:

7. Digital Twins for Energy Systems

References:

8. Digital Twins in Healthcare

References:

9. Digital Twins of City Infrastructures (in Smart Cities)

References:

10. Digital Twins in Logistics

References:

11. Cognitive Digital Twins

References:
6 COURSES

Course: Seminar in Informatics B (Master) [T-WIWI-103480]


12. Fusing Data and Human Expert Knowledge in Digital Twins

References:

Seminar Knowledge Discovery and Data Mining (Master)
2513309, SS 2024, 3 SWS, Language: English, Open in study portal

Content
In this seminar different machine learning and data mining methods are implemented.
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.

Domains of interest include, but are not limited to:
- Medicine
- Social Media
- Finance Market
- Scientific Publications

Further Information: https://aifb.kit.edu/web/Lehre/Praktikum_Knowledge_Discovery_and_Data_Science
The exact dates and information for registration will be announced at the event page.

Organizational issues
Die Anmeldung erfolgt über das WiWi Portal https://portal.wiwi.kit.edu/.
Für weitere Fragen bezüglich des Seminar und der behandelten Themen wenden Sie bitte an die entsprechenden Verantwortlichen.

Literature
Detaillierte Referenzen werden zusammen mit den jeweiligen Themen angegeben. Allgemeine Hintergrundinformationen ergeben sich z.B. aus den folgenden Lehrbüchern:
- Mitchell, T.; Machine Learning

Seminar Data Science & Real-time Big Data Analytics (Master)
2513311, SS 2024, 2 SWS, Language: English, Open in study portal

Content
In this seminar, students will design applications in teams that use meaningful and creative Event Processing methods. Thereby, students have access to an existing record.

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 facing 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.

Further information to the practical seminar is given under the following Link:
http://seminar-cep.fzi.de
Questions are answered via the e-mail address sem-ep@fzi.de.

Organizational issues
Questions are answered via the e-mail address sem-ep@fzi.de.
Content
The seminar is intended as a theoretical supplement to lectures such as "Machine Learning". The theoretical basics will be deepened in the seminar. The aim of the seminar is that the participants work individually to analyze a subsystem from the field of robotics and cognitive systems using one or more procedures from the field of AI/ML.

The individual projects require the analysis of the task at hand, selection of suitable procedures, specification and theoretical evaluation of the approach taken. Finally, the chosen solution has to be documented and presented in a short presentation.

Learning objectives:

- Students can apply knowledge from the Machine Learning lecture in a selected field of current research in robotics or cognitive automobiles for theoretical analysis.
- Students can evaluate, document and present their concepts and results.

Recommendations:
Attendance of the lecture machine learning

Workload:
The workload of 3 credit points consists of the time spent on literature research and planning/specifying the proposed solution. In addition, a short report and a presentation of the work carried out will be prepared.

Organizational issues
Anmeldung und weitere Informationen sind im WiWi-Portal zu finden.
Registration and further information can be found in the WiWi-portal.

Content
What should a voting procedure fulfill? When is a voting procedure secure? Which components need to be examined? Which methods can be used to investigate this?

Cryptographic voting procedures and algorithmic voting (counting) procedures are examined from different perspectives (cryptographic methods, formal correctness, human factors).

This course can also be credited for the KASTEL certificate. Further information about obtaining the certificate can be found on the SECUSO website (https://secuso.aifb.kit.edu/Studium_und_Lehre.php).

Organizational issues
### Course: Seminar in Information Systems (Master) [T-WIWI-109827]

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Course: Seminar in Information Systems (Master) [T-WWI-109827]

| ST 2024 | 7900265 | User-Adaptive Systems Seminar | Mädche |
| ST 2024 | 7900281 | Affective User Research for Human-AI Interaction | Mädche |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled

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 for WIWI-seminars are listed on the internet: https://portal.wiwi.kit.edu.

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

- **V Business Data Analytics**
  2540473, WS 23/24, 2 SWS, Language: German/English, [Open in study portal](#)
  Content
  wird auf deutsch und englisch gehalten
  Organizational issues
  Blockveranstaltung, siehe WWW

- **V Master Seminar in Data Science and Machine Learning**
  2540510, WS 23/24, 2 SWS, Language: German, [Open in study portal](#)
  Content
  TBA

- **V Design Seminar: Digital Citizen Science**
  2500027, SS 2024, 2 SWS, [Open in study portal](#)
  Content
  TBA

- **V Affective User Research for Human-AI Interaction**
  2500036, SS 2024, 2 SWS, Language: English, [Open in study portal](#)
Content
User research aims to understand users’ needs, behaviors, and attitudes to effectively inform the design and development of products or services. It is a key endeavor to learn how users experience digital technologies, what is working well and what is not, and identify gaps and future needs in order to personalize and improve the user experience. To design for positive user experiences, investigating affective user reactions (e.g., emotions, stress, flow) is of particular interest. Therefore, affective user research collects and analyzes behavioral data and affective reactions of users when engaging with products or services. With the growing amount of data and computing capabilities, artificial intelligence (AI) technologies are increasingly used in user research for the prediction of affective user states when interacting with digital technology.

The recent advances in artificial intelligence (AI), however, may not only support affective user research as a method of inquiry, but it also has found its way into our daily lives as humans interact with it every day, for example, in form of recommendation engines on social media, in health applications, or as personal assistants based on large language models (LLMs) to receive text output for code completion, ideation, or writing. Interacting with AI-based digital technologies also triggers affective user reactions. However, these affective user reactions in Human-AI Interactions are yet to be understood.

In this seminar, participants will apply methods for affective user research on a particular type of Human-AI Interaction, the prompting of LLMs. LLM prompting is expected to become the up-and-coming form of interacting with AI in the future. To receive output from an LLM, users must send a prompt to the LLM. Given a prompt, an LLM responds incrementally with “tokens” (e.g., groups of letters, numbers, punctuation) which build the output. Structuring the prompt and receiving output influences the affective reactions of the user. Precisely, these user reactions should be investigated by the students participating in this seminar.

In the “Affective User Research for Human-AI Interaction” seminar, participating students will learn how to apply AI-based user research methods with a specific emphasis on the affective dimension when interacting with AI-based digital technologies. The goal of this seminar is to provide students with a unique set of skills in (1) quantitative data analysis, (2) knowledge about Human-AI Interaction and, in particular, LLM prompting, and (3) prediction of affective user states (e.g., emotions, stress) using state-of-the-art machine learning (ML) techniques. Students will leverage a dataset on Human-AI Interaction and gain in-depth knowledge from it as part of the seminar. The seminar emphasizes the importance of applying the aforementioned affective user research methods in an ethically compliant form. The core activities include:

- Learn the fundamentals of AI-based affective user research methods.
- Explore a dataset on Human-AI Interaction with the specific focus on the interplay of user behavior and affective user reactions.
- Developing AI-based supervised machine learning techniques for predicting user activities and affective user states.
- Present findings and insights to the seminar audience and discuss the results.

The seminar is held by Dr. Ivo Benke in cooperation with Dr. Lennard Schmidt. Both are experts from industry in the fields of affective user research, quantitative data analysis, and Human-AI Interaction.

Learning Objectives

- Understand the potential of combining user behavior and affective user reaction data for affective user research.
- Develop hands-on knowledge by applying AI-based affective user research methods on a real-world dataset.
- Develop a deeper understanding of a prominent form of Human-AI Interaction (e.g., LLM prompting).
- Deliver a presentation in a scientific context in front of an auditorium.

Human-Centered Systems Seminar: Engineering
2500125, SS 2024, 3 SWS, Language: English, Open in study portal
Seminar (S) Blended (On-Site/Online)

Content
Formerly known as “Current Topics in Digital Transformation”

With this seminar, we aim to provide students with the possibility to independently work on state-of-the-art research topics in addition to the knowledge gained in the lectures of the human-centered systems lab (Prof. Mädche). Students will work on a dedicated topic in the context of human-centered systems and apply a pre-defined research method. A broad spectrum of topics is offered every semester, topics may range from creating an experimental design, analyzing collected data, or systematically comparing existing software prototypes in a specific field of interest.
Content
User-adaptive systems collect and analyze biosignals from users to recognize user states as a basis for adaptation. Thermic, mechanical, electric, acoustic, and optical signals are collected using sensors which are integrated in wearables, e.g. glasses, earphones, belts, or bracelets. The collected data is processed with analytics and machine learning techniques in order to determine short-term, evolving over time, and long-term user states in the form of user characteristics, affective-cognitive states, or behavior. Finally, the recognized user states are leveraged for realizing user-centric adaptations.

In this seminar, interdisciplinary teams of students design, develop, and evaluate a user-adaptive system prototype leveraging state-of-the-art hard- and software. This seminar follows an interdisciplinary approach. Students from the fields of computer science, information systems and industrial engineering & management collaborate in the prototype design, development, and evaluation.

The seminar is carried out in cooperation between Teco/Chair of Pervasive Computing Systems (Prof. Beigl) and the Institute of Information Systems and Marketing (h-lab, Prof. Mädche). It is offered as part of the DFG-funded graduate school "KD2School: Designing Adaptive Systems for Economic Decisions" (https://kd2school.info/)

Learning objectives of the seminar
- Explain what a user-adaptive system is and how it can be conceptualized
- Suggest and evaluate different design solutions for addressing the identified problem
- Build a user-adaptive system prototype using state-of-the-art hard- and software
- Perform a user-centric evaluation of the user-adaptive system prototype

Prerequisites
Strong analytical abilities and profound software development skills are required.

Organizational issues
Termine werden bekannt gegeben

Literature
Required literature will be made available in the seminar.
Content
Formerly known as "Information Systems and Service Design Seminar"

With this seminar, we aim to provide students with the possibility to independently work on state-of-the-art research topics in addition to the knowledge gained in the lectures of the research group IS I (Prof. Mädche). The research group "Information Systems I" (IS I) headed by Prof. Mädche focuses in research, education, and innovation on designing interactive intelligent systems. It is positioned at the intersection of Information Systems and Human-Computer Interaction (HCI).

In the seminar, participants will get deeper insights in a contemporary research topic in the field of information systems, specifically interactive intelligent systems.

The actual seminar topics will be derived from current research activities of the research group. Our research assistants offer a rich set of topics from our research clusters (digital experience and participation, intelligent enterprise systems, or digital services design & innovation). Students can select among these topics individually depending on their personal interests. The seminar is carried out in the form of a literature-based thesis project. In the seminar, students will acquire the important methodological skills of running a systematic literature review.

Learning Objectives
- focus on a contemporary topic at the intersection of Information Systems and Human-Computer Interaction (HCI), specifically interactive intelligent systems
- carry out a structured literature search for a given topic
- aggregate the collected information in a suitable way to present and extract knowledge
- write a seminar thesis following academic writing standards
- deliver a presentation in a scientific context in front of an auditorium

Prerequisites
No specific prerequisites are required for the seminar.

Literature
Further literature will be made available in the seminar.

Organizational issues
Termine werden bekannt gegeben
6.341 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-102736 - Seminar Module Economic Sciences

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**Legend:** Online, Blended (On-Site/Online), On-Site, Cancelled

**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 on Methodical Foundations of Operations Research (B)
2550131, WS 23/24, 2 SWS, Language: German, Open in study portal

Content
The seminar aims at describing, evaluating, and discussing recent as well as classical topics in continuous optimization. The focus is on the treatment of optimization models and algorithms, also with respect to their practical application.

Bachelor students are introduced to the style of scientific work. By focussed treatment of a scientific topic they deal with the basics of scientific investigation and reasoning.

For further development of a scientific work style, master students are particularly expected to critically question the seminar topics.

With regard to the oral presentations the students become acquainted with presentation techniques and basics of scientific reasoning. Also rhetoric abilities may be improved.

Remarks:
Attendance at all oral presentations is compulsory.
Preferably at least one module offered by the Institute of Operations Research should have been chosen before attending this seminar.

Assessment:
The assessment is composed of a 15-20 page paper as well as a 40-60 minute oral presentation according to §4(2), 3 of the examination regulation. The grade is composed of the equally weighted assessments of the paper and the oral presentation.

The seminar is appropriate for bachelor as well as for master students. Their differentiation results from different assessment criteria for the seminar paper and the oral presentation.

Workload:
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Die Literatur und die relevanten Quellen werden gegen Ende des vorausgehenden Semesters im Wiwi-Portal und in einer Seminarvorbereitung bekannt gegeben.

References and relevant sources are announced at the end of the preceding semester in the Wiwi-Portal and in a preparatory meeting.

Seminar: Modern OR and Innovative Logistics
2550491, WS 23/24, 2 SWS, Language: German, Open in study portal

Content
The seminar aims at the presentation, critical evaluation and exemplary discussion of recent questions in discrete optimization. The focus lies on optimization models and algorithms, also with regard to their applicability in practical cases (especially in Supply Chain and Health Care Management). 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 seminar topic. Regarding the seminar presentations, the students will be familiarized with basic presentational and rhetoric skills.

Organizational issues
Anmeldezeitraum: 11.09.23 bis 30.09.23 im Wiwi Portal

Literature
Die Literatur und die relevanten Quellen werden zu Beginn des Seminars bekannt gegeben.
Seminar: Modern OR and Innovative Logistics
2500028, SS 2024, 2 SWS, Language: German, Open in study portal

Content
The seminar aims at the presentation, critical evaluation and exemplary discussion of recent questions in discrete optimization. The focus lies on optimization models and algorithms, also with regard to their applicability in practical cases (especially in Supply Chain and Health Care Management). 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 seminar topic. Regarding the seminar presentations, the students will be familiarized with basic presentational and rhetoric skills.

Organizational issues
Anmeldung erfolgt über das Wiwi-Portal. Nähere Informationen hierzu finden Sie hier zu einem späteren Zeitpunkt.

Literature
Die Literatur und die relevanten Quellen werden zu Beginn des Seminars bekannt gegeben.

Seminar on Methodical Foundations of Operations Research (B)
2550131, SS 2024, 2 SWS, Language: German, Open in study portal

Content
The seminar aims at describing, evaluating, and discussing recent as well as classical topics in continuous optimization. The focus is on the treatment of optimization models and algorithms, also with respect to their practical application.

Bachelor students are introduced to the style of scientific work. By focussed treatment of a scientific topic they deal with the basics of scientific investigation and reasoning.

For further development of a scientific work style, master students are particularly expected to critically question the seminar topics.

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Remarks:
Attendance at all oral presentations is compulsory.
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The seminar is appropriate for bachelor as well as for master students. Their differentiation results from different assessment criteria for the seminar paper and the oral presentation.

Workload:
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Die Literatur und die relevanten Quellen werden gegen Ende des vorausgehenden Semesters im Wiwi-Portal und in einer Seminarvorbereitung bekannt gegeben.

References and relevant sources are announced at the end of the preceding semester in the Wiwi-Portal and in a preparatory meeting.
6.342 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-102736 - Seminar Module Economic Sciences

<table>
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<td>2 SWS</td>
<td>Seminar /</td>
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**Exams**

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<tr>
<td>WT 23/24 7900254</td>
<td>Topics in Econometrics, Seminar in Economics (Bachelor)</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:

**Topics in Econometrics**

2521310, WS 23/24, 2 SWS, Language: German, Open in study portal

**Organizational issues**

Blockveranstaltung. Termine werden auf Homepage und über Ilias bekannt gegeben
6 COURSES

**Predictive Data Analytics - An Introduction to Statistical Machine Learning**
2500004, SS 2024, 2 SWS, Language: German/English, [Open in study portal]

**Organizational issues**
Blockveranstaltung, Termine werden bekannt gegeben

**Advanced Topics in Econometrics**
2521310, SS 2024, 2 SWS, Language: German/English, [Open in study portal]

**Organizational issues**
Blockveranstaltung, Termine werden bekannt gegeben
# 6.343 Course: Seminar Informatics A [T-INFO-104336]

**Responsible:** Prof. Dr. Sebastian Abeck  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-102822 - Seminar Module Informatics

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</table>
Below you will find excerpts from events related to this course:

**Seminar: Neuronale Netze und künstliche Intelligenz**

2400078, WS 23/24, SWS, Language: German/English, [Open in study portal](#)

**Content**
In many tasks that appear natural to us, the fastest computers are unable to match the performance of the human brain. Neural networks attempt to simulate the parallel and distributed architecture of the brain in order to master these skills with learning algorithms. In this context, focus is being put on neural network approaches to computer vision and speech recognition, robotics and other areas.

In this seminar students will acquaint themselves with literature from provided topics and will present their results as a talk supported by slides to the other participants of the seminar.

**Recommendations:**
- Finishing the module "Kognitive Systeme" prior to the seminar is recommended.
- Attending the lecture "Deep Learning und Neuronale Netze" prior to the seminar is of advantage

**Embedded Machine Learning Seminar**

2400137, WS 23/24, SWS, Language: German/English, [Open in study portal](#)

**Content**
In our seminars, students learn about cutting-edge research in the research fields presented below. Students are offered topics by the supervisors, but also can suggest their own topics in these fields. The seminar is offered in both English and German.

**Machine Learning on On-Chip Systems**
Machine learning and on-chip systems form a symbiosis where each research area benefits from advances in the other. In this seminar, students review cutting-edge research on both areas.

Machine learning (ML) gains importance in all aspects of information systems. From high-level algorithms like image recognition to lower-level intelligent CPU management - ML is ubiquitous. On-chip systems also benefit from advances in ML techniques. Examples include adaptive resource management or workload prediction. However, ML techniques also benefit from advances in on-chip systems. A prominent example is acceleration of neural networks in recent desktop GPUs and even smartphone chips.

In this seminar, students will review cutting-edge state-of-the-art research (publications) to a specific topic related to ML on on-chip systems. The findings will be summarized in a seminar report and presented to the other members of the course. Students are welcome to suggest own topics, but this is not required. The seminar can be held in English or German.

**DNN Pruning and Quantization**
As DNNs become more computationally hungry, their hardware implementation becomes more challenging, since embedded devices have limited resources. DNN compression techniques, such as pruning and quantization, can be applied for efficient utilization of computational resources. While pruning involves removing unimportant elements of a DNN structure (connections, filters, channels etc), quantization decreases the precision for representing DNN-related tensors (weights and activations). Both promise to trade-off some of the application’s accuracy for limited energy consumption and reduced memory footprint. Students will review state-of-the-art research works on hardware-aware DNN pruning and quantization. The findings will be summarized in a seminar report and presented to the other members of the course.

**Organizational issues**
Bitte im ILIAS zur Teilnahme anmelden.
Content
In our seminars, students learn about cutting-edge research in the research fields presented below. Students are offered topics by the supervisors, but also can suggest their own topics in these fields. The seminar is offered in both English and German.

**Dependability for Reconfigurable Architectures**
Dependability has become one of the prime concerns in recent nano-era. Reliability (the ability of the system to deliver services as specified) and Security (the ability of the system to protect itself against deliberate or accidental intrusion) are the two crucial attributes of dependable systems. Among the other reliability threats due to physical limits of CMOS technology, radiation induced soft errors or transient faults are also the most challenging threat to be handled. During this seminar, we will explore state-of-the-art for the power-efficient soft-error reliability and study different research solutions to improve soft-error resiliency in power efficient manner leveraging power-performance-reliability trade-offs. During this seminar, the students will also be able to understand hardware security in reconfigurable architectures.

**Thermal and Power Aware Embedded Systems**
Power densities are continuously increasing along with technology scaling and the integration of more transistors into smaller areas, potentially resulting in thermal emergencies on the chip. To mitigate such emergencies, power and thermal management techniques are employed. The state-of-the-art power and thermal management techniques can be classified into several categories, such as reactive and proactive techniques, centralized and distributed ones. Recently, machine learning algorithms are employed in power and thermal management techniques to make them more proactive and adaptive. Those various categories of the state-of-the-art techniques need to be reviewed in this seminar to demonstrate the advantage and disadvantage of each of them.

**Security of Reconfigurable Embedded Systems**
Various types of (re)configurable systems have emerged in recent years. The spectrum ranges from one-time configurable systems that are programmed at the design time for product-specific requirements, to reconfigurable systems that can also be adapted after commissioning, to dynamically reconfigurable systems whose configuration can be changed at runtime and their ability to dynamic reconfiguration is an important part of their system functionality. This seminar focuses on the runtime reconfigurable systems, their security aspects and methods. It investigates the current state of research for securing the runtime reconfigurable systems, as well as the feasibility of using the security measures from general processing architectures to runtime reconfigurable systems.

**Security in Resource Management**
Efficient resource management in many-core systems (ie, systems with more than 100 cores, not only a dozen) has become a research challenge in the last years. As complexity and the demand for scalability increase, this new paradigm should also consider new security features to avoid or mitigate the effects of malicious applications both on critical information and the system as a whole.
In this seminar, we will focus on the state-of-the-art of security attacks such as Side Channel Attacks (SCA), Covert channel attacks, as well as other similar resource-based attacks and their effects on other critical applications running on many-core systems. During this seminar, student will dive into the security aspects of resource management, while investigating answers to the following research questions:

- How do these attacks work?
- Which are the associated vulnerabilities? What resources are vulnerable?
- What’s their impact on critical information or other resources?
- What are the current countermeasures for the attacks?

Organizational issues
Please register in ILIAS to participate.

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<td>Blended</td>
<td>German/English</td>
<td>Open in study portal</td>
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<td><strong>Advanced Methods of Information Fusion</strong></td>
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<td><strong>Hot Topics in Bioinformatics</strong></td>
<td>2400011</td>
<td>On-Site</td>
<td>English</td>
<td>Open in study portal</td>
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Content

Prerequisites: CS Master’s level seminar. Participants must have attended and passed the course on "Introduction to Bioinformatics for Computer Scientists" in one of the preceding winter terms.

Task: You will need to select papers to present, give a presentation and write a report.

This seminar allows students to understand and present the contents of current papers in Bioinformatics such as published for instance in the journals *Bioinformatics*, *BMC Bioinformatics*, *Journal of Computational Biology* etc. or at conferences such as ISMB or RECOMB.

We will provide a list of interesting papers, but students can also propose papers they are interested in. Students may also choose to cover broader topics of more general interest such as multiple sequence alignment, Bayesian phylogenetic inference, read assembly etc.

Each student will be assigned a lab member for help with understanding the article and preparing the slides as well as the report. Students should give a 35 minute presentation on their topic of choice and write a report (Seminararbeit) comprising 8 pages.

Goals: Participants are able to understand, critically assess, and compare current research papers in Bioinformatics. They are able to present algorithms and models from current research papers in oral and written form at a level that corresponds to that of scientific publications and conference presentations. Participants are able to suggest extension to current methods.

Credits: 3 ECTS

Organizational issues

IMPORTANT: Register for the seminar mailing list by sending an email to Alexandros.Stamatakis@h-its.org

Please also register for the seminar via the campus system.

Up to date information on the seminar is provided at: Seminar page.

We will start with a *kick-off meeting in the second week of the summer term* on Thursday April 25 from 09:45 - 11:15 in SR236.

Seminar presentations will be conducted in a single block toward the end of the semester: July 23 in room SR 010 - exact time to be determined

**Embedded Machine Learning**

2400137, SS 2024, SWS, Language: German/English, [Open in study portal](#)

Seminar (S)

Blended (On-Site/Online)

Content

In our seminars, students learn about cutting-edge research in the research fields presented below. Students are offered topics by the supervisors, but also can suggest their own topics in these fields. The seminar is offered in both English and German.

Machine learning on on-chip systems

Machine learning and on-chip systems form a symbiosis where each research area benefits from advances in the other. In this seminar, students review cutting-edge research on both areas.

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In this seminar, students will review cutting-edge state-of-the-art research (publications) on a specific topic related to ML on on-chip systems. The findings will be summarized in a seminar report and presented to the other members of the course. Students are welcome to suggest their own topics, but this is not required. The seminar can be held in English or German.

Approximate Computing for Efficient Machine Learning

Nowadays, energy efficiency is a first-class design constraint in the ICT sector. Approximate computing emerges as a new design paradigm for generating energy efficient computing systems. There is a large body of resource-hungry applications (eg. image processing and machine learning) that exhibit an intrinsic resilience to errors and produce outputs that are useful and of acceptable quality for the users despite their underlying computations being performed in an approximate manner. By exploiting this inherent error tolerance of such applications, approximate computing trades computational accuracy for savings in other metrics, eg. energy consumption and performance. Machine learning, a very common and top trending workload of both data centers and embedded systems, is a perfect candidate for approximate computing application since, by definition, it delivers approximate results. Performance as well as energy efficiency (especially in the case of embedded systems) are crucial for machine learning applications and thus, approximate computing techniques are widely adopted in machine learning (eg, TPU) to improve its energy profile as well as performance.

Machine Learning methods for DNN compilation and mapping

Deep neural networks have achieved great success in challenging tasks such as image classification and object detection. There is a great demand for deploying these networks in different devices, ranging from cloud servers to embedded devices.

Mapping DNNs to these devices is a challenging task since each of these devices has different characteristics in terms of memory organization, compute units, etc. There have been efforts to automate the process of mapping/compiling DNNs to hardware with different characteristics.

In this seminar, we will discuss the efforts that have been done in mapping/compiling DNNs over hardware using machine learning methods.
Organizational issues
Please register in ILIAS to participate.

Embedded Security and Architectures
2400148, SS 2024, SWS, Language: German/English, Open in study portal
Seminar (S) Blended (On-Site/Online)

Content
In our seminars, students learn about cutting-edge research in the research fields presented below. Students are offered topics by the supervisors, but also can suggest their own topics in these fields. The seminar is offered in both English and German.

Dependability for Reconfigurable Architectures
Dependability has become one of the prime concerns in recent nano-era. Reliability (the ability of the system to deliver services as specified) and Security (the ability of the system to protect itself against deliberate or accidental intrusion) are the two crucial attributes of dependable systems. Among the other reliability threats due to physical limits of CMOS technology, radiation induced soft errors or transient faults are also the most challenging threat to be handled. During this seminar, we will explore state-of-the-art for the power-efficient soft-error reliability and study different research solutions to improve soft-error resiliency in power efficient manner leveraging power-performance-reliability trade-offs. During this seminar, the students will also be able to understand hardware security in reconfigurable architectures.

Thermal and Power Aware Embedded Systems
Power densities are continuously increasing along with technology scaling and the integration of more transistors into smaller areas, potentially resulting in thermal emergencies on the chip. To mitigate such emergencies, power and thermal management techniques are employed. The state-of-the-art power and thermal management techniques can be classified into several categories, such as reactive and proactive techniques, centralized and distributed ones. Recently, machine learning algorithms are employed in power and thermal management techniques to make them more proactive and adaptive. Those various categories of the state-of-the-art techniques need to be reviewed in this seminar to demonstrate the advantage and disadvantage of each of them.

Security of Reconfigurable Embedded Systems
Various types of (re)configurable systems have emerged in recent years. The spectrum ranges from one-time configurable systems that are programmed at the design time for product-specific requirements, to reconfigurable systems that can also be adapted after commissioning, to dynamically reconfigurable systems whose configuration can be changed at runtime and their ability to dynamic reconfiguration is an important part of their system functionality. This seminar focuses on the runtime reconfigurable systems, their security aspects and methods. It investigates the current state of research for securing the runtime reconfigurable systems, as well as the feasibility of using the security measures from general processing architectures to runtime reconfigurable systems.

Security in Resource Management
Efficient resource management in many-core systems (ie, systems with more than 100 cores, not only a dozen) has become a research challenge in the last years. As complexity and the demand for scalability increase, this new paradigm should also consider new security features to avoid or mitigate the effects of malicious applications both on critical information and the system as a whole.

In this seminar, we will focus on the state-of-the-art of security attacks such as Side Channel Attacks (SCA), Covert channel attacks, as well as other similar resource-based attacks and their effects on other critical applications running on many-core systems. During this seminar, student will dive into the security aspects of resource management, while investigating answers to the following research questions:

- How do these attacks work?
- Which are the associated vulnerabilities? What resources are vulnerable?
- What’s their impact on critical information or other resources?
- What are the current countermeasures for the attacks?

Organizational issues
Please register in ILIAS to participate.

Advanced Methods of Information Fusion
24344, SS 2024, 2 SWS, Language: German/English, Open in study portal
Seminar (S) On-Site

Content
The growing spread and performance of modern information and communication technologies produces an ever-increasing amount data. It is one of the central challenges of our time to extract meaningful information from these data sets. The approach to address these issues, often called data science, combines strategies and methods from the fields of machine learning, mathematics, state estimation, visualization and pattern recognition. During this seminar, the students will familiarize themselves with concepts and methods particularly focusing on estimation theory and its application.

The seminar targets master students in computer science and bachelor students in Information engineering and management.
**Human-Centered Systems Seminar: Engineering**

2500125, SS 2024, 3 SWS, Language: English, [Open in study portal](#)

**Seminar (S) Blended (On-Site/Online)**

### Content
Formerly known as "Current Topics in Digital Transformation"

With this seminar, we aim to provide students with the possibility to independently work on state-of-the-art research topics in addition to the knowledge gained in the lectures of the human-centered systems lab (Prof. Mädche). Students will work on a dedicated topic in the context of human-centered systems and apply a pre-defined research method. A broad spectrum of topics is offered every semester, topics may range from creating an experimental design, analyzing collected data, or systematically comparing existing software prototypes in a specific field of interest.

**User-Adaptive Systems Seminar**

2540553, SS 2024, 2 SWS, Language: English, [Open in study portal](#)

**Seminar (S) Blended (On-Site/Online)**

### Content
User-adaptive systems collect and analyze biosignals from users to recognize user states as a basis for adaptation. Thermic, mechanical, electric, acoustic, and optical signals are collected using sensors which are integrated in wearables, e.g. glasses, earphones, belts, or bracelets. The collected data is processed with analytics and machine learning techniques in order to determine short-term, evolving over time, and long-term user states in the form of user characteristics, affective-cognitive states, or behavior. Finally, the recognized user states are leveraged for realizing user-centric adaptations.

In this seminar, interdisciplinary teams of students design, develop, and evaluate a user-adaptive system prototype leveraging state-of-the-art hard- and software. This seminar follows an interdisciplinary approach. Students from the fields of computer science, information systems and industrial engineering & management collaborate in the prototype design, development, and evaluation.

The seminar is carried out in cooperation between Teco/Chair of Pervasive Computing Systems (Prof. Beigl) and the Institute of Information Systems and Marketing (h-lab, Prof. Mädche). It is offered as part of the DFG-funded graduate school "KD2School: Designing Adaptive Systems for Economic Decisions" ([https://kd2school.info/](https://kd2school.info/))

### Learning objectives of the seminar
- Explain what a user-adaptive system is and how it can be conceptualized
- Suggest and evaluate different design solutions for addressing the identified problem
- Build a user-adaptive system prototype using state-of-the-art hard- and software
- Perform a user-centric evaluation of the user-adaptive system prototype

### Prerequisites
Strong analytical abilities and profound software development skills are required.

### Organizational issues
Termine werden bekannt gegeben

### Literature
Required literature will be made available in the seminar.

**Human-Centered Systems Seminar: Research**

2540557, SS 2024, 3 SWS, Language: English, [Open in study portal](#)

**Seminar (S) Blended (On-Site/Online)**
Content

Formerly known as “Information Systems and Service Design Seminar”

With this seminar, we aim to provide students with the possibility to independently work on state-of-the-art research topics in addition to the knowledge gained in the lectures of the research group IS I (Prof. Mädche). The research group “Information Systems I” (IS I) headed by Prof. Mädche focuses in research, education, and innovation on designing interactive intelligent systems. It is positioned at the intersection of Information Systems and Human-Computer Interaction (HCI).

In the seminar, participants will get deeper insights in a contemporary research topic in the field of information systems, specifically interactive intelligent systems.

The actual seminar topics will be derived from current research activities of the research group. Our research assistants offer a rich set of topics from our research clusters (digital experience and participation, intelligent enterprise systems, or digital services design & innovation). Students can select among these topics individually depending on their personal interests. The seminar is carried out in the form of a literature-based thesis project. In the seminar, students will acquire the important methodological skills of running a systematic literature review.

Learning Objectives

- focus on a contemporary topic at the intersection of Information Systems and Human-Computer Interaction (HCI), specifically interactive intelligent systems
- carry out a structured literature search for a given topic
- aggregate the collected information in a suitable way to present and extract knowledge
- write a seminar thesis following academic writing standards
- deliver a presentation in a scientific context in front of an auditorium

Prerequisites

No specific prerequisites are required for the seminar.

Literature

Further literature will be made available in the seminar.

Organizational issues

Termine werden bekannt gegeben
### 6.344 Course: Seminar Informatics Master [T-INFO-111205]

**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-102822 - Seminar Module Informatics

<table>
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<tr>
<th>Events</th>
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<td>WT 23/24 2400013</td>
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<td>WT 23/24 2400047</td>
<td>Seminar Algorithmtechnik</td>
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<td>WT 23/24 2400108</td>
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<tr>
<td>WT 23/24 2400126</td>
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<tr>
<td>WT 23/24 2400129</td>
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<td>WT 23/24 2400137</td>
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<tr>
<td>WT 23/24 2400148</td>
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<tr>
<td>WT 23/24 2400175</td>
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<tr>
<td>WT 23/24 2400206</td>
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<tr>
<td>WT 23/24 2400210</td>
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<tr>
<td>WT 23/24 24344</td>
<td>Advanced Methods of Information Fusion</td>
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<tr>
<td>WT 23/24 2500125</td>
<td>Engineering Seminar: Human-Centered Systems</td>
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<td>Seminar / 🕯️</td>
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<tr>
<td>ST 2024 2400035</td>
<td>Seminar Image Analysis and Fusion</td>
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<tr>
<td>ST 2024 2400044</td>
<td>Seminar Cryptanalysis</td>
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<tr>
<td>ST 2024 2400084</td>
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<tr>
<td>ST 2024 2400085</td>
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<td>ST 2024 2400089</td>
<td>Decentralized Systems: Fundamentals, Modeling, and Applications</td>
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<td>ST 2024 2400136</td>
<td>Seminar: Interactive Learning</td>
<td>2 SWS</td>
<td>Seminar / 📚</td>
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</table>
Below you will find excerpts from events related to this course:

Continuous Software Engineering
2400108, WS 23/24, 2 SWS, Language: German/English, Open in study portal

Content
Modern software engineering happens in short cycles, which allow fast feedback. Technologies like build servers and containerization support fast, frequent and automated deployment of software to production systems and fast feedback to development (devops).

The term "continuous software engineering" combines different aspects of this intertwining of different software engineering activities.

In this seminars, students will work on a topic in the context of continuous software engineering. Some of the addressed topics will be concerned with challenges when engineering systems with machine-learning components.

Literature
Content
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Machine Learning on On-Chip Systems
Machine learning and on-chip systems form a symbiosis where each research area benefits from advances in the other. In this seminar, students review cutting-edge research on both areas.

Machine learning (ML) gains importance in all aspects of information systems. From high-level algorithms like image recognition to lower-level intelligent CPU management - ML is ubiquitous. On-chip systems also benefit from advances in ML techniques. Examples include adaptive resource management or workload prediction. However, ML techniques also benefit from advances in on-chip systems. A prominent example is acceleration of neural networks in recent desktop GPUs and even smartphone chips.

In this seminar, students will review cutting-edge state-of-the-art research (publications) to a specific topic related to ML on on-chip systems. The findings will be summarized in a seminar report and presented to the other members of the course. Students are welcome to suggest own topics, but this is not required. The seminar can be held in English or German.

DNN Pruning and Quantization
As DNNs become more computationally hungry, their hardware implementation becomes more challenging, since embedded devices have limited resources. DNN compression techniques, such as pruning and quantization, can be applied for efficient utilization of computational resources. While pruning involves removing unimportant elements of a DNN structure (connections, filters, channels etc), quantization decreases the precision for representing DNN-related tensors (weights and activations). Both promise to trade-off some of the application's accuracy for limited energy consumption and reduced memory footprint. Students will review state-of-the-art research works on hardware-aware DNN pruning and quantization. The findings will be summarized in a seminar report and presented to the other members of the course.

Organizational issues
Bitte im ILIAS zur Teilnahme anmelden.
Course: Seminar Informatics Master [T-INFO-111205]

Content
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Organizational issues
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Advanced Topics in Continual / Organic Machine Learning
2400206, WS 23/24, 2 SWS, Open in study portal

Content
In many areas, neural networks have achieved a performance comparable to or better than that of humans. However, neural networks usually learn in a different way than humans. The neuronal networks are trained with gigantic data sets and after learning these data sets they are used in production. Humans learn continuously from their interaction with their environment. In organic machine learning, neural networks should learn in the same way as humans.

In this seminar, current research results on different aspects of such organic learning neural networks are presented. Possible topics are Continual/Incremental Learning, integration of knowledge, learning concepts, feedback mechanisms, ...

Organizational issues
Raum 223, Geb. 50.20

Advanced Methods of Information Fusion
24344, WS 23/24, 2 SWS, Language: German, Open in study portal

Content
...
Content
The growing spread and performance of modern information and communication technologies produces an ever-increasing amount data. It is one of the central challenges of our time to extract meaningful information from these data sets. The approach to address these issues, often called data science, combines strategies and methods from the fields of machine learning, mathematics, state estimation, visualization and pattern recognition. During this seminar, the students will familiarize themselves with concepts and methods particularly focusing on estimation theory and its application.

The seminar targets master students in computer science and bachelor students in Information engineering and management.

Organizational issues
Termin und Ort der Einführungsveranstaltung werden vor Semesterbeginn auf der Webseite bekannt gegeben. Findet - sofern Präsenz-Veranstaltung erlaubt - im Fraunhofer IOSB statt.
Content

Decentralized Systems (like blockchain-based systems) represent distributed systems that are controlled by multiple parties who make their own independent decisions. In this course, we cover fundamental theoretical aspects as well as up-to-date decentralized systems and connect theory with current practice. We thereby address fault tolerance, security and trust, as well as performance aspects at the example of applications like Bitcoin, Ethereum, IPFS, and Matrix. As a research-oriented lecture, we may cover additional current topics like verifiable computing and/or identity and access management in decentralized settings.

The lecture covers at least the following topics:

- **Fundamentals**
  - Peer-to-Peer Overlay Networks, Sybil and Eclipse Attacks
  - Formalization of decentralized systems, including models for their computation, communication, faults, and timing.
  - Leader election and mutual exclusion in decentralized systems based on different models for node identities and timing.
  - Byzantine consensus in synchronous and asynchronous settings, including Bracha’s fundamental algorithm for reliable broadcast, Practical Byzantine Fault Tolerant consensus, and fundamental limits.
  - Consistency models and protocols including Conflict-Free Replicated Data Types.

- **Applications**
  - The Matrix decentralized messaging platform
  - Distributed Ledgers and Blockchains at the examples of Bitcoin and Ethereum, in particular Proof-of-Work and Proof-of-Stake consensus
  - Payment Channel Networks and Rollups
  - Decentralized storage systems, at the example of IPFS

Competency Goals:

1. Fundamentals & Modeling
   1. The student is able to recognize and distinguish distributed, federated, and decentralized systems.
   2. The student understands consensus, consistency and coordination within the context of networked and decentralized systems.
   3. The student understands the concept of Sybil attacks.
   4. The student is familiar with decentralized algorithms for leader election and mutual exclusion for execution contexts with various guarantees.
   5. The student understands the formally proven limits of fault tolerance and their underlying assumptions. This includes an understanding of synchronous and asynchronous network models which underpin the respective proofs. The student also understands several models for fault tolerance, notably silent and noisy crash as well as byzantine fault tolerance within the context of decentralized and distributed systems.
   6. The student has a basic understanding of state machine replication.
   7. The student knows various models for and levels of consistency.

2. Applications
   1. The student understands conflict-free replicated data types and their use in decentralized systems like Matrix.
   2. The student has a fundamental understanding of blockchain-based systems (e.g. Bitcoin/Ethereum), Payment Channels, Rollups, and decentralized communication systems like Matrix.
   3. The student understands trust relations in distributed and decentralized systems and applications.
   4. The student is able to understand how theoretical foundations relate to networked and decentralized systems in practice.
   5. The student understands concepts of decentralized storage systems.

Workload:

Lecture workload:

1. Attendance time (Course, exercise, etc.)
   - Lecture: 3 SWS: 3,0h x 15 = 45h
   - Exercise: 1 SWS: 1,0h x 15 = 15h

2. Self-study (e.g. independent review of course material, work on homework assignments)
   - Weekly preparation and follow-up of the lecture: 15 x 1h x 3 = 45h
   - Weekly preparation and follow-up of the exercise: 15 x 2h = 30h

3. Preparation for the exam: 45 h

\[ \Sigma = 180h = 6 \text{ ECTS} \]
Competency certificate:

Depending on the number of participants, it will be announced six weeks before the examination (§ 6 Abs. 3 SPO) whether the examination takes place

- in the form of an oral examination lasting 30 minutes pursuant to § 4 Abs. 2 Nr. 2 SPO or
- in the form of a written examination lasting 60 minutes in accordance with § 4 Abs. 2 Nr. 1 SPO.

Seminar: Interactive Learning
2400136, SS 2024, 2 SWS, Language: English, Open in study portal

Content
Arbeitsaufwand = 90 h = 3 ECTS

- Präsenzzeit: 15hr
- Selbststudium: 45h
- Scientific Report schreiben: 20h

Präsentation vorbereiten: 10h

Each student will select several related papers in the field of Interactive Learning. The organizers will suggest several papers but the students will be encouraged to indentify and research additional relevant papers during the semester. The students will then prepare a presentation and a basic scientific research paper.

It is highly recommended to take this seminar in combination with the "Interactive Learning" Research Project (Forschungspraktikum), where the students get the chance to deepen their understanding, implement and evaluate their presented work.

We highly recommend to take this seminar in combination with the "Interactive Learning" research project (Forschungspraktikum).

It is highly recommended to attend the “Explainable Artificial Intelligence” lecture in parallel or prior to this seminar.

- Experience in Machine Learning is recommended, e.g. through prior coursework.
- The Computer Science Department offers several great lectures e.g., "Maschinelles Lernen - Grundlagen und Algorithmen" and "Deep Learning"
- A good mathematical background will be beneficial
- Python experience is recommended
- We might use the PyTorch deep learning library In the exercises. Some prior knowledge in this is helpful but not necessary.

Vortrag zum gewählten Thema am Ende des Semesters und schriftliche Ausarbeitung.

Ein Rücktritt ist innerhalb von zwei Wochen nach Vergabe des Themas möglich.
It is only possible to resign within two weeks after assignment of the topic.

Organizational issues
KIT-Fakultät für Informatik/1. Informatik Lehrveranstaltungen/1.7 Seminare

Embedded Machine Learning
2400137, SS 2024, SWS, Language: German/English, Open in study portal
Content
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Approximate Computing for Efficient Machine Learning
Nowadays, energy efficiency is a first-class design constraint in the ICT sector. Approximate computing emerges as a new design paradigm for generating energy efficient computing systems. There is a large body of resource-hungry applications (eg, image processing and machine learning) that exhibit an intrinsic resilience to errors and produce outputs that are useful and of acceptable quality for the users despite their underlying computations being performed in an approximate manner. By exploiting this inherent error tolerance of such applications, approximate computing trades computational accuracy for savings in other metrics, eg, energy consumption and performance. Machine learning, a very common and top trending workload of both data centers and embedded systems, is a perfect candidate for approximate computing application since, by definition, it delivers approximate results. Performance as well as energy efficiency (especially in the case of embedded systems) are crucial for machine learning applications and thus, approximate computing techniques are widely adopted in machine learning (eg, TPU) to improve its energy profile as well as performance.

Machine Learning methods for DNN compilation and mapping
Deep neural networks have achieved great success in challenging tasks such as image classification and object detection. There is a great demand for deploying these networks in different devices, ranging from cloud servers to embedded devices. Mapping DNNs to these devices is a challenging task since each of these devices has different characteristics in terms of memory organization, compute units, etc. There have been efforts to automate the process of mapping/compiling DNNs to hardware with different characteristics.

In this seminar, we will discuss the efforts that have been done in mapping/compiling DNNs over hardware using machine learning methods.

Organizational issues
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- What’s their impact on critical information or other resources?
- What are the current countermeasures for the attacks?

Organizational issues
Please register in ILIAS to participate.
6 COURSES

Content

Content:

Machine learning (ML) methods are already ubiquitous in many areas of society and research. This is especially true for climate and environmental sciences, where ML algorithms help e.g. to improve predictions of climate change and weather, or to optimize energy supply systems. In this session, we will discuss cutting-edge publications on ML applications in climate and environmental sciences, as well as the underlying theory behind the classes of algorithms. While organizers will suggest initial papers, students will be encouraged to seek out additional relevant literature throughout the semester.

The seminar will cover both the in-depth study of the climate/environmental sciences topic as well as of the specific machine learning method(s) employed in the literature. It will include two short and one longer final presentation from each student. The first presentation will focus solely on the chosen climate or environmental event or phenomenon, while the second presentation will cover the machine learning methods employed in studying it. Next to suggested reading by the module organizers, students will be encouraged to seek out additional relevant literature throughout the semester.

Towards the end, students will compile their findings into the final presentation accompanied by a scientific report, presenting the results in the form of a lecture.

Workload:

Total 90 h, consisting of:

- Attendance time in the seminar and personal meetings with the supervisors: 10 h
- Literature research: 30 h
- Writing the seminar paper and preparing the final presentation: 50 h

Competency certificate:

Success is assessed in the form of a different type of examination in accordance with Section § 4 Abs. 2 Nr. 3 SPO.

- In the form of a written seminar paper and the presentation of the same.

Recommendations:

An interest in climate and environmental sciences topics is a prerequisite.

Advanced Methods of Information Fusion

24344, SS 2024, 2 SWS, Language: German/English, Open in study portal

Seminar (S) On-Site

Content

The growing spread and performance of modern information and communication technologies produces an ever-increasing amount data. It is one of the central challenges of our time to extract meaningful information from these data sets. The approach to address these issues, often called data science, combines strategies and methods from the fields of machine learning, mathematics, state estimation, visualization and pattern recognition. During this seminar, the students will familiarize themselves with concepts and methods particularly focusing on estimation theory and its application.

The seminar targets master students in computer science and bachelor students in Information engineering and management.

Affective User Research for Human-Al Interaction

2500036, SS 2024, 2 SWS, Language: English, Open in study portal

Seminar (S) Blended (On-Site/Online)
Content
User research aims to understand users’ needs, behaviors, and attitudes to effectively inform the design and development of products or services. It is a key endeavor to learn how users experience digital technologies, what is working well and what is not, and identify gaps and future needs in order to personalize and improve the user experience. To design for positive user experiences, investigating affective user reactions (e.g., emotions, stress, flow) is of particular interest. Therefore, affective user research collects and analyzes behavioral data and affective reactions of users when engaging with products or services. With the growing amount of data and computing capabilities, artificial intelligence (AI) technologies are increasingly used in user research for the prediction of affective user states when interacting with digital technology.

The recent advances in artificial intelligence (AI), however, may not only support affective user research as a method of inquire, but it also has found its way into our daily lives as humans interact with it every day, for example, in form of recommendation engines on social media, in health applications, or as personal assistants based on large language models (LLMs) to receive text output for code completion, ideation, or writing. Interacting with AI-based digital technologies also triggers affective user reactions. However, these affective user reactions in Human-AI Interactions are yet to be understood.

In this seminar, participants will apply methods for affective user research on a particular type of Human-AI Interaction, the prompting of LLMs. LLM prompting is expected to become the up-and-coming form of interacting with AI in the future. To receive output from an LLM, users must send a prompt to the LLM. Given a prompt, an LLM responds incrementally with “tokens” (e.g., groups of letters, numbers, punctuation) which build the output. Structuring the prompt and receiving output influences the affective reactions of the user. Precisely, these user reactions should be investigated by the students participating in this seminar.

In the “Affective User Research for Human-AI Interaction” seminar, participating students will learn how to apply AI-based user research methods with a specific emphasis on the affective dimension when interacting with AI-based digital technologies. The goal of this seminar is to provide students with a unique set of skills in (1) quantitative data analysis, (2) knowledge about Human-AI Interaction and, in particular, LLM prompting, and (3) prediction of affective user states (e.g., emotions, stress) using state-of-the-art machine learning (ML) techniques. Students will leverage a dataset on Human-AI Interaction and gain in-depth knowledge from it as part of the seminar. The seminar emphasizes the importance of applying the aforementioned affective user research methods in an ethically compliant form. The core activities include:

- Learn the fundamentals of AI-based affective user research methods.
- Explore a dataset on Human-AI Interaction with the specific focus on the interplay of user behavior and affective user reactions.
- Developing AI-based supervised machine learning techniques for predicting user activities and affective user states.
- Present findings and insights to the seminar audience and discuss the results.

The seminar is held by Dr. Ivo Benke in cooperation with Dr. Lennard Schmidt. Both are experts from industry in the fields of affective user research, quantitative data analysis, and Human-AI Interaction.

Learning Objectives

- Understand the potential of combining user behavior and affective user reaction data for affective user research.
- Develop hands-on knowledge by applying AI-based affective user research methods on a real-world dataset.
- Develop a deeper understanding of a prominent form of Human-AI Interaction (e.g., LLM prompting).
- Deliver a presentation in a scientific context in front of an auditorium.
Content
User-adaptive systems collect and analyze biosignals from users to recognize user states as a basis for adaptation. Thermic, mechanical, electric, acoustic, and optical signals are collected using sensors which are integrated in wearables, e.g. glasses, earphones, belts, or bracelets. The collected data is processed with analytics and machine learning techniques in order to determine short-term, evolving over time, and long-term user states in the form of user characteristics, affective-cognitive states, or behavior. Finally, the recognized user states are leveraged for realizing user-centric adaptations.

In this seminar, interdisciplinary teams of students design, develop, and evaluate a user-adaptive system prototype leveraging state-of-the-art hard- and software. This seminar follows an interdisciplinary approach. Students from the fields of computer science, information systems and industrial engineering & management collaborate in the prototype design, development, and evaluation.

The seminar is carried out in cooperation between Teco/Chair of Pervasive Computing Systems (Prof. Beigl) and the Institute of Information Systems and Marketing (h-lab, Prof. Mädche). It is offered as part of the DFG-funded graduate school "KD2School: Designing Adaptive Systems for Economic Decisions" (https://kd2school.info/)

Learning objectives of the seminar
- Explain what a user-adaptive system is and how it can be conceptualized
- Suggest and evaluate different design solutions for addressing the identified problem
- Build a user-adaptive system prototype using state-of-the-art hard- and software
- Perform a user-centric evaluation of the user-adaptive system prototype

Prerequisites
Strong analytical abilities and profound software development skills are required.

Organizational issues
Termine werden bekannt gegeben

Literature
Required literature will be made available in the seminar.

Human-Centered Systems Seminar: Research
2540557, SS 2024, 3 SWS, Language: English, Open in study portal
Content
Formerly known as "Information Systems and Service Design Seminar"

With this seminar, we aim to provide students with the possibility to independently work on state-of-the-art research topics in addition to the knowledge gained in the lectures of the research group IS I (Prof. Mädche). The research group "Information Systems I" (IS I) headed by Prof. Mädche focuses in research, education, and innovation on designing interactive intelligent systems. It is positioned at the intersection of Information Systems and Human-Computer Interaction (HCI).

In the seminar, participants will get deeper insights in a contemporary research topic in the field of information systems, specifically interactive intelligent systems.

The actual seminar topics will be derived from current research activities of the research group. Our research assistants offer a rich set of topics from our research clusters (digital experience and participation, intelligent enterprise systems, or digital services design & innovation). Students can select among these topics individually depending on their personal interests. The seminar is carried out in the form of a literature-based thesis project. In the seminar, students will acquire the important methodological skills of running a systematic literature review.

Learning Objectives
- focus on a contemporary topic at the intersection of Information Systems and Human-Computer Interaction (HCI), specifically interactive intelligent systems
- carry out a structured literature search for a given topic
- aggregate the collected information in a suitable way to present and extract knowledge
- write a seminar thesis following academic writing standards
- deliver a presentation in a scientific context in front of an auditorium

Prerequisites
No specific prerequisites are required for the seminar.

Literature
Further literature will be made available in the seminar.

Organizational issues
Termine werden bekannt gegeben
### 6.345 Course: Seminar Laboratory: Machine Learning and Intelligent Systems [T-INF-112105]

**Responsible:** Michael Fennel  
Prof. Dr.-Ing. Uwe Hanebeck

**Organisation:** KIT Department of Informatics

**Part of:** M-INF-105959 - Seminar Laboratory: Machine Learning and Intelligent Systems

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Legend: 🖥 Online, 📋 Blended (On-Site/Online), ☑️ On-Site, ❌ Cancelled
### 6.346 Course: Seminar: Commercial and Corporate Law in the IT Industry [T-INFO-111405]

**Responsible:** Dr. Georg Nolte  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101216 - Private Business Law

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**Responsible:** Martin Schallbruch  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101217 - Public Business Law

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Information Systems M.Sc.  
Module Handbook as of 11/04/2024
Course: Seminar: Legal Studies I [T-INFO-101997]

**Responsible:** N.N.

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-101218 - Seminar Module Law

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣️ On-Site, ✗ Cancelled

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

#### EU Digital Regulatory Framework

**2400184, WS 23/24, 2 SWS, Language: English, Open in study portal**

**Seminar (S)**

**On-Site**
Content
This class aims to provide an overview on the legal instruments forming the EU digital regulatory framework. Following its Digital Single Market Strategy, the EU has set up a new strategic programme for a “Digital Decade”. Existing regulations like the General Data Protection Regulation (GDPR), or the E-Commerce Directive, are being complemented by a variety of new instruments that aim to set binding rules on online markets, to regulate data flows in various ways, but also to pioneer a legal framework on AI. Prominent instruments include the new AI Act (proposal), the Digital Services Act (DSA) and Digital Markets Act (DMA), the Data Act, Data Governance Act, or Open Data Directive.

The class will provide an overview on the existing framework: Which regulations and directives are relevant? How do they apply and interact which each other in a broader context?

Another objective is to provide students with the ability to read these legal instruments: How to access regulatory instruments that often have more than 100 pages (without having to read every single sentence)? How to gain a comprehensive, high-level understanding of the instrument? How to identify parts relevant to a particular legal problem?

The class will start with an introduction into EU law and regulatory instruments in general. Concrete guidance on reading, analysing and working with legal instruments in English will be given. Based on these instructions, students will be assigned legal instruments to present in the final unit along with a two-pages report.

Grades will be assigned based on the quality of these presentations and the report, as well as participation in the discussion (presentation: 40 %, two-pages report: 40 %, discussion: 20 %).

Organizational issues
WS 2023/24
Course: Service Design Thinking [T-WIWI-102849]

**Responsibility:**
Prof. Dr. Gerhard Satzger
Prof. Dr. Orestis Terzidis

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

**Part of:**
M-WIWI-101503 - Service Design Thinking

### Type
Examination of another type

### Credits
12

### Grading scale
Grade to a third

### Recurrence
Irregular

### Version
4

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣️ On-Site, × Cancelled

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**Competence Certificate**

Success is assessed in the form of an alternative exam assessment which consists of a case study, workshops, and a final presentation. The weighting of these components for the grade will be announced at the beginning of the course.

**Prerequisites**

None

**Recommendation**

This course is held in English – proficiency in writing and communication is required. Our past students recommend to take this course at the beginning of the masters program.

**Annotation**

Due to practical project work as a component of the program, access is limited. The module (as well as the module component) spans two semesters. It starts in September every year and runs until end of June in the subsequent year. Entering the program is only possible at its beginning - after prior application in May/June. For more information on the application process and the program itself are provided in the module component description and the program's website (http://sdt-karlsruhe.de). Furthermore, the KSRI conducts an information event for applicants every year in May. This module is part of the KSRI Teaching Program „Digital Service Systems“. For more information see the KSRI Teaching website: www.ksri.kit.edu/teaching.

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

**Service Design Thinking**
2595600, WS 23/24, 2 SWS, Language: English, Open in study portal

Lecture (V)  On-Site
Content
The Service Design Thinking course is more than a usual lecture. You will learn what it really takes to be an innovator. You will receive education in the human-centric innovation approach Design Thinking, work in small but interdisciplinary and international teams on real business challenges over the course of nine months (September to June). You will collaborate directly with mentors from a partner company as well as with fellow students from renowned universities from the SUGAR network, e.g. the University of St. Gallen, the Trinity College Dublin or the University of Science and Technology of China (USTC). Along the way, you will visit international destinations known for being innovation hotspots and will be on stage at innovation events that draw an audience of several hundred participants.

What students will learn:
- Deep knowledge of the innovation method “Design Thinking”, as introduced and promoted by Stanford University.
- Development of new, creative solutions through extensive observation of oneself and one’s environment, in particular with regard to the relevant service users.
- Know-how to use prototyping and experimentation to visualize one’s ideas, to test and iteratively develop them, and to converge on a solution.
- Learn to apply the method to real innovation projects issued by industry partners.
- Communicate, work and present in an interdisciplinary and international project setting.

Course phases (roughly 4 weeks each):
- **Paper Bike:**
  Learning about the basic method elements by building a paper bike that has to fulfill a given set of challenges. The bikes will be tested in a race during an international Kick-Off event with other universities of the SUGAR network (internally known as Design Thinking network).
- **Design Space Exploration:**
  Exploring the problem space through customer and user observation as well as desk research.
- **Critical Function Prototype:**
  Identification of critical features from the customer’s perspective that can contribute to the solution of the overarching problem. Building and testing prototypes that integrate these functionalities.
- **Dark Horse Prototype:**
  Inverting earlier assumptions and experiences, which leads to the inclusion of new features and solutions. Developing radically new ideas are the focus of this phase.
- **Funky Prototype:**
  Integration of the individually tested and successful functions to a complete solution, which is further tested and developed.
- **Functional Prototype:**
  Selection of successful scenarios from the previous phase and building a higher resolution prototype. The final solution to the challenge is laid out in detail and tested with users.
- **Final Prototype:**
  Implementing the functional prototype and presenting it to the customer as well as the SUGAR network.

Organizational issues
Bei der Vorlesung handelt es sich um eine zweisemestrische Veranstaltung, die jährlich im September startet.

Literature
- Design Thinking: Das Handbuch; Falk Uebernickel, Walter Brenner, Therese Naef, Britta Pukall, Bernhard Schindlholzer
- The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems; Michael Lewrick, Patrick Link, Larry Leifer
- The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods; Michael Lewrick, Patrick Link, Larry Leifer
- Frame Innovation: Create New Thinking by Design (Design Thinking, Design Theory); Kees Dorst

Information Systems M.Sc.
Module Handbook as of 11/04/2024
Content
The Service Design Thinking program is much more than a normal course. Through this program, we provide the knowledge and skills that true innovators need. In this context, we train our participants in the human-centric innovation approach “Design Thinking”. In addition, participants work in small international and interdisciplinary teams on real innovation challenges from practice.

The teams are made up of students from KIT and another university from the global SUGAR network. These include, for example, the Hasso Plattner Institute in Potsdam, Trinity College in Dublin and the University of Science and Technology of China. The program includes visits to international events of the SUGAR Network, which are usually held in places known for their high level of innovation. At these events, our participants present their (interim) results to a large audience consisting of employees from the partner companies and the universities involved.

What students will learn:

- A comprehensive understanding of the globally recognized innovation approach “Design Thinking” as introduced and promoted by the Stanford University
- Development of new, creative solutions through extensive need finding, in particular with regard to the relevant service users
- to develop prototypes of the collected ideas early and independently, to test them and improve them iteratively, thereby solving the issue defined by the partner company
- to communicate, present and network in an interdisciplinary and international environment
- to apply the learned approach in the context of a real innovation project provided by a practical partner.

Course phases (roughly 4 weeks each):

- Kick off:
  Learning the basic method elements by solving an exercise challenge. Participation in the Global Kick-Off of the SUGAR Network consisting of method workshops, working on team challenges, networking with other universities and forming project teams for the challenges of the practical partners.
- Design Space Exploration:
  Exploring the problem space by questioning the given innovation challenge from practice. Familiarization with the topic area of the respective challenge. Gathering first impressions of the requirements and needs of people related to the problem.
- Critical Function Prototype:
  Building an intensive understanding of the needs of the target group of the respective challenge. Deriving critical functions from the customer’s perspective that could help solve the overall problem. Building prototypes for the critical functions and testing them in real customer situations.
- Dark Horse Prototype:
  Reversal of assumptions and experiences made so far. The goal is to develop radically new and unconventional ideas. Implementation of the ideas into simple prototypes and subsequent testing.
- Funky Prototype:
  Integration of the individual successfully tested functions from the critical function and dark horse phase into solution concepts. These are also tested and further developed.
- Functional Prototype:
  Selection of successful funky prototypes and development of these towards high-resolution prototypes. The final solution approach for the project is written down in detail and feedback is obtained.
- Final Prototype:
  Implementing the final prototype and presenting it to the practical partner as well as the SUGAR Network.

Organizational issues
Bei der Vorlesung handelt es sich um eine zweisemestrische Veranstaltung, die jährlich im September startet.

Literature
- Design Thinking: Das Handbuch; Falk Uebernickel, Walter Brenner, Therese Naef, Britta Pukall, Bernhard Schindholzer
- The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems; Michael Lewrick, Patrick Link, Larry Leifer
- The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods; Michael Lewrick, Patrick Link, Larry Leifer
- Frame Innovation: Create New Thinking by Design (Design Thinking, Design Theory); Kees Dorst

Information Systems M.Sc.
Module Handbook as of 11/04/2024
6.350 Course: Signals and Codes [T-INFO-101360]

**Responsible:** Prof. Dr. Jörn Müller-Quade

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100823 - Signals and Codes

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**Exams**

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

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

**Signals and Codes**

WT 23/24, 24137, 2 SWS, Language: German, Open in study portal

**Content**

In this lecture, bounds for codes (Hamming, Gilbert-Varshamov, Singleton) are presented. Coding and decoding for classical algebraic codes (linear, cyclic, Reed Solomon-, Goppa- und Reed Muller-codes) will be presented as well as concatenated codes.

**Literature**


Todd Moon, 'Error Correction Coding', Wiley, 2005

Weitere Literatur wird in der Vorlesung bekannt gegeben.

**Weiterführende Literatur**

Wird in der Vorlesung bekannt gegeben.
6.351 Course: Simulation Game in Energy Economics [T-WIWI-108016]

**Responsible:** Dr. Massimo Genoese  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101451 - Energy Economics and Energy Markets

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**Competence Certificate**  
Examination as written assignment and oral presentation (§4 (2), 1 SPO).

**Prerequisites**  
None

**Recommendation**  
Visiting the course "Introduction to Energy Economics"

**Annotation**  
The number of participants is limited.  
There is a registration procedure via CAS followed by a selection of the participants.

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

**Simulation Game in Energy Economics**  
2581025, SS 2024, 3 SWS, Language: German,  
Open in study portal

**Content**

- Introduction  
- Agents and market places in the electricity industry  
- Selected planning tasks of energy service companies  
- Methods of modelling in the energy sector  
- Agent-based simulation: The PowerACE model  
- Simulation game: Simulation in energy economics (electricity and emission trading, investment decisions)

The lecture is structured in a theoretical and a practical part. In the theoretical part, the students are taught the basics to carry out simulations themselves in the practical part which comprises amongst others the simulation of the power exchange. The participants of the simulation game take a role as a power trader in the power market. Based on various sources of information (e.g. prognosis of power prices, available power plants, fuel prices), they can launch bids in the power exchange.

**Assessment:** presentation and written summary

**Prerequisites:** Basics in Energy economics ad markets are advantageous.

**Organizational issues**  
CIP-Pool West, Raum 102, Geb. 06.41 - siehe Institutsaushang

**Literature**

**Weiterführende Literatur:**
6.352 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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**Competence Certificate**

The assessment consists of a written exam (60 minutes). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

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

**V** (Smart) Energy Infrastructure  
2581023, WS 23/24, 4 SWS, Language: English, [Open in study portal](#)

**Content**

The lecture provides a techno-economic overview of different infrastructures of the energy system and their importance regarding the future energy system ("Energiewende") – in particular

- for electricity:
  - the supply side (e.g. power plants)
  - the demand side (e.g. load structures of appliances, flexibilities) as well as transport infrastructures (electricity grids)
- for fuel transportation:
  - pipeline infrastructures (focus on natural gas)
  - shipping of LNG
  - crude oil and oil product transportation
  - hydrogen transportation
  - comparison of potential energy carriers for global trade of renewable energy (e.g., hydrogen and its derivates, e-fuels, reactive metals)
- storage systems (e.g. batteries)

Additionally, the lecture provides a toolbox for energy system analysis such as an overview and classification of energy systems modelling approaches as well as the usage of scenario techniques for energy systems analysis.

The lecture also provides practical examples for the relevant methods presented.

**Organizational issues**

Blockveranstaltung
### 6.353 Course: Smart Grid Applications [T-WIWI-107504]

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

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

**Part of:**
- M-WIWI-101446 - Market Engineering
- M-WIWI-103720 - eEnergy: Markets, Services and Systems

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, × Cancelled

**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 no longer be offered from the coming winter semester 2023/24. It is only possible to take part in the main exam (first-time writer) and follow-up exam (repeater).
6.354 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

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*Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Canceled*

**Competence Certificate**  
Success is assessed by an alternative exam assessment in the form of an open-book examination lasting 60 minutes. The examination is offered every summer semester.

**Prerequisites**  
None

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

**Social Choice Theory**  
2520537, SS 2024, 2 SWS, Language: English, Open in study portal

**Content**  
How should (political) candidates be elected? What are good ways of merging individual judgments into collective judgments? Social Choice Theory is the systematic study and comparison of how groups and societies can come to collective decisions. The course offers a rigorous and comprehensive treatment of judgment and preference aggregation as well as voting theory. It is divided into two parts. The first part deals with (general binary) aggregation theory and builds towards a general impossibility result that has the famous Arrow theorem as a corollary. The second part treats voting theory. Among other things, it includes proving the Gibbard-Satterthwaite theorem.

**Literature**  
Main texts:


Secondary texts:

6.355 Course: Sociotechnical Information Systems Development [T-WIWI-109249]

**Responsible:** Prof. Dr. Ali Sunyaev  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-104403 - Critical Digital Infrastructures

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**Events**

| ST 2024 | 2512400 | Advanced Lab Development of Sociotechnical Information Systems (Bachelor) | 3 SWS | Practical course / 🧩 | Sunyaev, Leiser |
| ST 2024 | 2512401 | Advanced Lab Development of Sociotechnical Information Systems (Master) | 3 SWS | Practical course / 🧩 | Sunyaev, Leiser |

**Exams**

| WT 23/24 | 7900080 | Advanced Lab Development of Sociotechnical Information Systems (Bachelor) | Sunyaev |
| WT 23/24 | 7900143 | Advanced Lab Development of Sociotechnical Information Systems (Master) | Sunyaev |
| ST 2024  | 7900173 | Advanced Lab Development of Sociotechnical Information Systems (Master) | Sunyaev |

**Competence Certificate**

The alternative exam assessment 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:**

### Advanced Lab Development of Sociotechnical Information Systems (Bachelor)

- **Code:** 2512400
- **Type:** Practical course (P)
- **Credits:** 3 SWS
- **Language:** German/English
- **Location:** Open in study portal

**Content**

The aim of the lab is to get to know the development of socio-technical information systems in different application areas. In the event framework, you should develop a suitable solution strategy for your problem alone or in group work, collect requirements, and implement a software artifact based on it (for example, web platform, mobile apps, desktop application). Another focus of the lab is on the subsequent quality assurance and documentation of the implemented software artifact.

Registration information will be announced on the course page.

### Advanced Lab Development of Sociotechnical Information Systems (Master)

- **Code:** 2512401
- **Type:** Practical course (P)
- **Credits:** 3 SWS
- **Language:** German/English
- **Location:** Open in study portal

**Content**

The aim of the lab is to get to know the development of socio-technical information systems in different application areas. In the event framework, you should develop a suitable solution strategy for your problem alone or in group work, collect requirements, and implement a software artifact based on it (for example, web platform, mobile apps, desktop application). Another focus of the lab is on the subsequent quality assurance and documentation of the implemented software artifact.

Registration information will be announced on the course page.
6.356 Course: Software Architecture and Quality [T-INFO-101381]

**Responsible:** Prof. Dr. Ralf Reussner

**Organisation:** KIT Department of Informatics

**Part of:**
- M-INFO-100844 - Software Architecture and Quality
- M-WIWI-104812 - Information Systems: Engineering and Transformation

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**Exams**

| WT 23/24 | 7500032 | Software Architecture and Quality | Reussner |
| ST 2024  | 7500021 | Software Architecture and Quality | Reussner |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
6.357 Course: Software Engineering II [T-INFO-101370]

**Responsible:** Prof. Dr.-Ing. Anne Koziolek
Prof. Dr. Ralf Reussner

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-100833 - Software Engineering II

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled

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

**Software Engineering II**

24076, WS 23/24, 4 SWS, Language: German, [Open in study portal](#)

**Literature**

### 6.358 Course: Software Lab Parallel Numerics [T-INFO-105988]

**Responsible:** Prof. Dr. Wolfgang Karl  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-102998 - Software Lab Parallel Numerics

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Legend: Online, Blended (On-Site/Online), On-Site, Cancelled
**6.360 Course: Software Quality Management [T-WIWI-102895]**

**Responsible:** Prof. Dr. Andreas Oberweis

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

**Part of:**
- M-WIWI-101477 - Development of Business Information Systems
- M-WIWI-104812 - Information Systems: Engineering and Transformation

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<td>Software Quality Management (Registration until 15 July 2024)</td>
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**Legends:**
- 🖥 Online
- ⚣ Blended (On-Site/Online)
- 🗣 On-Site
- ✗ Cancelled

**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:**

**Software Quality Management**

2511208, SS 2024, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V) On-Site**

**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.

**Learning objectives:**
Students

- explain the relevant quality models,
- apply methods to evaluate the software quality and evaluate the results,
- know the main models of software certification, compare and evaluate these models,
- write scientific theses in the area of software quality management and find own solutions for given problems.

**Recommendations:**
Programming knowledge in Java and basic knowledge of computer science are expected.

**Workload:**
- Lecture 30h
- Exercise 15h
- Preparation of lecture 24h
- Preparation of exercises 25h
- Exam preparation 40h
- Exam 1h
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

Weitere Literatur wird in der Vorlesung bekanntgegeben.
# 6.361 Course: Software Security Engineering [T-INFO-112862]

**Responsible:** Dr. Christopher Gerking  
Prof. Dr. Ralf Reussner  

**Organisation:** KIT Department of Informatics  

**Part of:** M-INFO-106344 - Software Security Engineering

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## Exams

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣️ On-Site, ✗ Cancelled
### 6.362 Course: Software-Evolution [T-INFO-101256]

**Responsible:** Prof. Dr. Ralf Reussner  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100719 - Software-Evolution

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#### Exams

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ⌚ Cancelled
6.363 Course: Spatial Economics [T-WIWI-103107]

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

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

**Part of:**
- M-WIWI-101485 - Transport Infrastructure Policy and Regional Development
- M-WIWI-101496 - Growth and Agglomeration

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**Competence Certificate**

Depending on further pandemic developments, the examination will be offered either as an open-book examination, or as a 60-minute written examination.

**Prerequisites**

None

**Recommendation**

Basic micro- and macroeconomic knowledge is required, such as that taught in the courses "Economics I" [2600012] and "Economics II" [2600014], attendance of which is strongly recommended (but not mandatory). An interest in quantitative-mathematical modeling is also a prerequisite. Attendance of the course "Introduction to Economic Policy" [2560280] is recommended.

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

**Spatial Economics**

2561260, WS 23/24, 2 SWS, Language: English, Open in study portal

Lecture (V) On-Site
Content
The course covers the following topics:

- 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

Learning objectives:
The student

- analyses how spatial distribution of economic activity is determined.
- uses quantitative methods within the context of economic models.
- has basic knowledge of formal-analytic methods.
- understands the link between economic theory and its empirical applications.
- understands to what extent concentration processes result from agglomeration and dispersion forces.
- is able to determine theory based policy recommendations.

Recommendations:
Basic knowledge of micro- and macroeconomics is assumed, as taught in the courses Economics I [2600012], and Economics II [2600014]. An interest in mathematical modeling is advantageous.

Workload:
The total workload for this course is approximately 135 hours.

- Classes: ca. 30 h
- Self-study: ca. 45 h
- Exam and exam preparation: ca. 60 h

Assessment:
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

Literature

Weitere Literatur wird in der Vorlesung bekanntgegeben.
(Further literature will be announced in the lecture.)
6.364 Course: Special Topics in Information Systems [T-WIWI-109940]

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

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

**Part of:**
- M-WIWI-101410 - Business & Service Engineering
- M-WIWI-101506 - Service Analytics
- M-WIWI-103720 - eEnergy: Markets, Services and Systems

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**Exams**

| WT 23/24 | 7900263 | Special Topics in Information Systems | Weinhardt |

**Competence Certificate**

The assessment of this course is 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 (such as a survey or an implementation of an application) is part of the course. Please examine the course description for the particular tasks.

The overall grade is composed as follows:

A total of 60 points can be achieved, of which

- A maximum of 30 points for the written documentation
- A maximum of 30 points for the practical component

In order to pass the success control, at least 15 points (written documentation / practical component) must be achieved.

**Prerequisites**

see below

**Recommendation**

None

**Annotation**

All the practical seminars offered at the chair of Prof. Dr. Weinhardt can be chosen in the Special Topics in Information Systems course. The current topics of the practical seminars are available at the following homepage: [www.iism.kit.edu/im/lehre](http://www.iism.kit.edu/im/lehre).

The Special Topics Information Systems is equivalent to the practical seminar, as it was only offered for the major in "Information Systems" so far. With this course students majoring in "Industrial Engineering and Management" and "Economics Engineering" also have the chance of getting practical experience and enhance their scientific capabilities.

The Special Topics Information Systems can be chosen instead of a regular lecture (see module description). Please take into account, that this course can only be accounted once per module.
### 6.365 Course: Startup Experience [T-WIWI-111561]

**Responsible:** Prof. Dr. Orestis Terzidis  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101488 - Entrepreneurship (EnTechnon)

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#### Events

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<td>Startup Experience</td>
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#### Exams

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**Competence Certificate**  
Alternative exam assessment. Details on the design of the examination performance of other types will be announced in the course. The grade is composed of a presentation and a written paper (plus any specified documentation, e.g. work results, experience diary, reflection).

**Recommendation**  
Lecture Entrepreneurship already completed

**Annotation**  
The language in the seminar is English. The seminar contents will be published on the chair homepage.

---

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

#### Startup Experience

2545004, WS 23/24, 4 SWS, Language: English, [Open in study portal](#)
Content

In the Startup Experience seminar you will develop entrepreneurial competences that will enable you to build a new business. In an entrepreneurial project, you have three main objectives:

1. Identify and develop an opportunity. Who is your target customer and what problem or task does he or she have? How attractive and how big is this market?
2. How will you add value to it? How can you use specific resources, including technology, to develop a solution?
3. How can you design and set up a viable organisation? What business model do you propose to create, deliver and capture value?

Our primary focus is on digital healthcare ventures, granting you the opportunity to delve into the realm of entrepreneurship within the healthcare system. After gaining a deep understanding of healthcare needs, you will utilize creativity techniques to uncover potential business ideas that provide value for patients and doctors. Additionally, you will learn how to create viable business models, dive into health regulations, and pitch your idea to a jury.

Learning Objectives

After completing this course, the course participants will be able to:

- Work effectively in a cohesive team
- Understand the role of digital entrepreneurship in healthcare
- Apply creativity techniques to ideate
- Use utility analysis approaches to select promising solutions
- Develop a value proposition based on techniques like the value proposition canvas or the jobs-to-be-done method
- Apply advanced business modeling methods to develop a sound business concept
- Develop and deliver a concise presentation ("pitch") to communicate your project
- Gain basic knowledge of healthcare regulations and reimbursement ways

Additional information:

Alternative exam assessment. The grade consists of the presentation and the written elaboration. Potentially, a ‘project diary’ of the seminar progress may be part of the deliverables (depends on tutor and will be communicated at the kick-off).

For a successful course completion, we expect you to submit a Business Plan with the following features:

- Scope: 9000 words,
- Sound and clear structure,
- Expression and spelling are correct
- Complete and correct references, quotations, etc.
- Visual elements are chosen appropriately
- Documentation and traceability of data acquisition, analysis and evaluation,
- Content is developed according to the course instructions.

Furthermore, we expect you to deliver a team Pitch.

- Duration: will be communicated (typically 5-10 minutes)
- Content: Introduction/Purpose; Problem; Solution; Business Model; Prototype; Competition; Management Team; Current Status and next steps,
- Layout and form: appropriate choice,
- Appearance: appropriate amount of visual elements,
- Data: well researched and organized visually
- Story Line: is sound; clear and convincing.

Organizational issues

Registration is via the Wiwi portal.

In the seminar you will work on a project in teams of max. 5 persons. The groups are formed in the seminar.
Content

Content

In the Startup Experience seminar you will develop entrepreneurial competences that will enable you to build a new business. In an entrepreneurial project, you have three main objectives:

1. Identify and develop an opportunity. Who is your target customer and what problem or task does he or she have? How attractive and how big is this market?
2. How will you add value to it? How can you use specific resources, including technology, to develop a solution?
3. How can you design and set up a viable organisation? What business model do you propose to create, deliver and capture value?

Our primary focus is on digital healthcare ventures, granting you the opportunity to delve into the realm of entrepreneurship within the healthcare system. After gaining a deep understanding of healthcare needs, you will utilize creativity techniques to uncover potential business ideas that provide value for patients and doctors. Additionally, you will learn how to create viable business models, dive into health regulations, and pitch your idea to a jury.

Learning Objectives

After completing this course, the course participants will be able to:

- Work effectively in a cohesive team
- Understand the role of digital entrepreneurship in healthcare
- Apply creativity techniques to ideate
- Use utility analysis approaches to select promising solutions
- Develop a value proposition based on techniques like the value proposition canvas or the jobs-to-be-done method
- Apply advanced business modeling methods to develop a sound business concept
- Develop and deliver a concise presentation ("pitch") to communicate your project
- Gain basic knowledge of healthcare regulations and reimbursement ways

Additional information:

Alternative exam assessment. The grade consists of the presentation and the written elaboration. Potentially, a ‘project diary’ of the seminar progress may be part of the deliverables (depends on tutor and will be communicated at the kick-off).

For a successful course completion, we expect you to submit a Business Plan with the following features:

- Scope: 9000 words,
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- Complete and correct references, quotations, etc.
- Visual elements are chosen appropriately
- Documentation and traceability of data acquisition, analysis and evaluation,
- Content is developed according to the course instructions.

Furthermore, we expect you to deliver a team Pitch.

- Duration: will be communicated (typically 5-10 minutes)
- Content: Introduction/Purpose; Problem; Solution; Business Model; Prototype; Competition; Management Team; Current Status and next steps,
- Layout and form: appropriate choice,
- Appearance: appropriate amount of visual elements,
- Data: well researched and organized visually
- Story Line: is sound; clear and convincing.

Organizational issues

Tuesday, 23.04.24
Tuesday, 30.04.24
Tuesday, 07.05.24
Tuesday, 28.05.24
Tuesday, 04.06.24
Tuesday, 18.06.24

Registration is via the Wiwi-Portal.

In the seminar you will work on a project in teams of max. 5 persons. Team applications are welcome but not a prerequisite for participation. The seminars will be held in English.
### Course: Statistical Modeling of Generalized Regression Models [T-WIWI-103065]

**Responsibility:** apl. Prof. 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
- M-WIWI-105414 - Statistics and Econometrics II

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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.

**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:

#### Lecture (V)

**Content**

**Learning objectives:**
The student has profound knowledge of generalized regression models.

**Requirements:**
Knowledge of the contents covered by the course "Economics III: Introduction in Econometrics" [2520016].

**Workload:**
- Total workload for 4.5 CP: approx. 135 hours
- Attendance: 30 hours
- Preparation and follow-up: 65 hours
6.367 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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**Competence Certificate**

The assessment of this course consists of a written examination (§4(2), 1 SPOs, 180 min.).

**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 23/24, 2 SWS, Language: English, Open in study portal

**Content**

**Learning objectives:**

After successful completion of the course students will be familiar with many common methods of pricing and portfolio models in finance. Emphasis we be put on both finance and the theory behind it.

**Content:**

The course will provide rigorous yet focused training in stochastic calculus and mathematical finance. Topics to be covered:


**Workload:**

Total workload for 4.5 CP: approx. 135 hours  
Attendance: 30 hours  
Preparation and follow-up: 65 hours

**Organizational issues**

Blockveranstaltung. Termine werden über Ilias bekannt gegeben
Literature

- Stochastic Finance: An Introduction in Discrete Time by H. Föllmer, A. Schied, de Gruyter, 2011
- Introduction to Stochastic Calculus Applied to Finance by D. Lamberton, B. Lapeyre, Chapman&Hall, 1996
### Course: Stochastic Information Processing [T-INFO-101366]

**Responsible:** Prof. Dr.-Ing. Uwe Hanebeck  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100829 - Stochastic Information Processing

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**Legend:** Online, Blended (On-Site/Online), On-Site, Cancelled

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

### Stochastic Information Processing

**24113, WS 23/24, 3 SWS, Language: German, Open in study portal**

**Lecture (V)**

**On-Site**

**Content**

In order to handle complex dynamic systems (e.g., in robotics), an in-step estimation of the system's internal state (e.g., position and orientation of the actuator) is required. Such an estimation is ideally based on the system model (e.g., a discretized differential equation describing the system dynamics) and the measurement model (e.g., a nonlinear function that maps the state space to a measurement subspace). Both system and measurement model are uncertain (e.g., include additive or multiplicative noise).

For continuous state spaces, an exact calculation of the probability densities is only possible in a few special cases. In practice, general nonlinear systems are often traced back to these special cases by simplifying assumptions. One extreme is linearization with subsequent application of linear estimation theory. However, this often leads to unsatisfactory results and requires additional heuristic measures. At the other extreme are numerical approximation methods, which only evaluate the desired distribution densities at discrete points in the state space. Although the working principle of these procedures is usually quite simple, a practical implementation often turns out to be difficult and especially for higher-dimensional systems it is computationally complex.

As a middle ground, analytical nonlinear estimation methods would therefore often be desirable. In this lecture the main difficulties in the development of such estimation methods are presented and corresponding solution modules are presented. Based on these building blocks, some analytical estimation methods are discussed in detail as examples, which are very suitable for practical implementation and offer a good compromise between computing effort and performance. Useful applications of these estimation methods are also discussed. Both known methods and the results of current research are presented.

**Organizational issues**

Der Prüfungstermin ist per E-Mail (gambichler@kit.edu) zu vereinbaren.

**Literature**

**Weiterführende Literatur**

Skript zur Vorlesung
## 6.369 Course: Strategic Management of Information Technology [T-WIWI-102669]

**Responsible:** Prof. Dr. Thomas Wolf  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-101477 - Development of Business Information Systems

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<td>Each summer term</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
6.370 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

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Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Competence Certificate
The control of success according to § 4(2), 3 SPO takes place by writing a scientific work and a presentation of the results of the work in the context of a conclusion meeting. Details on the design of the performance review will be announced during the lecture.

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:
Content
This course covers highly topical issues of great relevance to the management of organizations. Students will be enabled to take strategic management positions. By applying appropriate models from the fields of strategy and management - or models developed in-house - participants will learn to evaluate the strategic starting position of an organization and derive precise and well-founded recommendations for action based on this.
This course offers students the opportunity to explore current management issues and sharpen their skills in strategic analysis and evaluation. Through intensive collaboration and practical application of the knowledge learned, students are optimally prepared for the demands and challenges of modern business management.

Structure
The course begins with an overarching theme, based on which students are divided into groups of two. The core of the course consists of the preparation of a written paper as well as the presentation and discussion of the results.

Learning Objectives
Upon completion of the course, students will be able to,

- analyze complex business situations, think strategically and derive sound management decisions.
- compose clear and convincing written papers that accurately present the analyses and recommendations developed.
- present results in an engaging manner and actively participate in substantive discussions.

Recommendations:
Prior attendance of the Bachelor’s module "Strategy and Organization" or another module with comparable content at another university is recommended.

Workload:
Total effort approx. 90 hours
Attendance time: 15 hours
Preparation and follow-up: 75 hours
Examination and preparation: not applicable

Verification:
The success control according to § 4(2), 3 SPO is done by writing a scientific paper and a presentation of the results of the paper in the context of a final event. Details on the design of the performance review will be announced during the lecture.

Annotation:
The course is admission restricted. In case of prior admission to another course in the module "Strategy and Management: Advanced Topics" [M-WWI-103119], participation in this course is guaranteed. For more information on the application process, see the IBU website.

Exams are offered at least every other semester, so the entire module can be completed in two semesters.

Organizational issues
siehe Homepage
6.371 Course: Subdivision Algorithms [T-INFO-103551]

**Responsible:** Prof. Dr. Hartmut Prautzsch

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-101863 - Subdivision Algorithms

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**Competence Certificate**
The assessment is carried out as an oral examination (§ 4 Abs. 2 Nr. 2 SPO) lasting 20 minutes.

**Prerequisites**
None.
### Course: Successful Transformation Through Innovation [T-WIWI-111823]

| Responsible: | Malte Busch |
| Organisation: | KIT Department of Economics and Management |
| Part of: | M-WIWI-101507 - Innovation Management |
| | M-WIWI-101507 - Innovation Management |

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**Competence Certificate**

Alternative exam assessments. The grade consists of a presentation of the results (50%) and a seminar paper (50%).

**Recommendation**

Prior attendance of the course Innovation Management [2545015] is recommended.
6.373 Course: Supplement Enterprise Information Systems [T-WIWI-110346]

**Responsible:** Prof. Dr. Andreas Oberweis
**Organisation:** KIT Department of Economics and Management
**Part of:** M-WIWI-101477 - Development of Business Information Systems

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**Competence Certificate**
The assessment of this course is a written or (if necessary) oral examination.

**Prerequisites**
None

**Annotation**
This course can be used in particular for the acceptance of external courses whose content is in the broader area of applied informatics, but is not equivalent to another course of this topic.
6.374 Course: Supply Chain Management in the Automotive Industry [T-WIWI-102828]

**Responsible:** Tilman Heupel
Hendrik Lang

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

**Part of:**
- M-WIWI-101412 - Industrial Production III
- M-WIWI-101471 - Industrial Production II

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**Competence Certificate**

The examination will be offered for the last time in the summer semester 2024. Success is assessed in the form of an oral (30 minutes) or written (60 minutes) examination (in accordance with SPO § 4(2)).

**Prerequisites**

None

**Recommendation**

None

**Annotation**

The lecture is no longer offered.
6.375 Course: Supply Chain Management with Advanced Planning Systems [T-WIWI-102763]

Responsible: Claus J. Bosch
Dr. Mathias Göbelt

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-101412 - Industrial Production III
M-WIWI-101471 - Industrial Production II

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Events

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Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Competence Certificate
The assessment consists of an oral (30 minutes) or written exam (60 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (alternative exam assessment, following §4(2), 3 of the examination regulation).

Prerequisites
None

Recommendation
None

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

Supply Chain Management with Advanced Planning Systems
2581961, SS 2024, 2 SWS, Language: English, Open in study portal

Lecture (V)
On-Site
Content
This lecture deals with supply chain management from a practitioner’s perspective with a special emphasis Advanced Planning Systems (APS) and the planning domain. The software solution SAP SCM, one of the most widely used Advanced Planning Systems, is used as an example to show functionality and application of an APS in practice.

First, the term supply chain management is defined and its scope is determined. Methods to analyze supply chains as well as indicators to measure supply chains are derived. Second, the structure of an APS (advanced planning system) is discussed in a generic way. Later in the lecture, the software solution SAP SCM is mapped to this generic structure. The individual planning tasks and software modules (demand planning, supply network planning / sales & operations planning, production planning / detailed scheduling, deployment, transportation planning, global available-to-promise) are presented by discussing the relevant business processes, providing academic background, describing typical planning processes and showing the user interface and user-related processes in the software solution. At the end of the lecture, implementation methodologies and project management approaches for SAP SCM are covered.

Contents
1. Introduction to Supply Chain Management
   1.1. Supply Chain Management Fundamentals
   1.2. Supply Chain Management Analytics
2. Structure of Advanced Planning Systems
3. SAP SCM
   3.1. Introduction / SCM Solution Map
   3.2. Demand Planning
   3.4. Production Planning and Detailed Scheduling
   3.5. Deployment
   3.6. Transportation Planning / Global Available to Promise
   3.7. Cloud-based Supply Chain Planning
4. SAP SCM in Practice
   4.1. Project Management and Implementation
   4.2. SAP Implementation Methodology

Literature
will be announced in the course
### 6.376 Course: Tax Law [T-INFO-111437]

**Responsible:** Detlef Dietrich  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101216 - Private Business Law

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, 🗑 Cancelled
6.377 Course: Technologies for Innovation Management [T-WIWI-102854]

**Responsible:** Dr. Daniel Jeffrey Koch

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

**Part of:**
- M-WIWI-101507 - Innovation Management
- M-WIWI-101507 - Innovation Management

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<td>Grade to a third</td>
<td>Each winter term</td>
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**Competence Certificate**
Presentation and individual paper (ca. 15 pages) as alternative exam assessment.

**Prerequisites**
None

**Recommendation**
Prior attendance of the course Innovationsmanagement: Konzepte, Strategien und Methoden is recommended.
6.378 Course: Technology Assessment [T-WIWI-102858]

**Responsible:** Dr. Daniel Jeffrey Koch

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

**Part of:**
- M-WIWI-101507 - Innovation Management
- M-WIWI-101507 - Innovation Management

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**Competence Certificate**
Alternative exam assessment.

**Prerequisites**
None

**Recommendation**
Prior attendance of the course Innovation Management is recommended.

**Annotation**
See German version.

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

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

**Part of:**
- M-WIWI-101406 - Network Economics
- M-WIWI-101409 - Electronic Markets

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**Events**

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**Exams**

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**Legend:** 📚 Online, 📚 Blended (On-Site/Online), 🔷 On-Site, ❌ Canceled

**Competence Certificate**
Students’ understanding and knowledge will be assessed through either an oral or a written exam. The actual method used will be announced during the course. The course takes place every winter term, and exams are offered two times a year, in March and in September.

**Recommendation**
Basic knowledge of microeconomics is a precondition. Further knowledge of industrial economics or networks economics is useful, but not necessary. No prior knowledge of telecommunications or internet technologies is required.

**Annotation**
Disclaimer: German wording is sometimes provided in parallel. Some German original literature is used (especially official and legislative texts) where we will try to provide English translations in parallel.

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

**Telecommunication and Internet - Economics and Policy**
2561232, WS 23/24, 2 SWS, Language: German/English, Open in study portal

**Lecture (V)**
Blended (On-Site/Online)
Content

Description:

The course provides students with a comprehensive understanding of the economic principles, dynamics, and policies that govern the telecommunication and internet industries and markets. It focuses on the infrastructure of the internet, both physical and logical.

Course Objectives:

Understand the telecommunication and internet landscape: Students will be introduced to the historical development, evolution, and current state of the telecommunication and internet industries. This includes technology, industrial organization, regulation, and other policies. Students will explore the emergence of modern telecommunication networks, the birth of the internet, and key milestones that have shaped the global communication landscape.

Examine network economics: Students will explore the unique economic characteristics of telecommunications networks, including network effects, economies of scale, the implications for investment decisions and market entry barriers, and regulatory responses.

Analyse market structures and competition policies: Students will dive into the various market structures that exist within the telecommunication and internet industries, including: access to the internet by users, access to the infrastructure by firms, economic interactions between the autonomous systems (i.e. sub-networks) and other players (like internet exchange points) of the internet, implications for quality of services and network neutrality. Emphasis will be placed on competitiveness of markets, resp. market power, on the role of regulation, and how they impact market dynamics.

Investigate infrastructure investment and policy: The course will address the significant role of infrastructure investment in the telecommunication and internet sectors. Students will analyse the economic drivers behind infrastructure construction, government policies, and regulatory frameworks that influence investment decisions.

Address emerging trends: The course will address the latest trends and technologies in telecommunication and the internet, such as 5G, Internet of Things (IoT), and cloud computing, content delivery networks, and their economic implications.

Assess platform economics: The role of digital platforms in the telecommunication and internet industries will be addressed. Students will understand platform business models and the economics of multisided markets. In this context, the "hypergiants" of the internet get into the focus as well as the challenges and opportunities they present.

Teaching Methodology:

The course will adopt a combination of lectures, case studies, and guest lectures from (industry) experts. Real-world examples will be used to illustrate economic principles in action within the telecommunication and internet sectors. A few economic models will be analysed, but most of the issues will be addressed verbally.
### 6.380 Course: Telecommunications Law [T-INFO-101309]

**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101217 - Public Business Law

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Legend: Online, Blended (On-Site/Online), On-Site, Cancelled
6.381 Course: Telematics [T-INFO-101338]

**Responsible:** Prof. Dr. Martina Zitterbart  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100801 - Telematics

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**Events**

| WT 23/24 | 24128 | Telematics | 3 SWS | Lecture / 🕵️ | Zitterbart, Kopmann, Seehofer, Mahrt |

**Exams**

| WT 23/24 | 7500166 | Telematics | Zitterbart |

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**Content**

The lecture covers (i.a.) protocols, architectures, as well as methods and algorithms, for routing and establishing reliable end-to-end connections in the Internet. In addition to various methods for media access control in local area networks, the lecture also covers other communication systems, e.g. circuit-switched systems such as ISDN. Participants should also have understood the possibilities for managing and administering networks.

Familiar with the contents of the lecture Einführung in Rechnernetze or comparable lectures is assumed.

**Learning Objectives**

After attending this lecture, the students will

- have a profound understanding of protocols, architectures, as well as procedures and algorithms used for routing and for establishing reliable end-to-end connections in the Internet
- have a profound understanding of different media access control procedures in local networks and other communication systems like circuit-switched ISDN
- have a profound understanding of the problems that arise in large scale dynamic communication systems and are familiar with mechanism to deal with these problems
- be familiar with current developments such as SDN and data center networking
- be familiar with different aspects and possibilities for network management and administration

Students have a profound understanding of the basic protocol mechanisms that are necessary to establish reliable end-to-end communication. Students have detailed knowledge about the congestion and flow control mechanisms used in TCP and can discuss fairness issue in the context of multiple parallel transport streams. Students can analytically determine the performance of transport protocols and know techniques for dealing with specific constraints in the context of TCP, e.g., high data rates and low latencies. Students are familiar with current topics such as the problem of middle boxes on the Internet, the usage of TCP in data centers or multipath TCP. Students are also familiar with practical aspects of modern transport protocols and know practical ways to overcome heterogeneity in the development of distributed applications.

Students know the functions of (Internet) routing and routers and can explain and apply common routing algorithms. Students are familiar with routing architectures and different alternatives for buffer placement as well as their advantages and disadvantages. Students understand the classification into interior and exterior gateway protocols and have in-depth knowledge of the functionality and features of common protocols such as RIP, OSPF, and BGP. Students are also familiar with current topics such as label switching, IPv6 and SDN.

Students know the function of media access control and are able to classify and analytically evaluate different media access control mechanisms. Students have an in-depth knowledge of Ethernet and various Ethernet variants and characteristics, which especially includes current developments such as real-time Ethernet and data center Ethernet. Students can explain and apply the Spanning Tree Protocol.

Students know the architecture of ISDN and can reproduce the peculiarities of setting up the ISDN subscriber line. Students are familiar with the technical features of DSL.
Literature
Weiterführende Literatur
Internet-Standards
Artikel in Fachzeitschriften
6.382 Course: Testing Digital Systems I [T-INFO-101388]

**Responsible:** Prof. Dr. Mehdi Baradaran Tahoori  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100851 - Testing Digital Systems I

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**Exams**

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**Competence Certificate**

The assessment is carried out as an oral examination (§ 4 Abs. 2 Nr. 2 SPO) lasting 20 minutes.

**Prerequisites**

None.

**Recommendation**

Knowledge of Digital Design and Computer Architecture is helpful.

**Responsible:** Prof. Dr. Mehdi Baradaran Tahoori  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-102962 - Testing Digital Systems II

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**Events**

| ST 2024 | 2400014 | Testing Digital Systems II (findet im SS 2024 nicht statt) | 2 SWS | Lecture / 
|---------|---------|----------------------------------------------------------|-------|---------|

Legend: ☑ Online, ☑ Blended (On-Site/Online), ☑ On-Site, ✗ Cancelled

**Competence Certificate**
The assessment is carried out as an oral examination (§ 4 Abs. 2 Nr. 2 SPO) lasting 20 minutes.

**Prerequisites**
None.

**Recommendation**
Knowledge of Digital Design and Computer Architecture is helpful.

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

| V | Testing Digital Systems II (findet im SS 2024 nicht statt) | 2400014, SS 2024, 2 SWS, Language: English, Open in study portal | Lecture (V) Online |

**Content**
Testing of digital circuits plays a critical role during the design and manufacturing cycles. It also ensures the quality of parts shipped to the customers. Test generation and design for testability are integral parts of automated design flow of all electronic products. The objective of this course is to provide more advanced topics on testing of digital systems and complement the foundation covered in Testing Digital Systems I.

Topics include Functional and Structural Testing (design verification vectors, exhaustive test, pseudo-exhaustive test, pseudo-random testing), Essentials of Test Generation for Sequential Circuits (state-machine initialization, time-frame expansion method), Built-in Self Test (test economics of BIST, test pattern generation, output response analysis, BIST architectures), Boundary Scan (Boundary scan architectures, BS test methodology), Delay Testing (path delay test, hazard-free, robust, and non-robust delay tests), transition faults, delay test schemes), Current-Based Testing (motivation, test vectors for IDDQ, variations of IDDQ), Memory Test (memory test algorithm, memory BIST, memory repair), and DFT for System-on-Chip.

The objective of this course is to provide more advanced topics on testing of digital systems and complement the foundation covered in Testing Digital Systems I.

**Responsible:** Prof. Dr. Jörn Müller-Quade

**Organisation:** KIT Department of Informatics

**Part of:** M-INFO-105584 - Theoretical Foundations of Cryptography

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**Exams**

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Legend: 🖥 Online, ⬔ Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
**6.385 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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### Events

| ST 2024 | 2560232 | Topics in Experimental Economics | 2 SWS | Lecture / 🗣️ | Reiß, Peters |
| ST 2024 | 25602333 | Übungen zu Topics in Experimental Economics | 1 SWS | Practice / 🗣️ | Reiß, Peters |

Legend: 🛥 Online, ⚪ Blended (On-Site/Online), 🗣️ On-Site, ✗ Cancelled

**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.
6.386 Course: Topics in Stochastic Optimization [T-WIWI-112109]

**Responsible:** Prof. Dr. Steffen Rebennack

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

**Part of:**
- M-WIWI-101473 - Mathematical Programming
- M-WIWI-101637 - Analytics and Statistics
- M-WIWI-102832 - Operations Research in Supply Chain Management
- M-WIWI-103289 - Stochastic Optimization

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**Competence Certificate**

Students will be given problem sets on which they work in groups. The problem sets will involve the implementation of the models presented in the course, and exploring features of these models. The groups will present their findings in front of the class. The grading will be based on the presentation.

**Recommendation**

A solid understanding of Stochastic Optimization and/or Optimization under Uncertainty as well as optimization in general is highly recommended, since we will heavily build upon basics of these areas.
### 6.387 Course: Trademark and Unfair Competition Law [T-INFO-101313]

**Responsible:** Dr. Yvonne Matz  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-101215 - Intellectual Property Law

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Legend: 🖤 Online, 🧩 Blended (On-Site/Online), ⏳ On-Site, ❌ Cancelled
Course: Transport Economics [T-WIWI-100007]

**6.388 Course: Transport Economics [T-WIWI-100007]**

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

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

**Part of:**  
M-WIWI-101406 - Network Economics  
M-WIWI-101468 - Environmental Economics  
M-WIWI-101485 - Transport Infrastructure Policy and Regional Development

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**Exams**

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**Competence Certificate**

The assessment is made by a 60 minutes written examination during the semester break (according to §4(2), 1 ERSC). Examination is offered every semester and can be retried at any regular examination date.

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

### Transport Economics

**2560230, SS 2024, 2 SWS, Language: German, [Open in study portal](#)**

**Lecture (V)**

**Content**

The course shall provide an overview of transport economics. It will be demonstrated, using new microeconomic models, which impacts regulation and pricing in transport have on the economic actions of individuals and logistics and which benefits and costs apply. The following topics will be discussed:

- demand and supply in transport
- empirical analysis of transport demand
- assessment of transport infrastructure projects
- external effects in transport
- transport policy
- cost structures of transport infrastructure
- Project evaluation from the perspective of the public sector

**Literature**


### 6.389 Course: Trustworthy Emerging Technologies [T-WIWI-113026]

**Responsible:** Prof. Dr. Ali Sunyaev  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-104403 - Critical Digital Infrastructures

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#### Exams

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

### Competence Certificate

Alternative exam assessment (§ 4(2), 3 SPO). Details will be announced in the respective course.
# 6.390 Course: Ubiquitous Computing [T-INFO-101326]

**Responsible:** Prof. Dr.-Ing. Michael Beigl

**Organisation:** KIT Department of Informatics

**Part of:**
- M-INFO-100789 - Ubiquitous Computing
- M-WIWI-101458 - Ubiquitous Computing
- M-WIWI-104814 - Information Systems: Analytical and Interactive Systems

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## Events

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## Exams

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6.391 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
- M-WIWI-101510 - Cross-Functional Management Accounting

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**Literature**

Weiterführende Literatur


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

**Valuation**

2530212, WS 23/24, 2 SWS, Language: English, Open in study portal
### 6.392 Course: Visualization [T-INFO-101275]

**Responsible:** Prof. Dr.-Ing. Carsten Dachsbacher  
**Organisation:** KIT Department of Informatics  
**Part of:** M-INFO-100738 - Visualization

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Competence Certificate
The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 60 minutes.

Prerequisites
Attending the lecture Mechano-Informatics and Robotics is recommended.

Recommendation
Attending the lecture Mechano-Informatics and Robotics is recommended.

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

Content
The lecture starts with an overview of wearable robot technologies (exoskeletons, prostheses and orthoses) and its potentials, followed by the basics of wearable robotics. In addition to different approaches to the design of wearable robots and their related actuator and sensor technology, the lecture focuses on modeling the neuromusculoskeletal system of the human body and the physical and cognitive human-robot interaction for tightly coupled hybrid human-robot systems. Examples of current research and various applications of lower, upper and full body exoskeletons as well as prostheses are presented.

Learning Objectives:
The students have received fundamental knowledge about wearable robotic technologies and understand the requirements for the design, the interface to the human body and the control of wearable robots. They are able to describe methods for modelling the human neuromusculoskeletal system, the mechatronic design, fabrication and composition of interfaces to the human body. The students understand the symbiotic human–machine interaction as a core topic of Anthropomatics and has knowledge of state-of-the-art examples of exoskeletons, orthoses and prostheses.

Organizational issues
Die Erfolgskontrolle erfolgt in Form einer schriftlichen Prüfung im Umfang von i.d.R. 60 Minuten nach § 4 Abs. 2 Nr. 1 SPO.

Modul für Master Maschinenbau, Mechatronik und Informationstechnik, Elektrotechnik und Informationstechnik, Sportwissenschaften
Empfehlungen: Der Besuch der Vorlesung Mechano-Informatik in der Robotik wird empfohlen.
Arbeitsaufwand: 120h

Literature
Course: Web App Programming for Finance [T-WIWI-110933]

Responsible: TT-Prof. Dr. Julian Thimme
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101480 - Finance 3

Type
Written examination

Credits
4,5

Grading scale
Grade to a third

Recurrence
Once

Version
1

Competence Certificate
Non exam assessment according to § 4 paragraph 3 of the examination regulation. (Anmerkung: gilt nur für SPO 2015). The grade is made up as follows: 50% result of the project (R-code), 50% presentation of the project.

Prerequisites
None

Recommendation
The content of the bachelor course Investments is assumed to be known and necessary to follow the course.
### 6.395 Course: Web Applications and Service-Oriented Architectures (II) [T-INFO-101271]

**Responsible:** Prof. Dr. Sebastian Abeck  
**Organisation:** KIT Department of Informatics  
**Part of:**  
- M-INFO-100734 - Web Applications and Service-Oriented Architectures (II)  
- M-WIWI-104812 - Information Systems: Engineering and Transformation

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<td>Web Applications and Service-oriented Architectures (II)</td>
<td>2 SWS</td>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 📚 On-Site, ❌ Cancelled
6.396 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

<table>
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### Events

**WT 23/24**  
| 2577922 | Workshop Business Wargaming - Analyse strategischer Interaktionen (Master) | 2 SWS | Seminar / 🗣 | Lindstädt |

### Exams

**WT 23/24**  
| 7900172 | Workshop Business Wargaming – Analyzing Strategic Interactions | Lindstädt |

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Canceled

**Competence Certificate**  
In this course, real conflict situations are simulated and analyzed using various methods from business wargaming. Details on the design of the performance review will be announced during the lecture.

**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:**

**Workshop Business Wargaming - Analyse strategischer Interaktionen (Master)  
2577922, WS 23/24, 2 SWS, Language: German, Open in study portal**

**Seminar (S)  
On-Site**
Content
This course enables the simulation of strategic conflicts in which the participants assume the roles of selected actors. With the help of specially programmed wargaming software, strategic conflicts are simulated interactively and then reflected upon and discussed.

The course focuses on the simulation and analysis of real conflict situations with strategic interaction. Students gain a better understanding of the structural characteristics of strategic conflicts in the fields of economics and politics as well as the ability to derive their own strategies for action.

Through a combination of group work, simulation, and reflection, the seminar provides a learning experience that both strengthens team skills and develops analytical skills in strategic conflict. Join this seminar to gain sound insights into conflict dynamics and develop effective action strategies for complex situations.

Learning Objectives
Upon completion of the course, students will be able to,

- learn the basic methodologies, features and benefits of business wargaming
- improve their understanding of conflict dynamics by reflecting on strategic conflicts
- Strengthen analytical skills by processing a variety of courses of action and deriving strategies for action

Recommendations:
Prior attendance of the Bachelor’s module "Strategy and Organization" or another module with comparable content at another university is recommended.

Workload:
- Total workload: approx. 90 hours
- Attendance time: 15 hours
- Preparation and follow-up: 75 hours
- Examination and preparation: not applicable

Evidence:
In this course, real conflict situations are simulated and analyzed with the help of various methods from business wargaming. Details on the design of the performance review will be announced during the lecture.

Annotation:
The course is admission restricted. In case of prior admission to another course in the module "Strategy and Management: Advanced Topics" [M-WIWI-103119], participation in this course is guaranteed. For more information on the application process, see the IBU website.

Exams are offered at least every other semester, so the entire module can be completed in two semesters.
6.397 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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**Events**

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<td>Workshop aktuelle Themen Strategie und Management (Master)</td>
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**Exams**

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<td>7900171</td>
<td>Workshop Current Topics in Strategy and Management</td>
<td>Lindstädt</td>
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**Competence Certificate**
The evaluation of the performance takes place through the active participation in the discussion rounds; an appropriate preparation is expressed here and a clear understanding of the topic and framework becomes recognizable. Further details on the design of the performance review will be announced during the lecture.

**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, WS 23/24, 2 SWS, Language: German, [Open in study portal](#)
Content
Aspects of strategic management can be found in a variety of daily events. In this course, current strategic and industrial policy issues are discussed and the exchange of ideas on current management topics is promoted.

For this purpose, practice-relevant case studies and dedicated questions are communicated to the students in advance so that they can prepare themselves individually for the discussion. The chair team actively moderates the discussion and creates typical discussion situations such as pro/con discussions and conflicting interests of different groups in order to bring opposing opinions into an exchange and to promote the power of argumentation. In this way, the discussion not only imparts knowledge about the content, but also strengthens the participants’ skills by simulating real discussion situations in a management team.

In addition, company representatives and managers participate in individual case studies to strengthen the context of the content and experience the daily dynamics of discussion in strategic business areas.

Learning Objectives:
Students will

- be able to evaluate strategic decisions using appropriate models of strategic business management,
- be able to present and critically evaluate theoretical approaches and models in the field of strategic business management and illustrate them using practical examples, and
- have the ability to present their position convincingly through a reasoned argumentation in structured discussions.

Recommendations:
Previous attendance of the Bachelor's module “Strategy and Organization” or another module with comparable content at another university is recommended.

Workload:
Total effort approx. 90 hours
Attendance time: 15 hours
Preparation and follow-up: 75 hours
Examination and preparation: not applicable

Evidence:
Performance will be assessed through active discussion participation in the discussion rounds; here, adequate preparation will be expressed and a clear understanding of the topic and framework will be evident. Further details on the design of the performance assessment will be announced during the lecture.

Annotation:
This course is admission restricted. In case of prior admission to another course in the module "Strategy and Management: Advanced Topics" [M-WIWI-103119], participation in this course is guaranteed. For more information on the application process, see the IBU website.

Exams are offered at least every other semester so that the entire module can be completed in two semesters.
Content
Aspects of strategic management can be found in a variety of daily events. In this course, current strategic and industrial policy issues are discussed and the exchange of ideas on current management topics is promoted.

For this purpose, practice-relevant case studies and dedicated questions are communicated to the students in advance so that they can prepare themselves individually for the discussion. The chair team actively moderates the discussion and creates typical discussion situations such as pro/con discussions and conflicting interests of different groups in order to bring opposing opinions into an exchange and to promote the power of argumentation. In this way, the discussion not only imparts knowledge about the content, but also strengthens the participants' skills by simulating real discussion situations in a management team.

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Preparation and follow-up: 75 hours
Examination and preparation: not applicable

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