Module Handbook Economathematics M.Sc.

SPO 2016

Winter term 2019/20

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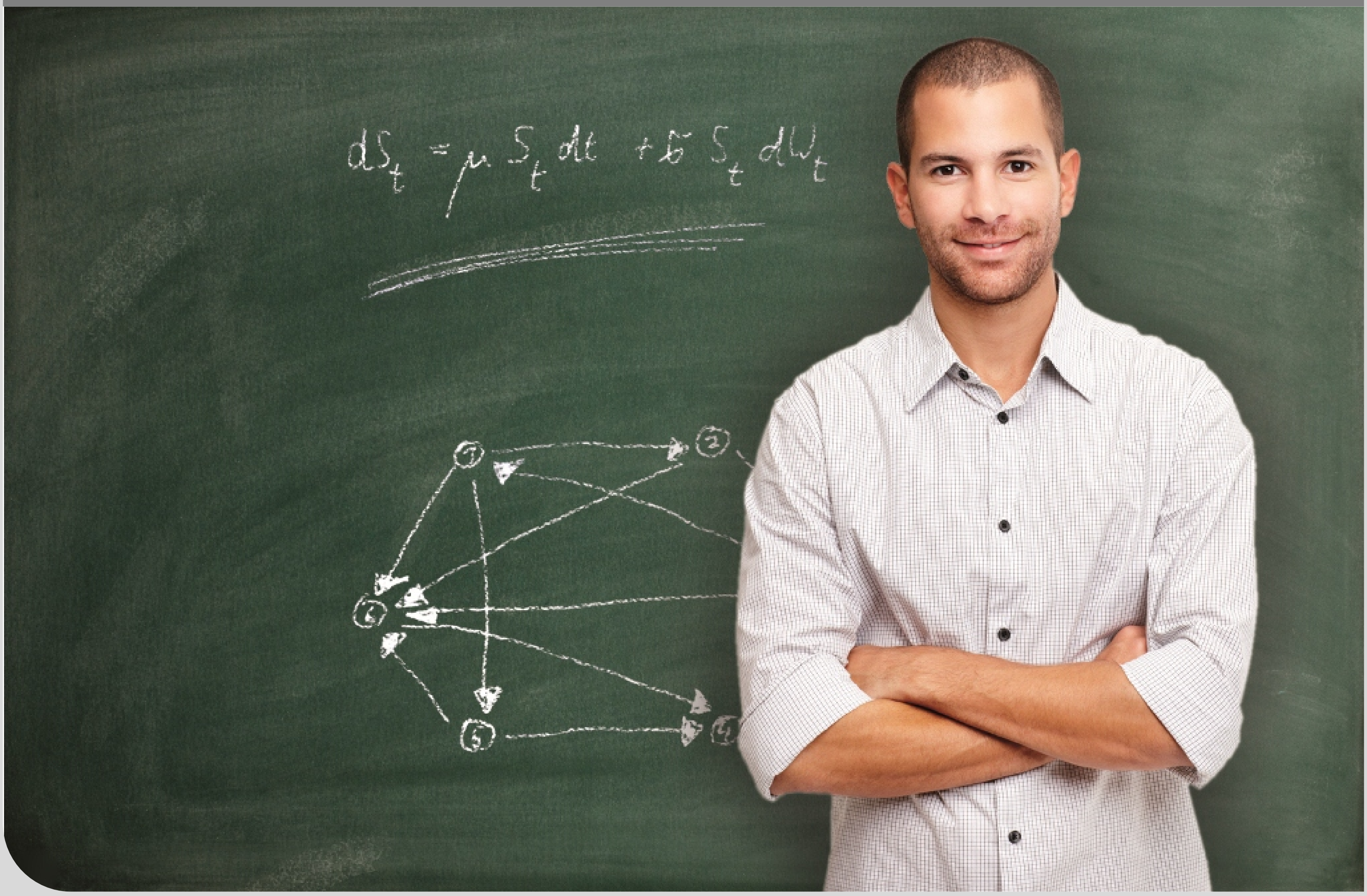
KIT DEPARTMENT OF ECONOMICS AND MANAGEMENT / KIT DEPARTMENT OF MATHEMATICS



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1 Welcome to the new module handbook of your study programme

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

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

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Write to us!

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2 Field of study structure

Mandatory	
Master Thesis	30 CR
Mathematical Methods	36 CR
Finance - Risk Management - Managerial Economics	18 CR
Operations Management - Data Analysis - Informatics	18 CR
Seminar in Economics and Management	3 CR
Mathematical Seminar	3 CR
Elective Field	12 CR

2.1 Master Thesis

Credits
30

Mandatory		
M-MATH-102917	Master Thesis	30 CR

2.2 Mathematical Methods

Credits
36

Election block: Stochastik (at least 8 credits)		
M-MATH-102860	Continuous Time Finance	8 CR
M-MATH-102865	Stochastic Geometry	8 CR
M-MATH-102902	Asymptotic Stochastics	8 CR
M-MATH-102903	Spatial Stochastics	8 CR
M-MATH-102904	Brownian Motion	4 CR
M-MATH-102905	Percolation	6 CR
M-MATH-102906	Generalized Regression Models	4 CR
M-MATH-102907	Markov Decision Processes	5 CR
M-MATH-102908	Stochastic Control	4 CR
M-MATH-102909	Mathematical Statistics	4 CR
M-MATH-102910	Nonparametric Statistics	4 CR
M-MATH-102911	Time Series Analysis	4 CR
M-MATH-102919	Discrete Time Finance	8 CR
M-MATH-102922	Poisson Processes	5 CR
M-MATH-102939	Extreme Value Theory	4 CR
M-MATH-102942	Stochastic Evolution Equations	8 CR
M-MATH-102946	Stein's Method	5 CR
M-MATH-102947	Probability Theory and Combinatorial Optimization	8 CR
M-MATH-102951	Random Graphs	6 CR
M-MATH-102956	Forecasting: Theory and Practice	8 CR
M-MATH-104055	Ruin Theory	4 CR
M-MATH-105101	Introduction to Homogeneous Dynamics neu	6 CR
Election block: Analysis oder Angewandte und Numerische Mathematik, Optimierung (at least 8 credits)		
M-MATH-101320	Functional Analysis	8 CR
M-MATH-101335	Special Functions and Applications in Potential Theory	5 CR
M-MATH-101768	Spectral Theory	8 CR
M-MATH-102870	Classical Methods for Partial Differential Equations	8 CR
M-MATH-102871	Boundary and Eigenvalue Problems	8 CR
M-MATH-102872	Evolution Equations	8 CR
M-MATH-102873	Fourier Analysis	8 CR
M-MATH-102874	Integral Equations	8 CR
M-MATH-102878	Complex Analysis	8 CR
M-MATH-102879	Potential Theory	8 CR
M-MATH-102881	Stochastic Differential Equations	8 CR
M-MATH-102883	Computer-Assisted Analytical Methods for Boundary and Eigenvalue Problems	8 CR
M-MATH-102885	Maxwell's Equations	8 CR
M-MATH-102890	Inverse Problems	8 CR
M-MATH-102924	Optimization in Banach Spaces	8 CR
M-MATH-102926	Sobolev Spaces	5 CR
M-MATH-102927	Traveling Waves	6 CR
M-MATH-102941	Control Theory	6 CR
M-MATH-102942	Stochastic Evolution Equations	8 CR
M-MATH-102952	L2-Invariants	5 CR
M-MATH-103080	Dynamical Systems	8 CR
M-MATH-103257	Nonlinear Maxwell Equations	3 CR
M-MATH-103259	Bifurcation Theory	5 CR

M-MATH-103539	Nonlinear Analysis	8 CR
M-MATH-103545	Harmonic Analysis for Dispersive Equations	8 CR
M-MATH-102884	Scattering Theory	8 CR
M-MATH-104059	Mathematical Topics in Kinetic Theory	4 CR
M-MATH-104425	Dispersive Equations	6 CR
M-MATH-104435	Selected Topics in Harmonic Analysis	3 CR
M-MATH-101338	Parallel Computing	5 CR
M-MATH-102888	Numerical Methods for Differential Equations	8 CR
M-MATH-102889	Introduction to Scientific Computing	8 CR
M-MATH-102891	Finite Element Methods	8 CR
M-MATH-102892	Numerical Optimisation Methods	8 CR
M-MATH-102894	Numerical Methods in Computational Electrodynamics	6 CR
M-MATH-102895	Wavelets	8 CR
M-MATH-102896	Medical Imaging	8 CR
M-MATH-102897	Mathematical Methods in Signal and Image Processing	8 CR
M-MATH-102899	Optimisation and Optimal Control for Differential Equations	4 CR
M-MATH-102900	Adaptive Finite Elemente Methods	6 CR
M-MATH-102901	Numerical Methods in Mathematical Finance	8 CR
M-MATH-102914	Numerical Methods in Mathematical Finance II	8 CR
M-MATH-102915	Numerical Methods for Hyperbolic Equations	6 CR
M-MATH-102920	Special Topics of Numerical Linear Algebra	8 CR
M-MATH-102921	Geometric Numerical Integration	6 CR
M-MATH-102928	Numerical Methods for Time-Dependent Partial Differential Equations	8 CR
M-MATH-102929	Mathematical Modelling and Simulation in Practise	4 CR
M-MATH-102930	Numerical Methods for Integral Equations	8 CR
M-MATH-102931	Numerical Methods for Maxwell's Equations	6 CR
M-MATH-102932	Numerical Methods in Fluid Mechanics	4 CR
M-MATH-102935	Compressive Sensing	5 CR
M-MATH-102936	Functions of Operators	6 CR
M-MATH-102937	Functions of Matrices	8 CR
M-MATH-102938	Project Centered Software-Lab	4 CR
M-MATH-102943	Introduction into Particulate Flows	3 CR
M-MATH-102944	Numerical Continuation Methods	5 CR
M-MATH-102945	Introduction to Matlab and Numerical Algorithms	5 CR
M-MATH-102955	Advanced Inverse Problems: Nonlinearity and Banach Spaces	5 CR
M-MATH-103260	Mathematical Methods of Imaging	5 CR
M-MATH-103527	Foundations of Continuum Mechanics	3 CR
M-MATH-103700	Exponential Integrators	6 CR
M-MATH-103709	Numerical Linear Algebra for Scientific High Performance Computing	3 CR
M-MATH-103919	Introduction to Kinetic Theory	4 CR
M-MATH-104054	Uncertainty Quantification	4 CR
M-MATH-104058	Numerical Linear Algebra in Image Processing	6 CR
M-MATH-104426	Comparison of Numerical Integrators for Nonlinear Dispersive Equations	4 CR
M-MATH-104827	Fourier Analysis and its Applications to PDEs	3 CR
M-MATH-103540	Boundary Element Methods	8 CR
M-MATH-102887	Monotonicity Methods in Analysis	3 CR
M-MATH-105066	Nonlinear Maxwell Equations neu	8 CR
M-MATH-105101	Introduction to Homogeneous Dynamics neu	6 CR
M-MATH-105093	Variational Methods neu	8 CR
Election block: Algebra und Geometrie (at most 20 credits)		
M-MATH-101315	Algebra	8 CR

M-MATH-101317	Differential Geometry	8 CR
M-MATH-101336	Graph Theory	8 CR
M-MATH-101724	Algebraic Geometry	8 CR
M-MATH-101725	Algebraic Number Theory	8 CR
M-MATH-102864	Convex Geometry	8 CR
M-MATH-102867	Geometric Group Theory	8 CR
M-MATH-102948	Algebraic Topology	8 CR
M-MATH-102949	Introduction to Geometric Measure Theory	6 CR
M-MATH-102950	Combinatorics	8 CR
M-MATH-102952	L2-Invariants	5 CR
M-MATH-102957	Extremal Graph Theory	8 CR
M-MATH-102958	Spin Manifolds, Alpha Invariant and Positive Scalar Curvature	5 CR
M-MATH-102959	Homotopy Theory	8 CR
M-MATH-102960	The Riemann Zeta Function	4 CR
M-MATH-102865	Stochastic Geometry	8 CR
M-MATH-102866	Geometry of Schemes	8 CR
M-MATH-102912	Global Differential Geometry	8 CR
M-MATH-102940	Comparison Geometry	5 CR
M-MATH-102953	Algebraic Topology II	8 CR
M-MATH-102954	Group Actions in Riemannian Geometry	5 CR
M-MATH-103258	Finite Group Schemes	4 CR
M-MATH-104053	Commutative Algebra	8 CR
M-MATH-104057	Key Moments in Geometry	5 CR
M-MATH-104261	Lie Groups and Lie Algebras	8 CR
M-MATH-104349	Bott Periodicity	5 CR
M-MATH-105101	Introduction to Homogeneous Dynamics neu	6 CR

2.3 Finance - Risk Management - Managerial Economics

Credits
18

Election block: Finance - Risk Management - Managerial Economics (at least 18 credits)		
M-WIWI-101478	Innovation and Growth	9 CR
M-WIWI-101480	Finance 3	9 CR
M-WIWI-101482	Finance 1	9 CR
M-WIWI-101483	Finance 2	9 CR
M-WIWI-101496	Growth and Agglomeration	9 CR
M-WIWI-101500	Microeconomic Theory	9 CR
M-WIWI-101502	Economic Theory and its Application in Finance	9 CR
M-WIWI-101504	Collective Decision Making	9 CR
M-WIWI-101505	Experimental Economics	9 CR
M-WIWI-101637	Analytics and Statistics	9 CR
M-WIWI-101638	Econometrics and Statistics I	9 CR
M-WIWI-101639	Econometrics and Statistics II	9 CR
M-WIWI-102970	Decision and Game Theory	9 CR
M-WIWI-103119	Advanced Topics in Strategy and Management	9 CR
M-WIWI-103720	eEnergy: Markets, Services and Systems	9 CR
M-WIWI-104068	Information Systems in Organizations	9 CR
M-WIWI-105032	Data Science for Finance neu	9 CR
M-WIWI-105036	FinTech Innovations neu	9 CR

2.4 Operations Management - Data Analysis - Informatics

Credits
18

Election block: Operations Management - Datenanalyse - Informatik (at least 18 credits)		
M-WIWI-101413	Applications of Operations Research	9 CR
M-WIWI-101414	Methodical Foundations of OR	9 CR
M-WIWI-101452	Energy Economics and Technology	9 CR
M-WIWI-101472	Informatics	9 CR
M-WIWI-101473	Mathematical Programming	9 CR
M-WIWI-101490	Marketing Management	9 CR
M-WIWI-102832	Operations Research in Supply Chain Management	9 CR
M-WIWI-102805	Service Operations	9 CR
M-WIWI-103289	Stochastic Optimization	9 CR

2.5 Seminar in Economics and Management

Credits
3

Election block: Wirtschaftswissenschaftliches Seminar (at least 3 credits)		
M-WIWI-102971	Seminar	3 CR
M-WIWI-102973	Seminar	3 CR

2.6 Mathematical Seminar

Credits
3

Mandatory		
M-MATH-102730	Seminar	3 CR

2.7 Elective Field

Credits
12

Election block: Wahlpflichtfach (at least 12 credits)		
M-MATH-102864	Convex Geometry	8 CR
M-MATH-102866	Geometry of Schemes	8 CR
M-MATH-102872	Evolution Equations	8 CR
M-MATH-102879	Potential Theory	8 CR
M-MATH-102883	Computer-Assisted Analytical Methods for Boundary and Eigenvalue Problems	8 CR
M-MATH-102888	Numerical Methods for Differential Equations	8 CR
M-MATH-102890	Inverse Problems	8 CR
M-MATH-102891	Finite Element Methods	8 CR
M-MATH-102894	Numerical Methods in Computational Electrodynamics	6 CR
M-MATH-102904	Brownian Motion	4 CR
M-MATH-102906	Generalized Regression Models	4 CR
M-MATH-102909	Mathematical Statistics	4 CR
M-MATH-102910	Nonparametric Statistics	4 CR
M-MATH-102924	Optimization in Banach Spaces	8 CR
M-MATH-102927	Traveling Waves	6 CR
M-MATH-102931	Numerical Methods for Maxwell's Equations	6 CR
M-MATH-102936	Functions of Operators	6 CR
M-MATH-101315	Algebra	8 CR
M-MATH-101724	Algebraic Geometry	8 CR
M-MATH-101725	Algebraic Number Theory	8 CR
M-MATH-101768	Spectral Theory	8 CR
M-MATH-102867	Geometric Group Theory	8 CR
M-MATH-102874	Integral Equations	8 CR
M-MATH-102899	Optimisation and Optimal Control for Differential Equations	4 CR
M-MATH-102905	Percolation	6 CR
M-MATH-102915	Numerical Methods for Hyperbolic Equations	6 CR
M-MATH-102947	Probability Theory and Combinatorial Optimization	8 CR
M-MATH-102951	Random Graphs	6 CR
M-MATH-102956	Forecasting: Theory and Practice	8 CR
M-MATH-101317	Differential Geometry	8 CR
M-MATH-101320	Functional Analysis	8 CR
M-MATH-101335	Special Functions and Applications in Potential Theory	5 CR
M-MATH-101336	Graph Theory	8 CR
M-MATH-101338	Parallel Computing	5 CR
M-MATH-102860	Continuous Time Finance	8 CR
M-MATH-102873	Fourier Analysis	8 CR
M-MATH-102878	Complex Analysis	8 CR
M-MATH-102885	Maxwell's Equations	8 CR
M-MATH-102889	Introduction to Scientific Computing	8 CR
M-MATH-102892	Numerical Optimisation Methods	8 CR
M-MATH-102930	Numerical Methods for Integral Equations	8 CR
M-MATH-102940	Comparison Geometry	5 CR
M-MATH-102941	Control Theory	6 CR
M-MATH-102942	Stochastic Evolution Equations	8 CR
M-MATH-102944	Numerical Continuation Methods	5 CR
M-MATH-102952	L2-Invariants	5 CR

M-MATH-102958	Spin Manifolds, Alpha Invariant and Positive Scalar Curvature	5 CR
M-MATH-102895	Wavelets	8 CR
M-MATH-102896	Medical Imaging	8 CR
M-MATH-102897	Mathematical Methods in Signal and Image Processing	8 CR
M-MATH-102901	Numerical Methods in Mathematical Finance	8 CR
M-MATH-102902	Asymptotic Stochastics	8 CR
M-MATH-102907	Markov Decision Processes	5 CR
M-MATH-102908	Stochastic Control	4 CR
M-MATH-102911	Time Series Analysis	4 CR
M-MATH-102912	Global Differential Geometry	8 CR
M-MATH-102914	Numerical Methods in Mathematical Finance II	8 CR
M-MATH-102919	Discrete Time Finance	8 CR
M-MATH-102920	Special Topics of Numerical Linear Algebra	8 CR
M-MATH-102922	Poisson Processes	5 CR
M-MATH-102926	Sobolev Spaces	5 CR
M-MATH-102928	Numerical Methods for Time-Dependent Partial Differential Equations	8 CR
M-MATH-102929	Mathematical Modelling and Simulation in Practise	4 CR
M-MATH-102932	Numerical Methods in Fluid Mechanics	4 CR
M-MATH-102935	Compressive Sensing	5 CR
M-MATH-102937	Functions of Matrices	8 CR
M-MATH-102939	Extreme Value Theory	4 CR
M-MATH-102943	Introduction into Particulate Flows	3 CR
M-MATH-102946	Stein's Method	5 CR
M-MATH-102948	Algebraic Topology	8 CR
M-MATH-102949	Introduction to Geometric Measure Theory	6 CR
M-MATH-102954	Group Actions in Riemannian Geometry	5 CR
M-MATH-102959	Homotopy Theory	8 CR
M-MATH-102960	The Riemann Zeta Function	4 CR
M-MATH-102865	Stochastic Geometry	8 CR
M-MATH-102870	Classical Methods for Partial Differential Equations	8 CR
M-MATH-102871	Boundary and Eigenvalue Problems	8 CR
M-MATH-102881	Stochastic Differential Equations	8 CR
M-MATH-102900	Adaptive Finite Elemente Methods	6 CR
M-MATH-102903	Spatial Stochastics	8 CR
M-MATH-102921	Geometric Numerical Integration	6 CR
M-MATH-102938	Project Centered Software-Lab	4 CR
M-MATH-102945	Introduction to Matlab and Numerical Algorithms	5 CR
M-MATH-102950	Combinatorics	8 CR
M-MATH-102953	Algebraic Topology II	8 CR
M-MATH-102955	Advanced Inverse Problems: Nonlinearity and Banach Spaces	5 CR
M-MATH-102957	Extremal Graph Theory	8 CR
M-WIWI-101413	Applications of Operations Research	9 CR
M-WIWI-101414	Methodical Foundations of OR	9 CR
M-WIWI-101452	Energy Economics and Technology	9 CR
M-WIWI-101472	Informatics	9 CR
M-WIWI-101473	Mathematical Programming	9 CR
M-WIWI-101478	Innovation and Growth	9 CR
M-WIWI-101480	Finance 3	9 CR
M-WIWI-101482	Finance 1	9 CR
M-WIWI-101483	Finance 2	9 CR
M-WIWI-101490	Marketing Management	9 CR

M-WIWI-101496	Growth and Agglomeration	9 CR
M-WIWI-101500	Microeconomic Theory	9 CR
M-WIWI-101502	Economic Theory and its Application in Finance	9 CR
M-WIWI-101504	Collective Decision Making	9 CR
M-WIWI-101505	Experimental Economics	9 CR
M-WIWI-101637	Analytics and Statistics	9 CR
M-WIWI-101638	Econometrics and Statistics I	9 CR
M-WIWI-101639	Econometrics and Statistics II	9 CR
M-WIWI-102832	Operations Research in Supply Chain Management	9 CR
M-WIWI-102970	Decision and Game Theory	9 CR
M-WIWI-102971	Seminar	3 CR
M-WIWI-102972	Seminar	3 CR
M-WIWI-102973	Seminar	3 CR
M-WIWI-102974	Seminar	3 CR
M-MATH-103080	Dynamical Systems	8 CR
M-MATH-103257	Nonlinear Maxwell Equations	3 CR
M-MATH-103259	Bifurcation Theory	5 CR
M-MATH-103260	Mathematical Methods of Imaging	5 CR
M-MATH-103258	Finite Group Schemes	4 CR
M-WIWI-103289	Stochastic Optimization	9 CR
M-WIWI-103119	Advanced Topics in Strategy and Management	9 CR
M-WIWI-103720	eEnergy: Markets, Services and Systems	9 CR
M-MATH-103527	Foundations of Continuum Mechanics	3 CR
M-MATH-103539	Nonlinear Analysis	8 CR
M-MATH-103545	Harmonic Analysis for Dispersive Equations	8 CR
M-MATH-103700	Exponential Integrators	6 CR
M-MATH-103709	Numerical Linear Algebra for Scientific High Performance Computing	3 CR
M-MATH-103919	Introduction to Kinetic Theory	4 CR
M-WIWI-104068	Information Systems in Organizations	9 CR
M-MATH-104053	Commutative Algebra	8 CR
M-MATH-104054	Uncertainty Quantification	4 CR
M-MATH-104055	Ruin Theory	4 CR
M-MATH-104057	Key Moments in Geometry	5 CR
M-MATH-104058	Numerical Linear Algebra in Image Processing	6 CR
M-MATH-104059	Mathematical Topics in Kinetic Theory	4 CR
M-MATH-102884	Scattering Theory	8 CR
M-MATH-104261	Lie Groups and Lie Algebras	8 CR
M-MATH-104349	Bott Periodicity	5 CR
M-MATH-104425	Dispersive Equations	6 CR
M-MATH-104426	Comparison of Numerical Integrators for Nonlinear Dispersive Equations	4 CR
M-MATH-104435	Selected Topics in Harmonic Analysis	3 CR
M-MATH-104827	Fourier Analysis and its Applications to PDEs	3 CR
M-MATH-103540	Boundary Element Methods	8 CR
M-MATH-102887	Monotonicity Methods in Analysis	3 CR
M-MATH-105066	Nonlinear Maxwell Equations neu	8 CR
M-MATH-105101	Introduction to Homogeneous Dynamics neu	6 CR
M-MATH-105093	Variational Methods neu	8 CR

3 Modules

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

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

Credits	Recurrence	Duration	Level	Version
6	Irregular	1 semester	4	1

Mandatory			
T-MATH-105898	Adaptive Finite Element Methods	6 CR	Dörfler

Prerequisites
none

M 3.2 Module: Advanced Inverse Problems: Nonlinearity and Banach Spaces [M-MATH-102955]

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

Credits	Recurrence	Duration	Level	Version
5	Irregular	2 term	5	1

Mandatory			
T-MATH-105927	Advanced Inverse Problems: Nonlinearity and Banach Spaces	5 CR	Rieder

Prerequisites
none

M 3.3 Module: Advanced Topics in Strategy and Management [M-WIWI-103119]

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

Credits	Language	Level	Version
9	German	4	1

Election block: Wahlpflichtangebot (9 credits)			
T-WIWI-106188	Workshop Current Topics in Strategy and Management	3 CR	Lindstädt
T-WIWI-106189	Workshop Business Wargaming – Analyzing Strategic Interactions	3 CR	Lindstädt
T-WIWI-106190	Strategy and Management Theory: Developments and "Classics"	3 CR	Lindstädt

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

Competence Goal
Students

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

Prerequisites
None

Content
The module is divided into three main topics:

The students

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

Recommendation
None

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

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

This module will be offered for the first time in the winter term 2017/18.

M 3.4 Module: Algebra [M-MATH-101315]

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

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

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

Prerequisites
None

M 3.5 Module: Algebraic Geometry [M-MATH-101724]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-103340	Algebraic Geometry	8 CR	Herrlich, Kühnlein

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

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-103346	Algebraic Number Theory	8 CR	Kühnlein

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

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	2 term	4	1

Mandatory			
T-MATH-105915	Algebraic Topology	8 CR	Kammeyer, Sauer

Prerequisites
none

M 3.8 Module: Algebraic Topology II [M-MATH-102953]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	2 term	5	1

Mandatory			
T-MATH-105926	Algebraic Topology II	8 CR	Sauer

Prerequisites
none

M 3.9 Module: Analytics and Statistics [M-WIWI-101637]

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

Credits	Language	Level	Version
9	German	4	2

Mandatory			
T-WIWI-103123	Advanced Statistics	4,5 CR	Grothe
Election block: Ergänzungsangebot (between 4,5 and 5 credits)			
T-WIWI-106341	Machine Learning 2 – Advanced Methods	4,5 CR	Zöllner
T-WIWI-103124	Multivariate Statistical Methods	4,5 CR	Grothe

Competence Certificate
The assessment is carried out as partial written exams (according to Section 4(2), 1 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The examinations are offered every semester. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module seperately.
The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Competence Goal
A Student

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

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

Content

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

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

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

3.10 Module: Applications of Operations Research [M-WIWI-101413]

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

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

Election block: Wahlpflichtangebot (between 1 and 2 items)			
T-WIWI-102704	Facility Location and Strategic Supply Chain Management	4,5 CR	Nickel
T-WIWI-102714	Tactical and Operational Supply Chain Management	4,5 CR	Nickel
Election block: Ergänzungsangebot (at most 1 item)			
T-WIWI-102726	Global Optimization I	4,5 CR	Stein
T-WIWI-106199	Modeling and OR-Software: Introduction	4,5 CR	Nickel
T-WIWI-106545	Optimization under Uncertainty	4,5 CR	Rebennack

Competence Certificate

Due to a research semester of Professor Nickel in WS 19/20, the events 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://dol.ior.kit.edu/Lehrveranstaltungen.php for further details.

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 seperately.

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

Competence Goal

The student

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

Prerequisites

At least one of the courses *Facility Location and strategic Supply Chain Management* and *Tactical and operational Supply Chain Management* has to be taken.

Content

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

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

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

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

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

Workload
The total workload of the module is about 240 hours. The workload is proportional to the credit points of the individual courses.

M 3.11 Module: Asymptotic Stochastics [M-MATH-102902]

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

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

Mandatory			
T-MATH-105866	Asymptotic Stochastics	8 CR	Fasen-Hartmann, Henze, Klar

Prerequisites
none

3.12 Module: Bifurcation Theory [M-MATH-103259]

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

Credits	Recurrence	Level	Version
5	Irregular	4	1

Mandatory			
T-MATH-106487	Bifurcation Theory	5 CR	Mandel

Prerequisites
None

Annotation
Course is held in English

M 3.13 Module: Bott Periodicity [M-MATH-104349]

Organisation: KIT Department of Mathematics

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

Credits	Recurrence	Duration	Level	Version
5	Each winter term	1 semester	4	1

Mandatory			
T-MATH-108905	Bott Periodicity	5 CR	Tuschmann

Prerequisites
None

3.14 Module: Boundary and Eigenvalue Problems [M-MATH-102871]

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

Credits	Recurrence	Duration	Level	Version
8	Each summer term	1 semester	4	1

Mandatory			
T-MATH-105833	Boundary and Eigenvalue Problems	8 CR	Hundertmark, Lamm, Plum, Reichel, Rottmann-Matthes, Schnaubelt, Weis

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

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

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

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

Prerequisites
None

M 3.16 Module: Brownian Motion [M-MATH-102904]

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

Credits	Recurrence	Duration	Level	Version
4	Irregular	1 semester	4	1

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

Prerequisites
none

M 3.17 Module: Classical Methods for Partial Differential Equations [M-MATH-102870]

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

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

Mandatory			
T-MATH-105832	Classical Methods for Partial Differential Equations	8 CR	Hundertmark, Lamm, Plum, Reichel, Schnaubelt, Weis

M 3.18 Module: Collective Decision Making [M-WIWI-101504]

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

Credits	Recurrence	Duration	Language	Level	Version
9	Each term	2 semester	English	4	4

Election block: Wahlpflichtangebot ()			
T-WIWI-102740	Public Management	4,5 CR	Wigger
T-WIWI-102859	Social Choice Theory	4,5 CR	Puppe

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 seperately.

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

Competence Goal
Students

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

Prerequisites
None

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

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

M 3.19 Module: Combinatorics [M-MATH-102950]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	2 term	4	1

Mandatory			
T-MATH-105916	Combinatorics	8 CR	Aksenovich

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

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

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

Prerequisites
none

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

Annotation

- Regular cycle: every 2nd year, summer semester
- Course is held in English

M 3.20 Module: Commutative Algebra [M-MATH-104053]

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

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

Mandatory			
T-MATH-108398	Commutative Algebra	8 CR	Herrlich

Prerequisites
None

M 3.21 Module: Comparison Geometry [M-MATH-102940]

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

Credits	Recurrence	Duration	Level	Version
5	Irregular	1 semester	5	1

Mandatory			
T-MATH-105917	Comparison Geometry	5 CR	Tuschmann

Prerequisites
none

3.22 Module: Comparison of Numerical Integrators for Nonlinear Dispersive Equations [M-MATH-104426]

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

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

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

Prerequisites
None

Content
We will compare numerical integrators (e.g., splitting methods, exponential integrators) for nonlinear dispersive equations such as the nonlinear Schrödinger equation and Kortweg-de Vries equation. We will analyze their convergence properties with regard to the regularity assumptions on the solution.

M 3.23 Module: Complex Analysis [M-MATH-102878]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	5	1

Mandatory			
T-MATH-105849	Complex Analysis	8 CR	Herzog, Plum, Reichel, Schmoeger, Schnaubelt, Weis

Content

- infinite products
- Mittag-Leffler theorem
- Montel's theorem
- Riemann mapping theorem
- conformal mappings
- univalent (schlicht) functions
- automorphisms of some domains
- harmonic functions
- Schwarz reflection principle
- regular and singular points of power series

M 3.24 Module: Compressive Sensing [M-MATH-102935]

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

Credits	Recurrence	Duration	Level	Version
5	Irregular	2 term	4	1

Mandatory			
T-MATH-105894	Compressive Sensing	5 CR	Rieder

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

Responsible: Prof. Dr. Michael Plum

Organisation: KIT Department of Mathematics

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-105854	Computer-Assisted Analytical Methods for Boundary and Eigenvalue Problems	8 CR	Plum

M 3.26 Module: Continuous Time Finance [M-MATH-102860]

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

Credits	Recurrence	Duration	Level	Version
8	Each summer term	1 semester	4	1

Mandatory			
T-MATH-105930	Continuous Time Finance	8 CR	Bäuerle, Fasen-Hartmann

M 3.27 Module: Control Theory [M-MATH-102941]

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

Credits	Recurrence	Duration	Level	Version
6	Irregular	2 term	4	1

Mandatory			
T-MATH-105909	Control Theory	6 CR	Schnaubelt, Weis

Prerequisites
none

3.28 Module: Convex Geometry [M-MATH-102864]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-105831	Convex Geometry	8 CR	Hug

Competence Goal
The students

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

Content
1. Convex Sets
1.1. Combinatorial Properties
1.2. Support and Separation Properties
1.3. Extremal Representations
2. Convex Functions
2.1. Basic Properties
2.2. Regularity
2.3. Support Function
3. Brunn-Minkowski Theory
3.1. Hausdorff Metric
3.2. Volume and Surface Area
3.3. Mixed Volumes
3.4. Geometric Inequalities
3.5. Surface Area Measures
3.6. Projection Functions
4. Integralgeometric Formulas
4.1. Invariant Measures
4.2. Projection and Section Formulas

M 3.29 Module: Data Science for Finance [M-WIWI-105032]

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

Credits	Language	Level	Version
9	English	4	1

Mandatory			
T-WIWI-102878	Computational Risk and Asset Management	6 CR	Ulrich
T-WIWI-110213	Python for Computational Risk and Asset Management	3 CR	Ulrich

Competence Certificate
The assessment is carried out as partial exams (according to Section 4(2), 1 and 3 of the examination regulation) of the single courses of this module.
The assessment of "Computational Risk and Asset Management" is carried out in form of a written exam (90 minutes), the assessment of "Python for Computational Risk and Asset Management" is carried out in form of twelve weekly Python programming tasks and offered each winter term.
The overall grade of the module is the grade of the written exam weighted with factor 0.75 and the grade for the Python programming tasks weighted with factor 0.25. The resulting grade is truncated after the first decimal.

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

Content
The module covers several topics, among them:

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

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

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

M 3.30 Module: Decision and Game Theory [M-WIWI-102970]

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

Credits	Language	Level	Version
9	German	4	1

Election block: Wahlpflichtangebot (9 credits)			
T-WIWI-102613	Auction Theory	4,5 CR	Ehrhart
T-WIWI-102614	Experimental Economics	4,5 CR	Weinhardt
T-WIWI-102861	Advanced Game Theory	4,5 CR	Ehrhart, Puppe, Reiß

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 seperately.

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

Competence Goal
The student learns the basics of individual and strategic decisions on an advanced and formal level.

He learns to analyze economic problems through abstract and method-based thinking and to design solution strategies. In the tutorials, the concepts and results of the lecture will be applied in case studies.

Prerequisites
None

Content
See German version.

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

M 3.31 Module: Differential Geometry [M-MATH-101317]

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

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

Mandatory			
T-MATH-102275	Differential Geometry	8 CR	Grensing, Leuzinger, Tuschmann

Prerequisites
None

M 3.32 Module: Discrete Time Finance [M-MATH-102919]

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

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

Mandatory			
T-MATH-105839	Discrete Time Finance	8 CR	Bäuerle, Fasen-Hartmann

Prerequisites
none

3.33 Module: Dispersive Equations [M-MATH-104425]

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

Credits	Recurrence	Duration	Level	Version
6	Each winter term	1 semester	4	1

Mandatory			
T-MATH-109001	Dispersive Equations	6 CR	Reichel

Prerequisites
None

3.34 Module: Dynamical Systems [M-MATH-103080]

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

Credits	Language	Level	Version
8	German	4	1

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

Prerequisites
none

3.35 Module: Econometrics and Statistics I [M-WIWI-101638]

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

Credits	Recurrence	Language	Level	Version
9	Each term	German	4	3

Mandatory			
T-WIWI-103125	Applied Econometrics	4,5 CR	Schienle
Election block: Ergänzungsangebot (between 4,5 and 5 credits)			
T-WIWI-103066	Data Mining and Applications	4,5 CR	Nakhaeizadeh
T-WIWI-103064	Financial Econometrics	4,5 CR	Schienle
T-WIWI-103126	Non- and Semiparametrics	4,5 CR	Schienle
T-WIWI-103127	Panel Data	4,5 CR	Heller
T-WIWI-103065	Statistical Modeling of Generalized Regression Models	4,5 CR	Heller

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

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

Prerequisites
The course "*Advanced Statistics*" [2520020] is compulsory and must be examined.
The course Financial Econometrics [2520022] can only be passed if the course Time Series Analysis in the module Time Series Analysis and the course Generalized Regression Models in the module Generalized Regression Models have not be passed.

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

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

M 3.36 Module: Econometrics and Statistics II [M-WIWI-101639]

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

Credits	Recurrence	Language	Level	Version
9	Each term	German	4	2

Election block: Wahlplfichtangebot (between 9 and 10 credits)			
T-WIWI-103066	Data Mining and Applications	4,5 CR	Nakhaeizadeh
T-WIWI-103064	Financial Econometrics	4,5 CR	Schienle
T-WIWI-103124	Multivariate Statistical Methods	4,5 CR	Grothe
T-WIWI-103126	Non- and Semiparametrics	4,5 CR	Schienle
T-WIWI-103127	Panel Data	4,5 CR	Heller
T-WIWI-103128	Portfolio and Asset Liability Management	4,5 CR	Safarian
T-WIWI-103065	Statistical Modeling of Generalized Regression Models	4,5 CR	Heller
T-WIWI-103129	Stochastic Calculus and Finance	4,5 CR	Safarian

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

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

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

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

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

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

M 3.37 Module: Economic Theory and its Application in Finance [M-WIWI-101502]

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

Credits	Language	Level	Version
9	German/English	4	4

Election block: Wahlpflichtangebot (1 item)			
T-WIWI-102609	Advanced Topics in Economic Theory	4,5 CR	Mitusch
T-WIWI-102861	Advanced Game Theory	4,5 CR	Ehrhart, Puppe, Reiß
Election block: Ergänzungsangebot (1 item)			
T-WIWI-102647	Asset Pricing	4,5 CR	Ruckes, Uhrig-Homburg
T-WIWI-102622	Corporate Financial Policy	4,5 CR	Ruckes
T-WIWI-109050	Corporate Risk Management	4,5 CR	Ruckes
T-WIWI-102623	Financial Intermediation	4,5 CR	Ruckes

Competence Certificate
The assessment is carried out as partial exams (according to Section 4(2), 1 or 2 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The exams are offered at the beginning of the recess period about the subject matter of the latest held lecture. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately. The overall grade for the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Competence Goal
The students

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

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

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.

3.38 Module: eEnergy: Markets, Services and Systems [M-WIWI-103720]

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

Credits	Language	Level	Version
9	German	4	1

Election block: Wahlpflichtangebot (at least 9 credits)			
T-WIWI-107501	Energy Market Engineering	4,5 CR	Weinhardt
T-WIWI-107503	Energy Networks and Regulation	4,5 CR	Weinhardt
T-WIWI-107504	Smart Grid Applications	4,5 CR	Weinhardt

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

Competence Goal
The student

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

Prerequisites
None.

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

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

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

M 3.39 Module: Energy Economics and Technology [M-WIWI-101452]

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

Credits	Recurrence	Duration	Language	Level	Version
9	Each term	1 semester	German/English	4	4

Election block: Wahlpflichtangebot (at least 9 credits)			
T-WIWI-102793	Efficient Energy Systems and Electric Mobility	3,5 CR	Jochem, McKenna
T-WIWI-102650	Energy and Environment	4,5 CR	Karl
T-WIWI-102830	Energy Systems Analysis	3 CR	Ardone, Fichtner
T-WIWI-107464	Smart Energy Infrastructure	3 CR	Ardone, Pustisek
T-WIWI-102695	Heat Economy	3 CR	Fichtner

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 seperately.

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

Competence Goal
The student

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

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

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

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

M 3.40 Module: Evolution Equations [M-MATH-102872]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-105844	Evolution Equations	8 CR	Schnaubelt, Weis

3.41 Module: Experimental Economics [M-WIWI-101505]

Responsible: Prof. Dr. Johannes Philipp Reiß
Organisation: KIT Department of Economics and Management
Part of: Finance - Risk Management - Managerial Economics
Elective Field

Credits	Language	Level	Version
9	German	4	5

Election block: Wahlpflichtangebot (2 items)			
T-WIWI-102614	Experimental Economics	4,5 CR	Weinhardt
T-WIWI-105781	Incentives in Organizations	4,5 CR	Nieken
T-WIWI-102862	Predictive Mechanism and Market Design	4,5 CR	Reiß
T-WIWI-102863	Topics in Experimental Economics	4,5 CR	Reiß

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

Competence Goal
Students

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

Prerequisites
None.

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

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

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

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

M 3.42 Module: Exponential Integrators [M-MATH-103700]

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

Credits	Recurrence	Duration	Level	Version
6	Each winter term	1 semester	4	1

Mandatory			
T-MATH-107475	Exponential Integrators	6 CR	Hochbruck

Competence Certificate
Oral exam of approximately 20 minutes

Prerequisites
None

Content
In this class we consider the construction, analysis, implementation and application of exponential integrators. The focus will be on two types of stiff problems.

The first one is characterized by a Jacobian that possesses eigenvalues with large negative real parts. Parabolic partial differential equations and their spatial discretization are typical examples. The second class consists of highly oscillatory problems with purely imaginary eigenvalues of large modulus.

Apart from motivating the construction of exponential integrators for various classes of problems, our main intention in this class is to present the mathematics behind these methods. We will derive error bounds that are independent of stiffness or highest frequencies in the system.

Since the implementation of exponential integrators requires the evaluation of the product of a matrix function with a vector, we will briefly discuss some possible approaches as well.

3.43 Module: Extremal Graph Theory [M-MATH-102957]

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

Credits	Recurrence	Language	Level	Version
8	Irregular	English	4	1

Mandatory			
T-MATH-105931	Extremal Graph Theory	8 CR	Aksenovich

Competence Certificate
The final grade is given based on an oral exam (approx. 30 min.).

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

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

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

Annotation
Course is held in English

M 3.44 Module: Extreme Value Theory [M-MATH-102939]

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

Credits	Recurrence	Duration	Level	Version
4	Irregular	1 term	4	2

Mandatory			
T-MATH-105908	Extreme Value Theory	4 CR	Fasen-Hartmann, Henze

Prerequisites
None

M 3.45 Module: Finance 1 [M-WIWI-101482]

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

Organisation: KIT Department of Economics and Management

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

Credits	Recurrence	Duration	Language	Level	Version
9	Each term	1 semester	German/English	4	1

Election block: Wahlpflichtangebot (9 credits)			
T-WIWI-102643	Derivatives	4,5 CR	Uhrig-Homburg
T-WIWI-102621	Valuation	4,5 CR	Ruckes
T-WIWI-102647	Asset Pricing	4,5 CR	Ruckes, Uhrig-Homburg

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 seperately.

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

Competence Goal
The student

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

Prerequisites
None

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

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

M 3.46 Module: Finance 2 [M-WIWI-101483]

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

Organisation: KIT Department of Economics and Management

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

Credits	Recurrence	Duration	Language	Level	Version
9	Each term	1 semester	German/English	4	5

Election block: Wahlpflichtangebot (9 credits)			
T-WIWI-110513	Advanced Empirical Asset Pricing	4,5 CR	Thimme
T-WIWI-102647	Asset Pricing	4,5 CR	Ruckes, Uhrig-Homburg
T-WIWI-108880	Blockchains & Cryptofinance	4,5 CR	Schuster, Uhrig-Homburg
T-WIWI-102622	Corporate Financial Policy	4,5 CR	Ruckes
T-WIWI-109050	Corporate Risk Management	4,5 CR	Ruckes
T-WIWI-102643	Derivatives	4,5 CR	Uhrig-Homburg
T-WIWI-109941	eFinance: Information Systems for Securities Trading	4,5 CR	Weinhardt
T-WIWI-102644	Fixed Income Securities	4,5 CR	Uhrig-Homburg
T-WIWI-102900	Financial Analysis	4,5 CR	Luedecke
T-WIWI-102623	Financial Intermediation	4,5 CR	Ruckes
T-WIWI-102626	Business Strategies of Banks	3 CR	Müller
T-WIWI-102646	International Finance	3 CR	Uhrig-Homburg
T-WIWI-102645	Credit Risk	4,5 CR	Uhrig-Homburg
T-WIWI-110511	Strategic Finance and Technoloy Change	1,5 CR	Ruckes
T-WIWI-102621	Valuation	4,5 CR	Ruckes

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 seperately.

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

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

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

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

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

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

M 3.47 Module: Finance 3 [M-WIWI-101480]

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

Organisation: KIT Department of Economics and Management

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

Credits	Recurrence	Duration	Language	Level	Version
9	Each term	1 semester	German/English	4	5

Election block: Wahlpflichtangebot (at least 9 credits)			
T-WIWI-110513	Advanced Empirical Asset Pricing	4,5 CR	Thimme
T-WIWI-102647	Asset Pricing	4,5 CR	Ruckes, Uhrig-Homburg
T-WIWI-108880	Blockchains & Cryptofinance	4,5 CR	Schuster, Uhrig-Homburg
T-WIWI-102622	Corporate Financial Policy	4,5 CR	Ruckes
T-WIWI-109050	Corporate Risk Management	4,5 CR	Ruckes
T-WIWI-102643	Derivatives	4,5 CR	Uhrig-Homburg
T-WIWI-109941	eFinance: Information Systems for Securities Trading	4,5 CR	Weinhardt
T-WIWI-102644	Fixed Income Securities	4,5 CR	Uhrig-Homburg
T-WIWI-102900	Financial Analysis	4,5 CR	Luedecke
T-WIWI-102623	Financial Intermediation	4,5 CR	Ruckes
T-WIWI-102626	Business Strategies of Banks	3 CR	Müller
T-WIWI-102646	International Finance	3 CR	Uhrig-Homburg
T-WIWI-102645	Credit Risk	4,5 CR	Uhrig-Homburg
T-WIWI-110511	Strategic Finance and Technoloy Change	1,5 CR	Ruckes
T-WIWI-102621	Valuation	4,5 CR	Ruckes

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 seperately.

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

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

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

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

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

M 3.48 Module: Finite Element Methods [M-MATH-102891]

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

Organisation: KIT Department of Mathematics

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

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

Mandatory			
T-MATH-105857	Finite Element Methods	8 CR	Dörfler, Hochbruck, Jahnke, Rieder, Wieners

M 3.49 Module: Finite Group Schemes [M-MATH-103258]

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

Organisation: KIT Department of Mathematics

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

Credits	Recurrence	Language	Level	Version
4	Irregular	German	4	1

Mandatory			
T-MATH-106486	Finite Group Schemes	4 CR	Januszewski

3.50 Module: FinTech Innovations [M-WIWI-105036]

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

Credits	Language	Level	Version
9	English	4	1

Mandatory			
T-WIWI-106193	Engineering FinTech Solutions	9 CR	Ulrich

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

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

Prerequisites
see T-WIWI-106193 "Engineering FinTech Solutions"

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

Recommendation
None

Workload
Total effort for 9 credit points: approx. 270 hours.

3.51 Module: Forecasting: Theory and Practice [M-MATH-102956]

Responsible: Prof. Dr. Tilmann Gneiting
Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Stochastik)
Elective Field

Credits	Recurrence	Duration	Language	Level	Version
8	Irregular	1 term	English	4	2

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

Prerequisites
None

Annotation

- Regular cycle: every 2nd year, starting winter semester 16/17
- Course is held in English

M 3.52 Module: Foundations of Continuum Mechanics [M-MATH-103527]

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

Credits	Recurrence	Duration	Level	Version
3	Irregular	2 term	4	1

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

Prerequisites
none

M 3.53 Module: Fourier Analysis [M-MATH-102873]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

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

Content

- Fourier series
- Fourier transform on L1 and L2
- Tempered distributions and their Fourier transform
- Explizit solutions of the Heat-, Schrödinger- and Wave equation in Rn
- the Hilbert transform
- the interpolation theorem of Marcinkiewicz
- Singular integral operators
- the Fourier multiplier theorem of Mihlin

3.54 Module: Fourier Analysis and its Applications to PDEs [M-MATH-104827]

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

Credits	Recurrence	Duration	Level	Version
3	Each winter term	1 semester	4	2

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

Prerequisites
None

M 3.55 Module: Functional Analysis [M-MATH-101320]

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

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

Mandatory			
T-MATH-102255	Functional Analysis	8 CR	Herzog, Hundertmark, Lamm, Plum, Reichel, Schmoeger, Schnaubelt, Weis

Prerequisites
None

3.56 Module: Functions of Matrices [M-MATH-102937]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	2 term	4	1

Mandatory			
T-MATH-105906	Functions of Matrices	8 CR	Grimm

Prerequisites
none

3.57 Module: Functions of Operators [M-MATH-102936]

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

Credits	Recurrence	Duration	Level	Version
6	Irregular	2 term	4	1

Mandatory			
T-MATH-105905	Functions of Operators	6 CR	

M 3.58 Module: Generalized Regression Models [M-MATH-102906]

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

Credits	Recurrence	Duration	Level	Version
4	Each summer term	1 semester	4	2

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

Prerequisites
None

3.59 Module: Geometric Group Theory [M-MATH-102867]

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

Credits	Recurrence	Duration	Level	Version
8	Each summer term	1 semester	4	1

Mandatory			
T-MATH-105842	Geometric Group Theory	8 CR	Herrlich, Leuzinger, Link, Sauer, Schwer, Tuschmann

M 3.60 Module: Geometric Numerical Integration [M-MATH-102921]

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

Credits	Recurrence	Duration	Level	Version
6	Irregular	2 term	4	1

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

Prerequisites
none

M 3.61 Module: Geometry of Schemes [M-MATH-102866]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	5	1

Mandatory			
T-MATH-105841	Geometry of Schemes	8 CR	Herrlich, Kühnlein

M 3.62 Module: Global Differential Geometry [M-MATH-102912]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	2 term	5	1

Mandatory			
T-MATH-105885	Global Differential Geometry	8 CR	Grensing, Tuschmann

Prerequisites
none

M 3.63 Module: Graph Theory [M-MATH-101336]

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

Credits	Recurrence	Duration	Language	Level	Version
8	Irregular	1 semester	English	4	1

Mandatory			
T-MATH-102273	Graph Theory	8 CR	Aksenovich

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

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

Prerequisites
None

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

Annotation

- Regular cycle: every 2nd year, winter semester
- Course is held in English

M 3.64 Module: Group Actions in Riemannian Geometry [M-MATH-102954]

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

Credits	Recurrence	Duration	Level	Version
5	Irregular	2 term	5	1

Mandatory			
T-MATH-105925	Group Actions in Riemannian Geometry	5 CR	Tuschmann

Prerequisites
none

M 3.65 Module: Growth and Agglomeration [M-WIWI-101496]

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

Credits	Recurrence	Duration	Language	Level	Version
9	Each term	1 semester	German/English	4	3

Election block: Wahlpflichtangebot (9 credits)			
T-WIWI-109194	Dynamic Macroeconomics	4,5 CR	Brumm
T-WIWI-102785	Theory of Endogenous Growth	4,5 CR	Ott
T-WIWI-103107	Spatial Economics	4,5 CR	Ott

Competence Certificate
The assessment is carried out as partial written exams (see the lectures descriptions).

The overall grade for the module is the average of the grades for each course weighted by the credits.

Competence Goal
The student

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

Prerequisites
None

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

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

Recommendation
Attendance of the course *Introduction Economic Policy* [2560280] is recommended.

Successful completion of the courses*Economics I: Microeconomics*and*Economics II: Macroeconomics*is required.

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

3.66 Module: Harmonic Analysis for Dispersive Equations [M-MATH-103545]

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

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

Mandatory			
T-MATH-107071	Harmonic Analysis for Dispersive Equations	8 CR	Kunstmann

Prerequisites
None

Content
Fourier transform, Fourier multipliers, interpolation, singular integral operators, Mihlin's Theorem, Littlewood-Paley decomposition, oscillating integrals, dispersive estimates, Strichartz estimates, nonlinear equations.

M 3.67 Module: Homotopy Theory [M-MATH-102959]

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

Credits	Recurrence	Language	Level	Version
8	Irregular	German	4	1

Mandatory			
T-MATH-105933	Homotopy Theory	8 CR	Sauer

M 3.68 Module: Informatics [M-WIWI-101472]

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

Organisation: KIT Department of Economics and Management

Part of: Operations Management - Data Analysis - Informatics
Elective Field

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

Election block: Wahlpflichtangebot ()			
T-WIWI-110339	Applied Informatics – Principles of Internet Computing: Foundations for Emerging Technologies and Future Services	4,5 CR	Sunyaev
T-WIWI-102680	Computational Economics	4,5 CR	Shukla
T-WIWI-109248	Critical Information Infrastructures	4,5 CR	Sunyaev
T-WIWI-109246	Digital Health	4,5 CR	Sunyaev
T-WIWI-109270	Human Factors in Security and Privacy	4,5 CR	Volkamer
T-WIWI-102661	Database Systems and XML	4,5 CR	Oberweis
T-WIWI-102668	Enterprise Architecture Management	4,5 CR	Wolf
T-WIWI-110346	Supplement Enterprise Information Systems	4,5 CR	Oberweis
T-WIWI-110372	Supplement Software- and Systemsengineering	4,5 CR	Oberweis
T-WIWI-106423	Information Service Engineering	4,5 CR	Sack
T-WIWI-102666	Knowledge Discovery	4,5 CR	Sure-Vetter
T-WIWI-102667	Management of IT-Projects	4,5 CR	Schätzle
T-WIWI-106340	Machine Learning 1 - Basic Methods	4,5 CR	Zöllner
T-WIWI-106341	Machine Learning 2 – Advanced Methods	4,5 CR	Zöllner
T-WIWI-102697	Business Process Modelling	4,5 CR	Oberweis
T-WIWI-102679	Nature-Inspired Optimization Methods	4,5 CR	Shukla
T-WIWI-109799	Process Mining	4,5 CR	Oberweis
T-WIWI-102874	Semantic Web Technologies	4,5 CR	Sure-Vetter
T-WIWI-102895	Software Quality Management	4,5 CR	Oberweis
T-WIWI-102669	Strategic Management of Information Technology	4,5 CR	Wolf
T-WIWI-103112	Web Science	4,5 CR	Sure-Vetter
Election block: Seminare und Praktika (between 0 and 1 items)			
T-WIWI-110144	Emerging Trends in Digital Health	4,5 CR	Sunyaev
T-WIWI-110143	Emerging Trends in Internet Technologies	4,5 CR	Sunyaev
T-WIWI-109249	Sociotechnical Information Systems Development	4,5 CR	Sunyaev
T-WIWI-110548	Advanced Lab Informatics (Master)	4,5 CR	Professorenschaft des Fachbereichs Informatik
T-WIWI-109786	Advanced Lab Security	4,5 CR	Volkamer
T-WIWI-109271	Advanced Lab User Studies in Security	4,5 CR	Volkamer
T-WIWI-109985	Project Lab Cognitive Automobiles and Robots	4,5 CR	Zöllner
T-WIWI-109983	Project Lab Machine Learning	4,5 CR	Zöllner
T-WIWI-109251	Selected Issues in Critical Information Infrastructures	4,5 CR	Sunyaev

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

The examinations are offered every semester. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately.

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

Please note the following information about the module component exams of Prof. Dr. H. Schmeck:

The examinations in Algorithms for Internet Applications [T-WIWI-102658], Efficient Algorithms [T-WIWI-102655], Organic Computing [T-WIWI-102659] and Smart Energy Distribution [T-WIWI-102845] are offered latest until summer term 2017 (repeaters only).

Competence Goal
The student

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

Prerequisites
It is only allowed to choose one lab.

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

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

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

M 3.69 Module: Information Systems in Organizations [M-WIWI-104068]

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

Credits	Language	Level	Version
9	German	4	2

Election block: Wahlpflichtangebot (at least 9 credits)			
T-WIWI-105777	Business Intelligence Systems	4,5 CR	Mädche, Nadj, Toreini
T-WIWI-106201	Digital Transformation of Organizations	4,5 CR	Mädche
T-WIWI-108461	Interactive Information Systems	4,5 CR	Mädche, Morana
T-WIWI-108437	Practical Seminar: Information Systems and Service Design	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.

Competence Goal
The student

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

Prerequisites
None

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

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

Annotation
New module starting summer term 2018.

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

M 3.70 Module: Innovation and Growth [M-WIWI-101478]

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

Credits	Recurrence	Duration	Language	Level	Version
9	Each term	1 semester	German/English	4	3

Election block: Wahlpflichtangebot (between 9 and 10 credits)			
T-WIWI-109194	Dynamic Macroeconomics	4,5 CR	Brumm
T-WIWI-102785	Theory of Endogenous Growth	4,5 CR	Ott
T-WIWI-102840	Innovationtheory and -Policy	4,5 CR	Ott

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 offerd at every ordinary examination date. The assessment procedures are described for each course of the module seperately.

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

Competence Goal
Students shall be given the ability to

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

Prerequisites
None

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

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

Workload
Total expenditure of time for 9 credits: 270 hours

Attendance time per lecture: 3x14h

Preparation and wrap-up time per lecture: 3x14h

Rest: Exam Preparation

The exact distribution is subject to the credits of the courses of the module.

M 3.71 Module: Integral Equations [M-MATH-102874]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-105834	Integral Equations	8 CR	Arens, Hettlich, Kirsch

M 3.72 Module: Introduction into Particulate Flows [M-MATH-102943]

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

Credits	Recurrence	Duration	Level	Version
3	Once	2 term	4	1

Mandatory			
T-MATH-105911	Introduction into Particulate Flows	3 CR	Dörfler

Prerequisites
none

M 3.73 Module: Introduction to Geometric Measure Theory [M-MATH-102949]

Responsible: PD Dr. Steffen Winter
Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Algebra und Geometrie)
Elective Field

Credits	Recurrence	Duration	Level	Version
6	Irregular	2 term	4	1

Mandatory			
T-MATH-105918	Introduction to Geometric Measure Theory	6 CR	Winter

Prerequisites
none

M 3.74 Module: Introduction to Homogeneous Dynamics [M-MATH-105101]

Responsible: Dr. Stefan Kühnlein
Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Stochastik)
Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)
Mathematical Methods (Algebra und Geometrie)
Elective Field

Credits	Recurrence	Duration	Level	Version
6	Each winter term	1 semester	4	1

Mandatory			
T-MATH-110323	Introduction to Homogeneous Dynamics	6 CR	Kühnlein

Prerequisites
None

M 3.75 Module: Introduction to Kinetic Theory [M-MATH-103919]

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

Credits	Recurrence	Duration	Language	Level	Version
4	Each winter term	1 semester	English	4	1

Mandatory			
T-MATH-108013	Introduction to Kinetic Theory	4 CR	Frank

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

Prerequisites
None

Content

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

Recommendation
Partial Differential Equations, Functional Analysis

M 3.76 Module: Introduction to Matlab and Numerical Algorithms [M-MATH-102945]

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

Credits	Recurrence	Duration	Level	Version
5	Irregular	2 term	4	1

Mandatory			
T-MATH-105913	Introduction to Matlab and Numerical Algorithms	5 CR	Weiß, Wieners

Prerequisites
none

3.77 Module: Introduction to Scientific Computing [M-MATH-102889]

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

Organisation: KIT Department of Mathematics

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

Credits	Recurrence	Duration	Level	Version
8	Each summer term	1 semester	4	2

Mandatory			
T-MATH-105837	Introduction to Scientific Computing	8 CR	Dörfler, Hochbruck, Jahnke, Rieder, Wieners

Prerequisites
None

M 3.78 Module: Inverse Problems [M-MATH-102890]

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

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

Mandatory			
T-MATH-105835	Inverse Problems	8 CR	Arens, Hettlich, Kirsch, Rieder

M 3.79 Module: Key Moments in Geometry [M-MATH-104057]

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

Credits	Recurrence	Duration	Level	Version
5	Each winter term	1 semester	4	1

Mandatory			
T-MATH-108401	Key Moments in Geometry	5 CR	Tuschmann

Prerequisites
None

M 3.80 Module: L2-Invariants [M-MATH-102952]

Responsible: Dr. Holger Kammeyer
Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Analysis oder Angewandte und Numerische Mathematik, Optimierung)
Mathematical Methods (Algebra und Geometrie)
Elective Field

Credits	Recurrence	Duration	Level	Version
5	Irregular	2 term	4	1

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

Prerequisites
none

M 3.81 Module: Lie Groups and Lie Algebras [M-MATH-104261]

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

Credits	Language	Level	Version
8	German	4	1

Mandatory			
T-MATH-108799	Lie Groups and Lie Algebras	8 CR	Leuzinger

M 3.82 Module: Marketing Management [M-WIWI-101490]

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

Credits	Recurrence	Duration	Language	Level	Version
9	Each summer term	1 semester	German/English	4	11

Election block: Wahlpflichtangebot (at least 1 item)			
T-WIWI-107720	Market Research	4,5 CR	Klarmann
T-WIWI-102883	Pricing	4,5 CR	Feurer
T-WIWI-109864	Product and Innovation Management	3 CR	Klarmann
Election block: Ergänzungsangebot (at most 1 item)			
T-WIWI-106137	Country Manager Simulation	1,5 CR	Feurer
T-WIWI-102835	Marketing Strategy Business Game	1,5 CR	Klarmann

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

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

Competence Goal
Students

- have an advanced knowledge about central marketing contents

- have a fundamental understanding of the marketing instruments

- know and understand several strategic concepts and how to implement them

- are able to implement their extensive marketing knowledge in a practical context

- know several qualitative and quantitative approaches to prepare decisions in Marketing

- have the theoretical knowledge to write a master thesis in Marketing

- have the theoretical knowledge to work in/together with the Marketing department

Prerequisites
The course "Market Research" is obligatory.

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

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

Annotation
Please note that only one of the listed 1,5-ECTS courses can be chosen in the Marketing Management module.

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

M 3.83 Module: Markov Decision Processes [M-MATH-102907]

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

Credits	Recurrence	Duration	Level	Version
5	Irregular	1 semester	4	1

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

Prerequisites
none

M 3.84 Module: Master Thesis [M-MATH-102917]

Responsible: Dr. Sebastian Grensing
Organisation: KIT Department of Mathematics
Part of: Master Thesis

Credits	Recurrence	Duration	Level	Version
30	Each term	1 term	4	1

Mandatory			
T-MATH-105878	Master Thesis	30 CR	Grensing

M 3.85 Module: Mathematical Methods in Signal and Image Processing [M-MATH-102897]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-105862	Mathematical Methods in Signal and Image Processing	8 CR	Rieder

Prerequisites
none

M 3.86 Module: Mathematical Methods of Imaging [M-MATH-103260]

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

Credits	Recurrence	Level	Version
5	Irregular	4	1

Mandatory			
T-MATH-106488	Mathematical Methods of Imaging	5 CR	Rieder

Prerequisites
None

M 3.87 Module: Mathematical Modelling and Simulation in Practise [M-MATH-102929]

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

Credits	Recurrence	Duration	Language	Level	Version
4	Irregular	2 term	English	4	2

Mandatory			
T-MATH-105889	Mathematical Modelling and Simulation in Practise	4 CR	Thäter

Prerequisites
None

M 3.88 Module: Mathematical Programming [M-WIWI-101473]

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

Credits	Recurrence	Duration	Language	Level	Version
9	Each term	1 semester	German/English	4	6

Election block: Wahlpflichtangebot (at most 2 items)			
T-WIWI-102719	Mixed Integer Programming I	4,5 CR	Stein
T-WIWI-102726	Global Optimization I	4,5 CR	Stein
T-WIWI-103638	Global Optimization I and II	9 CR	Stein
T-WIWI-102856	Convex Analysis	4,5 CR	Stein
T-WIWI-102724	Nonlinear Optimization I	4,5 CR	Stein
T-WIWI-103637	Nonlinear Optimization I and II	9 CR	Stein
T-WIWI-102855	Parametric Optimization	4,5 CR	Stein
Election block: Ergänzungsangebot (at most 2 items)			
T-WIWI-106548	Advanced Stochastic Optimization	4,5 CR	Rebennack
T-WIWI-102720	Mixed Integer Programming II	4,5 CR	Stein
T-WIWI-102727	Global Optimization II	4,5 CR	Stein
T-WIWI-102723	Graph Theory and Advanced Location Models	4,5 CR	Nickel
T-WIWI-106549	Large-scale Optimization	4,5 CR	Rebennack
T-WIWI-103124	Multivariate Statistical Methods	4,5 CR	Grothe
T-WIWI-102725	Nonlinear Optimization II	4,5 CR	Stein
T-WIWI-102715	Operations Research in Supply Chain Management	4,5 CR	Nickel
T-WIWI-110162	Optimization Models and Applications	4,5 CR	Sudermann-Merx

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 seperately.

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

Competence Goal
The student

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

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

Content
The modul focuses on theoretical foundations as well as solution algorithms for optimization problems with continuous and mixed integer decision variables.

Annotation
The lectures are partly offered irregularly. The curriculum of the next three years is available online (www.ior.kit.edu).

For the lectures of Prof. Stein a grade of 30 % of the exercise course has to be fulfilled. The description of the particular lectures is more detailed.

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

M 3.89 Module: Mathematical Statistics [M-MATH-102909]

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

Credits	Recurrence	Duration	Level	Version
4	Irregular	1 semester	4	1

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

Prerequisites
none

M 3.90 Module: Mathematical Topics in Kinetic Theory [M-MATH-104059]

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

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

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

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

Prerequisites
None

Content

- Boltzmann equation: Cauchy problem and properties of solutions
- entropy and H theorem
- equilibrium and convergence to equilibrium
- other models of kinetic theory

M 3.91 Module: Maxwell's Equations [M-MATH-102885]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-105856	Maxwell's Equations	8 CR	Arens, Hettlich, Kirsch

M 3.92 Module: Medical Imaging [M-MATH-102896]

Responsible: Prof. Dr. Andreas Rieder

Organisation: KIT Department of Mathematics

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-105861	Medical Imaging	8 CR	Rieder

Prerequisites
None

M 3.93 Module: Methodical Foundations of OR [M-WIWI-101414]

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

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

Election block: Wahlpflichtangebot (at least 1 item as well as between 4,5 and 9 credits)			
T-WIWI-102726	Global Optimization I	4,5 CR	Stein
T-WIWI-103638	Global Optimization I and II	9 CR	Stein
T-WIWI-102724	Nonlinear Optimization I	4,5 CR	Stein
T-WIWI-103637	Nonlinear Optimization I and II	9 CR	Stein
Election block: Ergänzungsangebot ()			
T-WIWI-106546	Introduction to Stochastic Optimization	4,5 CR	Rebennack
T-WIWI-102727	Global Optimization II	4,5 CR	Stein
T-WIWI-102725	Nonlinear Optimization II	4,5 CR	Stein
T-WIWI-102704	Facility Location and Strategic Supply Chain Management	4,5 CR	Nickel

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

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

Competence Goal
The student

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

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

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

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

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

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

M 3.94 Module: Microeconomic Theory [M-WIWI-101500]

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

Credits	Language	Level	Version
9	German/English	4	3

Election block: Wahlpflichtangebot (at least 9 credits)			
T-WIWI-102609	Advanced Topics in Economic Theory	4,5 CR	Mitusch
T-WIWI-102861	Advanced Game Theory	4,5 CR	Ehrhart, Puppe, Reiß
T-WIWI-102859	Social Choice Theory	4,5 CR	Puppe
T-WIWI-102613	Auction Theory	4,5 CR	Ehrhart
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 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 seperately.

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

Competence Goal
Students

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

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

Prerequisites
None

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

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

3.95 Module: Monotonicity Methods in Analysis [M-MATH-102887]

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

Credits	Recurrence	Duration	Level	Version
3	Irregular	2 term	4	1

Mandatory			
T-MATH-105877	Monotonicity Methods in Analysis	3 CR	Herzog

M 3.96 Module: Nonlinear Analysis [M-MATH-103539]

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

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

Mandatory			
T-MATH-107065	Nonlinear Analysis	8 CR	Lamm

Prerequisites
None

3.97 Module: Nonlinear Maxwell Equations [M-MATH-105066]

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

Credits	Language	Level	Version
8	German	4	1

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

Prerequisites
none

M 3.98 Module: Nonlinear Maxwell Equations [M-MATH-103257]

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

Credits	Recurrence	Duration	Level	Version
3	Irregular	1 semester	4	1

Mandatory			
T-MATH-106484	Nonlinear Maxwell Equations	3 CR	Schnaubelt

Prerequisites
none

Content

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

M 3.99 Module: Nonparametric Statistics [M-MATH-102910]

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

Credits	Recurrence	Duration	Level	Version
4	Irregular	1 semester	4	2

Mandatory			
T-MATH-105873	Nonparametric Statistics	4 CR	Henze, Klar

Prerequisites
None

M 3.100 Module: Numerical Continuation Methods [M-MATH-102944]

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

Credits	Recurrence	Duration	Level	Version
5	Irregular	2 term	4	1

Mandatory			
T-MATH-105912	Numerical Continuation Methods	5 CR	Rottmann-Matthes

Prerequisites
none

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

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

Credits	Recurrence	Duration	Language	Level	Version
3	Each winter term	1 semester	English	4	1

Mandatory			
T-MATH-107497	Numerical Linear Algebra for Scientific High Performance Computing	3 CR	Anzt

Prerequisites
None

3.102 Module: Numerical Linear Algebra in Image Processing [M-MATH-104058]

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

Credits	Recurrence	Duration	Level	Version
6	Each winter term	1 semester	4	1

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

Prerequisites
None

3.103 Module: Numerical Methods for Differential Equations [M-MATH-102888]

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

Organisation: KIT Department of Mathematics

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

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

Mandatory			
T-MATH-105836	Numerical Methods for Differential Equations	8 CR	Dörfler, Hochbruck, Jahnke, Rieder, Wieners

M 3.104 Module: Numerical Methods for Hyperbolic Equations [M-MATH-102915]

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

Credits	Recurrence	Duration	Level	Version
6	Irregular	2 term	4	1

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

Competence Goal
.

Prerequisites
none

M 3.105 Module: Numerical Methods for Integral Equations [M-MATH-102930]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	2 term	5	1

Mandatory			
T-MATH-105901	Numerical Methods for Integral Equations	8 CR	Arens, Hettlich, Kirsch

M 3.106 Module: Numerical Methods for Maxwell's Equations [M-MATH-102931]

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

Organisation: KIT Department of Mathematics

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

Credits	Recurrence	Duration	Level	Version
6	Irregular	2 term	4	1

Mandatory			
T-MATH-105920	Numerical Methods for Maxwell's Equations	6 CR	Hochbruck, Jahnke

M 3.107 Module: Numerical Methods for Time-Dependent Partial Differential Equations [M-MATH-102928]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	5	1

Mandatory			
T-MATH-105899	Numerical Methods for Time-Dependent Partial Differential Equations	8 CR	Hochbruck, Jahnke

3.108 Module: Numerical Methods in Computational Electrodynamics [M-MATH-102894]

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

Credits	Recurrence	Duration	Level	Version
6	Irregular	1 semester	4	1

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

Prerequisites
none

M 3.109 Module: Numerical Methods in Fluid Mechanics [M-MATH-102932]

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

Organisation: KIT Department of Mathematics

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

Credits	Recurrence	Duration	Level	Version
4	Irregular	2 term	4	1

Mandatory			
T-MATH-105902	Numerical Methods in Fluid Mechanics	4 CR	Dörfler, Thäter

M 3.110 Module: Numerical Methods in Mathematical Finance [M-MATH-102901]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-105865	Numerical Methods in Mathematical Finance	8 CR	Jahnke

Prerequisites
none

M 3.111 Module: Numerical Methods in Mathematical Finance II [M-MATH-102914]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	2 term	5	1

Mandatory			
T-MATH-105880	Numerical Methods in Mathematical Finance II	8 CR	Jahnke

Prerequisites
none

M 3.112 Module: Numerical Optimisation Methods [M-MATH-102892]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-105858	Numerical Optimisation Methods	8 CR	Dörfler, Hochbruck, Jahnke, Rieder, Wieners

3.113 Module: Operations Research in Supply Chain Management [M-WIWI-102832]

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

Credits	Language	Level	Version
9	German	4	6

Election block: Wahlpflichtangebot (at most 2 items)			
T-WIWI-102723	Graph Theory and Advanced Location Models	4,5 CR	Nickel
T-WIWI-106200	Modeling and OR-Software: Advanced Topics	4,5 CR	Nickel
T-WIWI-102715	Operations Research in Supply Chain Management	4,5 CR	Nickel
Election block: Ergänzungsangebot (at most 2 items)			
T-WIWI-106546	Introduction to Stochastic Optimization	4,5 CR	Rebennack
T-WIWI-102718	Discrete-Event Simulation in Production and Logistics	4,5 CR	Nickel
T-WIWI-102719	Mixed Integer Programming I	4,5 CR	Stein
T-WIWI-102720	Mixed Integer Programming II	4,5 CR	Stein
T-WIWI-106549	Large-scale Optimization	4,5 CR	Rebennack
T-WIWI-110162	Optimization Models and Applications	4,5 CR	Sudermann-Merx
T-WIWI-102704	Facility Location and Strategic Supply Chain Management	4,5 CR	Nickel
T-WIWI-102714	Tactical and Operational Supply Chain Management	4,5 CR	Nickel

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 seperately.

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

Competence Goal
The student

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

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

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

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

Recommendation
Basic knowledge as conveyed in the module*Introduction toOperations Research*[WI1OR] is assumed.

Annotation
Some lectures and courses are offered irregularly.

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

Workload
Total effort for 9 credits: ca. 270 hours

- Presence time: 84 hours
- Preparation/Wrap-up: 112 hours
- Examination and examination preparation: 74 hours

3.114 Module: Optimisation and Optimal Control for Differential Equations [M-MATH-102899]

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

Credits	Recurrence	Duration	Level	Version
4	Irregular	1 semester	4	1

Mandatory			
T-MATH-105864	Optimisation and Optimal Control for Differential Equations	4 CR	

Prerequisites
none

M 3.115 Module: Optimization in Banach Spaces [M-MATH-102924]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-105893	Optimization in Banach Spaces	8 CR	Kirsch

Prerequisites
none

3.116 Module: Parallel Computing [M-MATH-101338]

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

Organisation: KIT Department of Mathematics

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

Credits	Recurrence	Level	Version
5	Irregular	4	1

Mandatory			
T-MATH-102271	Parallel Computing	5 CR	Krause, Wieners

Prerequisites
None

3.117 Module: Percolation [M-MATH-102905]

Responsible: Prof. Dr. Günter Last
Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Stochastik)
Elective Field

Credits	Recurrence	Duration	Level	Version
6	Irregular	1 semester	4	1

Mandatory			
T-MATH-105869	Percolation	6 CR	Last

Competence Goal
The students

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

Prerequisites
none

M 3.118 Module: Poisson Processes [M-MATH-102922]

Responsible: Prof. Dr. Günter Last
Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Stochastik)
Elective Field

Credits	Recurrence	Duration	Level	Version
5	Irregular	1 term	4	1

Mandatory			
T-MATH-105922	Poisson Processes	5 CR	Fasen-Hartmann, Hug, Last

Competence Certificate
oral exam

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

Module grade calculation
Marking: grade of exam

Prerequisites
none

Content

- Distributional properties of Poisson processes
- The Poisson process as a particular point process
- stationary Poisson and point processes
- Random measures and Cox processes
- Poisson cluster processes and compound Poisson processes
- The spatial Gale-Shapley algorithm

M 3.119 Module: Potential Theory [M-MATH-102879]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-105850	Potential Theory	8 CR	Arens, Hettlich, Kirsch, Reichel

M 3.120 Module: Probability Theory and Combinatorial Optimization [M-MATH-102947]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 term	4	1

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

Prerequisites
none

M 3.121 Module: Project Centered Software-Lab [M-MATH-102938]

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

Credits	Recurrence	Duration	Level	Version
4	Irregular	2 term	4	1

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

Prerequisites
none

3.122 Module: Random Graphs [M-MATH-102951]

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

Credits	Recurrence	Duration	Level	Version
6	Irregular	1 term	4	1

Mandatory			
T-MATH-105929	Random Graphs	6 CR	Schulte

Prerequisites
none

M 3.123 Module: Ruin Theory [M-MATH-104055]

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

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

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

Prerequisites
None

M 3.124 Module: Scattering Theory [M-MATH-102884]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-105855	Scattering Theory	8 CR	Arens, Hettlich, Kirsch

M 3.125 Module: Selected Topics in Harmonic Analysis [M-MATH-104435]

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

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

Mandatory			
T-MATH-109065	Selected Topics in Harmonic Analysis	3 CR	Hundertmark

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

Prerequisites
None

Content
- Calderon-Zygmund and Singular Integral operators
- BMO space and Muckenhoupt weights
- Reverse Holder Inequality and Factorisation of Ap weights
- Extrapolation Theory and weighted norm inequalities for singular integral operators

3.126 Module: Seminar [M-WIWI-102973]

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

Organisation: KIT Department of Economics and Management

Part of: Seminar in Economics and Management
Elective Field

Credits	Language	Level	Version
3	German	4	1

Election block: Wahlpflichtangebot (3 credits)			
T-WIWI-103479	Seminar in Informatics A (Master)	3 CR	Professorenschaft des Fachbereichs Informatik
T-WIWI-103481	Seminar in Operations Research A (Master)	3 CR	Nickel, Rebennack, Stein

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

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

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

• They are able to research, analyze, abstract and critically review the information.

• They can draw own conclusions using their interdisciplinary knowledge from the less structured information and selectively develop current research results.

• They can logically and systematically present the obtained results both orally and in written form in accordance with scientific guidelines (structuring, technical terminology, referencing). They can argue and defend the results professionally in the discussion.

Prerequisites
None.

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

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

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

Recommendation
None.

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

M 3.127 Module: Seminar [M-WIWI-102971]

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

Organisation: KIT Department of Economics and Management

Part of: Seminar in Economics and Management
Elective Field

Credits	Language	Level	Version
3	German	4	1

Election block: Wahlpflichtangebot (3 credits)			
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-103483	Seminar in Statistics A (Master)	3 CR	Grothe, Schienle

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

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

• They are able to research, analyze, abstract and critically review the information.

• They can draw own conclusions using their interdisciplinary knowledge from the less structured information and selectively develop current research results.

• They can logically and systematically present the obtained results both orally and in written form in accordance with scientific guidelines (structuring, technical terminology, referencing). They can argue and defend the results professionally in the discussion.

Prerequisites
None.

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

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

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

Recommendation
None.

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

M 3.128 Module: Seminar [M-MATH-102730]

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

Credits	Recurrence	Language	Level	Version
3	Each term	German	4	3

Election block: Wahlbereich Seminar (1 item)			
T-MATH-105686	Seminar Mathematics	3 CR	

M 3.129 Module: Seminar [M-WIWI-102972]

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

Organisation: KIT Department of Economics and Management

Part of: Elective Field

Credits	Recurrence	Language	Level	Version
3	Each term	German/English	4	1

Election block: Wahlplfichtangebot (1 item)			
T-WIWI-103476	Seminar in Business Administration B (Master)	3 CR	Professorenschaft des Fachbereichs Betriebswirtschaftslehre
T-WIWI-103477	Seminar in Economics B (Master)	3 CR	Professorenschaft des Fachbereichs Volkswirtschaftslehre
T-WIWI-103484	Seminar in Statistics B (Master)	3 CR	Grothe, Schienle

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

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

Competence Goal

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

Prerequisites
None.

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

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

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

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

Workload
he total workload for this module is approximately 90 hours.

M 3.130 Module: Seminar [M-WIWI-102974]

Responsible: Prof. Dr. Hagen Lindstädt
Prof. Dr. Oliver Stein
Organisation: KIT Department of Economics and Management
Part of: Elective Field

Credits	Recurrence	Language	Level	Version
3	Each term	German/English	4	1

Election block: Wahlplfichtangebot (1 item)			
T-WIWI-103480	Seminar in Informatics B (Master)	3 CR	Professorenschaft des Fachbereichs Informatik
T-WIWI-103482	Seminar in Operations Research B (Master)	3 CR	Nickel, Rebennack, Stein

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

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

Competence Goal

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

Prerequisites
None.

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

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

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

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

Workload
he total workload for this module is approximately 90 hours.

M 3.131 Module: Service Operations [M-WIWI-102805]

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

Credits	Language	Level	Version
9	German	4	6

Election block: Wahlpflichtangebot (at most 2 items)			
T-WIWI-102718	Discrete-Event Simulation in Production and Logistics	4,5 CR	Nickel
T-WIWI-102884	Operations Research in Health Care Management	4,5 CR	Nickel
T-WIWI-102715	Operations Research in Supply Chain Management	4,5 CR	Nickel
T-WIWI-102716	Practical Seminar: Health Care Management (with Case Studies)	4,5 CR	Nickel
Election block: Ergänzungsangebot (at most 2 items)			
T-WIWI-102872	Challenges in Supply Chain Management	4,5 CR	Mohr

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

Competence Goal
Students

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

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

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

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

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

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

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

M 3.132 Module: Sobolev Spaces [M-MATH-102926]

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

Credits	Recurrence	Duration	Level	Version
5	Irregular	1 term	4	1

Mandatory			
T-MATH-105896	Sobolev Spaces	5 CR	Kirsch

M 3.133 Module: Spatial Stochastics [M-MATH-102903]

Responsible: Prof. Dr. Günter Last
Organisation: KIT Department of Mathematics
Part of: Mathematical Methods (Stochastik)
Elective Field

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

Mandatory			
T-MATH-105867	Spatial Stochastics	8 CR	Hug, Last

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

Prerequisites
none

Content

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

Recommendation
It is recommended to attend the following modules previously: Probability Theory

3.134 Module: Special Functions and Applications in Potential Theory [M-MATH-101335]

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

Credits	Recurrence	Level	Version
5	Irregular	4	1

Mandatory			
T-MATH-102274	Special Functions and Applications in Potential Theory	5 CR	Kirsch

Prerequisites
None

3.135 Module: Special Topics of Numerical Linear Algebra [M-MATH-102920]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	2 term	4	1

Mandatory			
T-MATH-105891	Special Topics of Numerical Linear Algebra	8 CR	Hochbruck

Prerequisites
none

3.136 Module: Spectral Theory [M-MATH-101768]

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

Credits	Recurrence	Language	Level	Version
8	Each summer term	German	5	1

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

Recommendation
It is recommended to attend the module 'Functional Analysis' previously.

M 3.137 Module: Spin Manifolds, Alpha Invariant and Positive Scalar Curvature [M-MATH-102958]

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

Credits	Recurrence	Language	Level	Version
5	Irregular	German	4	1

Mandatory			
T-MATH-105932	Spin Manifolds, Alpha Invariant and Positive Scalar Curvature	5 CR	Klaus, Tuschmann

3.138 Module: Stein's Method [M-MATH-102946]

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

Credits	Recurrence	Duration	Level	Version
5	Irregular	1 term	4	1

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

Prerequisites
none

M 3.139 Module: Stochastic Control [M-MATH-102908]

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

Credits	Recurrence	Duration	Level	Version
4	Irregular	1 semester	4	1

Mandatory			
T-MATH-105871	Stochastic Control	4 CR	Bäuerle

Prerequisites
none

M 3.140 Module: Stochastic Differential Equations [M-MATH-102881]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	5	1

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

Content

- Brownian motion
- Martingales and Martingal inequalities
- Stochastic integrals and Ito's formula
- Existence and uniqueness of solutions for systems of stochastic differential equations
- Perturbation and stability results
- Application to equations in financial mathematics, physics and engineering
- Connection with diffusion equations and potential theory

M 3.141 Module: Stochastic Evolution Equations [M-MATH-102942]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 term	5	1

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

Prerequisites
none

M 3.142 Module: Stochastic Geometry [M-MATH-102865]

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

Credits	Recurrence	Duration	Level	Version
8	Each summer term	1 semester	5	1

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

Competence Goal
The students

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

Content

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

Recommendation
It is recommended to attend the module 'Spatial Stochastics' previously.

3.143 Module: Stochastic Optimization [M-WIWI-103289]

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

Credits	Recurrence	Duration	Language	Level	Version
9	Each term	1 semester	German/English	4	8

Election block: Wahlpflichtangebot (between 1 and 2 items)			
T-WIWI-106546	Introduction to Stochastic Optimization	4,5 CR	Rebennack
T-WIWI-106548	Advanced Stochastic Optimization	4,5 CR	Rebennack
T-WIWI-106549	Large-scale Optimization	4,5 CR	Rebennack
Election block: Ergänzungsangebot (at most 1 item)			
T-WIWI-102723	Graph Theory and Advanced Location Models	4,5 CR	Nickel
T-WIWI-102719	Mixed Integer Programming I	4,5 CR	Stein
T-WIWI-102720	Mixed Integer Programming II	4,5 CR	Stein
T-WIWI-103124	Multivariate Statistical Methods	4,5 CR	Grothe
T-WIWI-102715	Operations Research in Supply Chain Management	4,5 CR	Nickel
T-WIWI-106545	Optimization under Uncertainty	4,5 CR	Rebennack
T-WIWI-110162	Optimization Models and Applications	4,5 CR	Sudermann-Merx
T-WIWI-106552	Simulation of Stochastic Systems	4,5 CR	Grothe, Rebennack

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 seperately.

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

Competence Goal
The student

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

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

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

Recommendation
It is recommended to listen to the lecture "Introduction to Stochastic Optimization" before the lecture "Advanced Stochastic Optimization" is visited.

Annotation

The course "Introduction to Stochastic Optimization" will be offered until the summer semester 2019 as an additional option in the elective offer of the module. Thereafter, the course can only be selected in the supplementary offer.

The courses are sometimes offered irregularly. The curriculum, planned for three years in advance, can be found on the Internet at http://sop.ior.kit.edu/28.php.

Workload

The total workload for this module is approximately 270 hours (9 credits). The allocation is made according to the credit points of the courses of the module. The total number of hours per course is determined by the amount of time spent attending the lectures and exercises, as well as the exam times and the time required to achieve the module's learning objectives for an average student for an average performance.

3.144 Module: The Riemann Zeta Function [M-MATH-102960]

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

Credits	Recurrence	Language	Level	Version
4	Irregular	German	4	1

Mandatory			
T-MATH-105934	The Riemann Zeta Function	4 CR	Januszewski

M 3.145 Module: Time Series Analysis [M-MATH-102911]

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

Credits	Recurrence	Duration	Level	Version
4	Each summer term	1 semester	4	2

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

Prerequisites
None

M 3.146 Module: Traveling Waves [M-MATH-102927]

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

Credits	Recurrence	Duration	Level	Version
6	Irregular	1 term	4	1

Mandatory			
T-MATH-105897	Traveling Waves	6 CR	Rottmann-Matthes

M 3.147 Module: Uncertainty Quantification [M-MATH-104054]

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

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

Mandatory			
T-MATH-108399	Uncertainty Quantification	4 CR	Frank

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

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

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

Prerequisites
None

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

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

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

Recommendation
Numerical methods for differential equations

M 3.148 Module: Variational Methods [M-MATH-105093]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-110302	Variational Methods	8 CR	Reichel

M 3.149 Module: Wavelets [M-MATH-102895]

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

Credits	Recurrence	Duration	Level	Version
8	Irregular	1 semester	4	1

Mandatory			
T-MATH-105838	Wavelets	8 CR	Rieder

Prerequisites
none

4 Courses

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

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

Type	Credits	Version
Oral examination	6	1

Prerequisites
none

T 4.2 Course: Advanced Empirical Asset Pricing [T-WIWI-110513]

Responsible: Jun.-Prof. Dr. Julian Thimme
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101480 - Finance 3
M-WIWI-101483 - Finance 2

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2530569	Advanced Empirical Asset Pricing	2 SWS	Lecture (V)	Thimme
WS 19/20	2530570	Übung zu Advanced Empirical Asset Pricing	1 SWS	Practice (Ü)	Thimme

Competence Certificate
The success control takes place in form of a written examination (60 min) during the semester break (according to §4(2), 1 SPO). If the number of participants is low, an oral examination (according to §4 (2), 2 SPO) may also be offered. The examination is offered every semester and can be repeated at any regular examination date.
A bonus can be acquired through successful participation in the practice. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by up to one grade level (0.3 or 0.4). Details will be announced in the lecture.

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

Annotation
New course from winter semester 2019/2020.

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

V Advanced Empirical Asset Pricing

Lecture (V)

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

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

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

T 4.3 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-101500 - Microeconomic Theory
M-WIWI-101502 - Economic Theory and its Application in Finance
M-WIWI-102970 - Decision and Game Theory

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2521533	Advanced Game Theory	2 SWS	Lecture (V)	Reiß
WS 19/20	2521534	Übung zu Advanced Game Theory	1 SWS	Practice (Ü)	Reiß
Exams					
SS 2019	7900248	Advanced Game Theory		Prüfung (PR)	Puppe

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:

V Advanced Game Theory

Lecture (V)

2521533, WS 19/20, 2 SWS, Language: English, Open in study portal

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

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

4.4 Course: Advanced Inverse Problems: Nonlinearity and Banach Spaces [T-MATH-105927]

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

Type	Credits	Version
Oral examination	5	1

Prerequisites
none

T 4.5 Course: Advanced Lab Informatics (Master) [T-WIWI-110548]

Responsible: Professorenschaft des Fachbereichs Informatik
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

Type	Credits	Recurrence	Version
Examination of another type	4,5	Each term	1

Exams				
WS 19/20	7900038	Linked Data and the Semantic Web	Prüfung (PR)	Sure-Vetter
WS 19/20	7900046	Sicherheit	Prüfung (PR)	Volkamer
WS 19/20	7900047	Praktikum Betriebliche Informationssysteme: Realisierung innovativer Dienste für Studierende	Prüfung (PR)	Oberweis
WS 19/20	7900102	Advanced Lab Information Service Engineering	Prüfung (PR)	Sack
WS 19/20	7900107	Advanced Lab Cognitive Automobile and Robots	Prüfung (PR)	Zöllner
WS 19/20	7900116	Advanced Lab Security, Usability and Society	Prüfung (PR)	Volkamer
WS 19/20	7900187	Real-World Challenges in Data Science und Analytics	Prüfung (PR)	Sure-Vetter

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.

T 4.6 Course: Advanced Lab Security [T-WIWI-109786]

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

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

Events					
WS 19/20	2512100	Security	4 SWS	Practical course (P)	Baumgart, Volkamer, Mayer, Zarei
Exams					
WS 19/20	7900046	Sicherheit		Prüfung (PR)	Volkamer

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.

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

V Security

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

Practical course (P)

Notes
The lab deals with the IT security of everyday utensils. Implemented security mechanisms are first theoretically investigated and put to the test with practical attacks. Finally, countermeasures and suggestions for improvement are worked out. The lab is offered within the competence center for applied security technologies (KASTEL) and is supervised by several institutes.

The success control takes the form of a final presentation, a thesis and the handing over of the developed code.

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

T 4.7 Course: Advanced Lab User Studies in Security [T-WIWI-109271]

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

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

Events					
SS 2019	2512552	Praktikum User Studies in Security and Privacy	3 SWS	Practical course (P)	Volkamer, Gerber, Mayer
Exams					
SS 2019	7900129	Advanced Lab User Studies in Security		Prüfung (PR)	Volkamer

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

T 4.8 Course: Advanced Statistics [T-WIWI-103123]

Responsible: Prof. Dr. Oliver Grothe
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101637 - Analytics and Statistics

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2550552	Statistik für Fortgeschrittene	2 SWS	Lecture (V)	Grothe
WS 19/20	2550553	Übung zu Statistik für Fortgeschrittene	2 SWS	Practice (Ü)	Grothe, Kaplan
Exams					
SS 2019	7900096	Advanced Statistics		Prüfung (PR)	Grothe

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

Prerequisites
None

Annotation
New course starting winter term 2015/2016

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

V Statistik für Fortgeschrittene

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

Lecture (V)

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

Literature
Comprehensive lecture notes

T 4.9 Course: Advanced Stochastic Optimization [T-WIWI-106548]

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

Type	Credits	Recurrence	Version
Written examination	4,5	Irregular	1

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.

T 4.10 Course: Advanced Topics in Economic Theory [T-WIWI-102609]

Responsible: Prof. Dr. Kay Mitusch
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101500 - Microeconomic Theory
M-WIWI-101502 - Economic Theory and its Application in Finance

Type	Credits	Recurrence	Version
Written examination	4,5	Irregular	1

Events					
SS 2019	2520527	Advanced Topics in Economic Theory	2 SWS	Lecture (V)	Mitusch, Scheffel
SS 2019	2520528	Übung zu Advanced Topics in Economic Theory	1 SWS	Practice (Ü)	Pegorari
Exams					
SS 2019	00227	Advanced Topics in Economic Theory		Prüfung (PR)	Mitusch, Scheffel
SS 2019	7900291	Advanced Topics in Economic Theory		Prüfung (PR)	Mitusch, Scheffel

Competence Certificate
The course T-WIWI-102609 "Advanced Topics in Economic Theory" restarts in summer term 2019.

The assessment consists of a written exam (60min) (following §4(2), 1 of the examination regulation) at the end of the lecture period or at the beginning of the following semester.

Prerequisites
None

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

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

V Advanced Topics in Economic Theory

2520527, SS 2019, 2 SWS, Language: English, Open in study portal

Lecture (V)

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

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

Literature
The course is based on the excellent textbook "Microeconomic Theory" (Chapters 1-5, 10, 13-20) by A.Mas-Colell, M.D.Whinston, and J.R.Green.

T 4.11 Course: Algebra [T-MATH-102253]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-101315 - Algebra

Type	Credits	Version
Oral examination	8	1

Events					
WS 19/20	0102200	Algebra	4 SWS	Lecture (V)	Herrlich
WS 19/20	0102210	Übungen zu 0102200 (Algebra)	2 SWS	Practice (Ü)	Herrlich
Exams					
SS 2019	7700031	Algebra		Prüfung (PR)	Kühnlein

T 4.12 Course: Algebraic Geometry [T-MATH-103340]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-101724 - Algebraic Geometry

Type	Credits	Version
Oral examination	8	1

Events					
SS 2019	0152000	Algebraische Geometrie	4 SWS	Lecture (V)	Januszewski
SS 2019	0152100	Übungen zu 0152000 (Algebraische Geometrie)	2 SWS	Practice (Ü)	Januszewski
Exams					
SS 2019	7700069	Algebraic Geometry		Prüfung (PR)	Januszewski

4.13 Course: Algebraic Number Theory [T-MATH-103346]

Responsible: Dr. Stefan Kühnlein
Organisation: KIT Department of Mathematics
Part of: M-MATH-101725 - Algebraic Number Theory

Type	Credits	Version
Oral examination	8	1

T 4.14 Course: Algebraic Topology [T-MATH-105915]

Responsible: Dr. Holger Kammeyer
Prof. Dr Roman Sauer

Organisation: KIT Department of Mathematics

Part of: M-MATH-102948 - Algebraic Topology

Type	Credits	Recurrence	Version
Written examination	8	Irregular	1

Events					
SS 2019	0157400	Algebraic Topology	4 SWS	Lecture (V)	Campagnolo
SS 2019	0157410	Tutorial for 0157400 (Algebraic Topology)	2 SWS	Practice (Ü)	Campagnolo
Exams					
SS 2019	7700008	Algebraic Topology - Exam		Prüfung (PR)	Sauer, Campagnolo

Prerequisites
none

T 4.15 Course: Algebraic Topology II [T-MATH-105926]

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

Type	Credits	Recurrence	Version
Written examination	8	Irregular	1

Events					
WS 19/20	0111500	Algebraic Topology II	4 SWS	Lecture (V)	Campagnolo
WS 19/20	0111510	Tutorial for 0111500 (Algebraic Topology II)	2 SWS	Practice (Ü)	Campagnolo

Prerequisites
none

T 4.16 Course: Applied Econometrics [T-WIWI-103125]

Responsible: Prof. Dr. Melanie Schienle
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101638 - Econometrics and Statistics I

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

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

Prerequisites
None

Annotation
The course is not offered regularly.

T 4.17 Course: Applied Informatics – Principles of Internet Computing: Foundations for Emerging Technologies and Future Services [T-WIWI-110339]

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

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2511032	Applied Informatics II - Principles of Internet Computing: Foundations for Emerging Technologies and Future Services	2 SWS	Lecture (V)	Sunyaev
SS 2019	2511033	Übungen zu Angewandte Informatik II – Internet Computing	1 SWS	Practice (Ü)	Sunyaev
Exams					
WS 19/20	7900004	Applied Informatics – Principles of Internet Computing: Foundations for Emerging Technologies and Future Services		Prüfung (PR)	Sunyaev

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

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

Prerequisites
None

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

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

V Applied Informatics II - Principles of Internet Computing: Foundations for Emerging Technologies and Future Services

Lecture (V)

2511032, SS 2019, 2 SWS, Language: German, Open in study portal

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

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

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

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

Literature
Tba in the lecture.

T 4.18 Course: Asset Pricing [T-WIWI-102647]

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

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-101480 - Finance 3
M-WIWI-101482 - Finance 1
M-WIWI-101483 - Finance 2
M-WIWI-101502 - Economic Theory and its Application in Finance

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	2

Events					
SS 2019	2530555	Asset Pricing	2 SWS	Lecture (V)	Uhrig-Homburg
SS 2019	2530556	Übung zu Asset Pricing	1 SWS	Practice (Ü)	Uhrig-Homburg, Reichenbacher
Exams					
SS 2019	7900110	Asset Pricing		Prüfung (PR)	Uhrig-Homburg

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

Prerequisites
None

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

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

V Asset Pricing

Lecture (V)

2530555, SS 2019, 2 SWS, Language: German, Open in study portal

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

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

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

Literature
Basic literature

- Asset pricing / Cochrane, J.H. - Rev. ed., Princeton Univ. Press, 2005.

Elective literature

- Investments and Portfolio Management / Bodie, Z., Kane, A., Marcus, A.J. - 9. ed., McGraw-Hill, 2011.
- The econometrics of financial markets / Campbell, J.Y., Lo, A.W., MacKinlay, A.C. - 2. printing, with corrections, Princeton Univ. Press, 1997.

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

Responsible:	Prof. Dr. Vicky Fasen-Hartmann Prof. Dr. Norbert Henze Dr. Bernhard Klar
Organisation:	KIT Department of Mathematics
Part of:	M-MATH-102902 - Asymptotic Stochastics

Type	Credits	Version
Oral examination	8	1

Events					
WS 19/20	0118000	Asymptotische Stochastik	4 SWS	Lecture (V)	Henze
WS 19/20	0118100	Tutorial for 0118000 (asymptotic Stochastics)	2 SWS	Practice (Ü)	Henze

Prerequisites
none

T 4.20 Course: Auction Theory [T-WIWI-102613]

Responsible: Prof. Dr. Karl-Martin Ehrhart
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101500 - Microeconomic Theory
M-WIWI-102970 - Decision and Game Theory

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2520408	Auktionstheorie	2 SWS	Lecture (V)	Ehrhart
WS 19/20	2520409	Übungen zu Auktionstheorie	1 SWS	Practice (Ü)	Ehrhart
Exams					
SS 2019	7900255	Auction Theory		Prüfung (PR)	Ehrhart

Competence Certificate
The assessment of this course is a written examination (following §4(2), 1 SPO) of 60 mins.
The exam is offered each semester.

Prerequisites
None

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

V Auktionstheorie

2520408, WS 19/20, 2 SWS, Open in study portal

Lecture (V)

Learning Content
This course deals with the analysis and modeling of auction which are based on game theory. This also includes aspects of applying and designing auctions as well as experiences with auctions. Main topics are:

- Single- and multi-unit auctions
- Selling and procurement auctions
- Electronic auctions (e.g. eBay, C2C, B2B)
- Multi-attributive auctions.

Annotation
We suggest to attend either Game Theory I or Decision Theory beforehand.

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

Literature

- Ehrhart , K.-M. und S. Seifert: Auktionstheorie, Skript zur Vorlesung, KIT, 2011
- Krishna, V.: Auction Theory, Academic Press, Second Edition, 2010
- Milgrom, P.: Putting Auction Theory to Work, Cambridge University Press, 2004
- Ausubel, L.M. und P. Cramton: Demand Reduction and Inefficiency in Multi-Unit Auctions, University of Maryland, 1999

4.21 Course: Bifurcation Theory [T-MATH-106487]

Responsible: Dr. Rainer Mandel
Organisation: KIT Department of Mathematics
Part of: M-MATH-103259 - Bifurcation Theory

Type	Credits	Recurrence	Version
Oral examination	5	Irregular	1

Prerequisites
None

T 4.22 Course: Blockchains & Cryptofinance [T-WIWI-108880]

Responsible: Dr. Philipp Schuster
Prof. Dr. Marliese Uhrig-Homburg
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101480 - Finance 3
M-WIWI-101483 - Finance 2

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2530567	Blockchains & Cryptofinance	2 SWS	Lecture (V)	Schuster, Uhrig-Homburg
WS 19/20	2530568	Übung zu Blockchains & Cryptofinance	1 SWS	Practice (Ü)	Müller
Exams					
SS 2019	7900260	Blockchains & Cryptofinance		Prüfung (PR)	Uhrig-Homburg

Competence Certificate
The assessment consists of a written exam (75 min) (§4(2), 1 of the examination regulations).
A bonus can be acquired through successful participation in the practice. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by up to one grade level (0.3 or 0.4). Details will be announced in the lecture.

Prerequisites
None

Recommendation
None

Annotation
New course starting winter term 2018/2019.

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

V Blockchains & Cryptofinance

Lecture (V)

2530567, WS 19/20, 2 SWS, Language: German, Open in study portal

Workload
Gesamtaufwand bei 4,5 Leistungspunkten: ca. 135.0 Stunden

Präsenzzeit: 30 Stunden

Vor – und Nachbereitung der LV: 45.0 Stunden

Prüfung und Prüfungsvorbereitung: 60.0 Stunden

T 4.23 Course: Bott Periodicity [T-MATH-108905]

Responsible: Prof. Dr. Wilderich Tuschmann
Organisation: KIT Department of Mathematics
Part of: M-MATH-104349 - Bott Periodicity

Type	Credits	Recurrence	Version
Oral examination	5	Irregular	1

Prerequisites
none

T 4.24 Course: Boundary and Eigenvalue Problems [T-MATH-105833]

Responsible: Prof. Dr. Dirk Hundertmark
Prof. Dr. Tobias Lamm
Prof. Dr. Michael Plum
Prof. Dr. Wolfgang Reichel
Prof. Dr. Jens Rottmann-Matthes
Prof. Dr. Roland Schnaubelt
Prof. Dr. Lutz Weis

Organisation: KIT Department of Mathematics

Part of: M-MATH-102871 - Boundary and Eigenvalue Problems

Type	Credits	Version
Oral examination	8	1

Events					
SS 2019	0157500	Rand- und Eigenwertprobleme	4 SWS	Lecture (V)	Reichel
SS 2019	0157510	Übungen zu 0157500	2 SWS	Practice (Ü)	Reichel
Exams					
SS 2019	7700062	Boundary and Eigenvalue Problems		Prüfung (PR)	Reichel

T 4.25 Course: Boundary Element Methods [T-MATH-109851]

Responsible: PD Dr. Tilo Arens
Organisation: KIT Department of Mathematics
Part of: M-MATH-103540 - Boundary Element Methods

Type	Credits	Recurrence	Version
Oral examination	8	Irregular	1

Exams				
SS 2019	7700049	Boundary Element Methods	Prüfung (PR)	Arens

Prerequisites
none

T 4.26 Course: Brownian Motion [T-MATH-105868]

Responsible: Prof. Dr. Nicole Bäuerle
Prof. Dr. Vicky Fasen-Hartmann
Prof. Dr. Günter Last

Organisation: KIT Department of Mathematics

Part of: M-MATH-102904 - Brownian Motion

Type	Credits	Version
Oral examination	4	1

Events					
SS 2019	0155700	Brownsche Bewegung	2 SWS	Lecture (V)	Bäuerle
SS 2019	0155710	Übungen zu 0155700 (Brownsche Bewegung)	1 SWS	Practice (Ü)	Bäuerle
Exams					
SS 2019	7700051	Brownian Motion		Prüfung (PR)	Bäuerle

Prerequisites
none

T 4.27 Course: Business Intelligence Systems [T-WIWI-105777]

Responsible: Prof. Dr. Alexander Mädche
Mario Nadj
Peyman Toreini

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-104068 - Information Systems in Organizations

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

Events					
WS 19/20	2540422	Business Intelligence Systems	3 SWS	Lecture (V)	Mädche, Nadj
Exams					
SS 2019	7900149	Business Intelligence Systems		Prüfung (PR)	Mädche
SS 2019	7900270	Business Intelligence Systems		Prüfung (PR)	Mädche

Competence Certificate
Assessment consists of a written exam of 1 hour length and by submitting written papers as part of the exercise. Details will be announced at the beginning of the course.

Prerequisites
None

Recommendation
Basic knowledge on database systems is helpful.

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

V Business Intelligence Systems
2540422, WS 19/20, 3 SWS, Language: English, Open in study portal

Lecture (V)

Description
In most modern enterprises, Business Intelligence Systems represent a core enabler of managerial decision making in that they are supplying up-to-date and accurate information about all relevant aspects of a company's planning and operations: from stock levels to sales volumes, from process cycle times to key indicators of corporate performance.

The aim of this course is to introduce theoretical foundations, concepts, tools, and current practice of Business Intelligence Systems from a managerial and technical perspective. The lecture is complemented with a Business Intelligence System challenge, where students work with real-world data and enable system-based decision making using commercial Business Intelligence software packages.

Learning Content
· Conceptual Foundations

· Provisioning: ETL Process, Metadata, Data Warehouse & Data Marts and Big Data Technologies

· Consumption: Reporting, Dashboards and its relation to (Big Data) Analytics

· BI Strategy & Governance

· BI Implementation & Post-Implementation Management

· Business Intelligence System Challenge (in cooperation with industry partner)

Literature

Turban, E., Aronson, J., Liang T.-P., Sharda, R. 2008. “Decision Support and Business Intelligence Systems”. Pearson.

Watson, H. J. 2014. “Tutorial: Big Data Analytics: Concepts, Technologies, and Applications,” Communications of the Association for Information Systems (34), p. 24.

Arnott, D., and Pervan, G. 2014. “A critical analysis of decision support systems research revisited: The rise of design science,” Journal of Information Technology (29:4), Nature Publishing Group, pp. 269–293 (doi: 10.1057/jit.2014.16).

Carlo, V. (2009). “Business intelligence: data mining and optimization for decision making”. Editorial John Wiley and Sons, 308-317.

Chen, H., Chiang, R. H. L, and Storey, V. C. 2012. „Business Intelligence and Analytics: From Big Data to Big Impact,“ MIS Quarterly (36:4), pp. 1165-1188.

Davenport, T. 2014. Big Data @ Work, Boston, MA: Harvard Business Review.

Economist Intelligence Unit. 2015 “Big data evolution: Forging new corporate capabilities for the long term”

Power, D. J. 2008. “Decision Support Systems: A Historical Overview,” Handbook on Decision Support Systems, pp. 121–140 (doi: 10.1007/978-3-540-48713-5_7).

Sharma, R., Mithras, S., and Kankanhalli, A. 2014. „Transforming decision-making processes: a research agenda for understanding the impact of business analytics on organisations,“ European Journal of Information Systems (23:4), pp. 433-441.

Silver, M. S. 1991. “Decisional Guidance for Computer-Based Decision Support,” MIS Quarterly (15:1), pp. 105-122.

T 4.28 Course: Business Process Modelling [T-WIWI-102697]

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

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	2

Events					
WS 19/20	2511210	Business Process Modelling	2 SWS	Lecture (V)	Oberweis
WS 19/20	2511211	Exercise Business Process Modelling	1 SWS	Practice (Ü)	Oberweis, Schüler, Schreiber
Exams					
SS 2019	7900047	Business Process Modelling		Prüfung (PR)	Oberweis
WS 19/20	7900015	Business Process Modelling		Prüfung (PR)	Oberweis

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:

V Business Process Modelling

2511210, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture (V)

Notes
The proper modeling of relevant aspects of business processes is essential for an efficient and effective design and implementation of processes. This lecture presents different classes of modeling languages and discusses the respective advantages and disadvantages of using actual application scenarios. For that simulative and analytical methods for process analysis are introduced. In the accompanying exercise the use of process modeling tools is practiced.

Learning objectives:

Students

- describe goals of business process modeling and aplly different modeling languages,
- choose the appropriate modeling language according to a given context,
- use suitable tools for modeling business processes,
- apply methods for analysing and assessing process modells to evaluate specific quality characteristics of the process model.

Recommendations:

Knowledge of course Applied Informatics I - Modelling is expected.

Workload:

- Lecture 30h
- Exercise 15h
- Preparation of lecture 24h
- Preparation of exercises 25h
- Exam preparation 40h
- Exam 1h

T 4.29 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

Type	Credits	Recurrence	Version
Written examination	3	Each winter term	1

Events					
WS 19/20	2530299	Business Strategies of Banks	2 SWS	Lecture (V)	Müller
Exams					
SS 2019	7900079	Business Strategies of Banks		Prüfung (PR)	Müller

Competence Certificate
See German version.

Prerequisites
None

Recommendation
None

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

V Business Strategies of Banks

2530299, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture (V)

Description
The management of a bank is in charge of the determination and implementation of business policy - taking into account all relevant endogenous and exogenous factors - that assures the bank's success in the long run. In this context, there exists a large body of banking models and theories which are helpful in describing the success and risk of a bank. This course is meant to be the bridging of banking theory and practical implementation. In the course of the lectures students will learn to take on the bank management's perspective.
The first chapter deals with the development of the banking sector. Making use of appropriate assumptions, a banking policy is developed in the second chapter. The design of bank services (ch. 3) and the adequate marketing plan (ch. 4) are then built on this framework. The operational business of banks must be guided by appropriate risk and earnings management (ch. 5 and 6), which are part of the overall (global) bank management (ch. 7). Chapter eight, at last, deals with the requirements and demands of bank supervision as they have significant impact on a bank's corporate policy.

Learning Content
The management of a bank is in charge of the determination and implementation of business policy - taking into account all relevant endogenous and exogenous factors - that assures the bank's success in the long run. In this context, there exists a large body of banking models and theories which are helpful in describing the success and risk of a bank. This course is meant to be the bridging of banking theory and practical implementation. In the course of the lectures students will learn to take on the bank management's perspective.
The first chapter deals with the development of the banking sector. Making use of appropriate assumptions, a banking policy is developed in the second chapter. The design of bank services (ch. 3) and the adequate marketing plan (ch. 4) are then built on this framework. The operational business of banks must be guided by appropriate risk and earnings management (ch. 5 and 6), which are part of the overall (global) bank management (ch. 7). Chapter eight, at last, deals with the requirements and demands of bank supervision as they have significant impact on a bank's corporate policy.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Elective literature:

- A script is disseminated chapter by chapter during the course of the lecture.
- Hartmann-Wendels, Thomas; Pfingsten, Andreas; Weber, Martin; 2000, Bankbetriebslehre, 6th edition, Springer

T 4.30 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

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

Events					
SS 2019	2550494	Challenges in Supply Chain Management	3 SWS	Lecture (V)	Mohr
Exams					
SS 2019	7900146	Challenges in Supply Chain Management		Prüfung (PR)	Nickel

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:

V Challenges in Supply Chain Management

2550494, SS 2019, 3 SWS, Language: English, Open in study portal

Lecture (V)

Learning Content
The course consists of case studies of BASF which cover future challenges of supply chain management. Thus, the course aims at a case-study based presentation, critical evaluation and exemplary discussion of recent questions in supply chain management. The focus lies on future challenges and trends, also with regard to their applicability in practical cases (especially in the chemical industry).

The main part of the course is working on a project together with BASF in Ludwigshafen. The students get in touch with scientific working: The in-depth work with a special scientific topic makes the students familiar with scientific literature research and argumentation methods. As a further aspect of scientific work, especially for Master students the emphasis is put on a critical discussion of the project topic.

This course will include working on cutting edge supply chain topics like Industry 4.0 / "Internet of Everything in production", supply chain analytics, risk management, procurement and production in SCM. The team essays / project reports will be linked to industry-related challenges as well as to upcoming theoretical concepts. The topics of the seminar will be announced at the beginning of the term in a preliminary meeting.

Annotation
The number of course participants is limited to 12 participants due to joint work in BASF project teams. Due to these capacity restrictions, registration before course start is required. For further information see the webpage of the course.

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

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

Literature

To be defined depending on the topic.

T 4.31 Course: Classical Methods for Partial Differential Equations [T-MATH-105832]

Responsible: Prof. Dr. Dirk Hundertmark
Prof. Dr. Tobias Lamm
Prof. Dr. Michael Plum
Prof. Dr. Wolfgang Reichel
Prof. Dr. Roland Schnaubelt
Prof. Dr. Lutz Weis

Organisation: KIT Department of Mathematics

Part of: M-MATH-102870 - Classical Methods for Partial Differential Equations

Type	Credits	Version
Written examination	8	1

Events					
WS 19/20	0105300	Classical Methods for Partial Differential Equations	4 SWS	Lecture (V)	Plum
WS 19/20	0105310	Tutorial for 0105300 (Classical Methods for Partial Differential Equations)	2 SWS	Practice (Ü)	Plum
Exams					
SS 2019	7700052	Classical Methods for Partial Differential Equations		Prüfung (PR)	Reichel, Plum, Anapolitanos
WS 19/20	7700045	Classical Methods for Partial Differential Equations		Prüfung (PR)	Plum, Reichel, Anapolitanos

T 4.32 Course: Combinatorics [T-MATH-105916]

Responsible: Prof. Dr. Maria Aksenovich
Organisation: KIT Department of Mathematics
Part of: M-MATH-102950 - Combinatorics

Type	Credits	Recurrence	Version
Written examination	8	Irregular	1

Prerequisites
none

T 4.33 Course: Commutative Algebra [T-MATH-108398]

Responsible: Prof. Dr. Frank Herrlich
Organisation: KIT Department of Mathematics
Part of: M-MATH-104053 - Commutative Algebra

Type	Credits	Recurrence	Version
Oral examination	8	Irregular	1

Prerequisites
none

T 4.34 Course: Comparison Geometry [T-MATH-105917]

Responsible: Prof. Dr. Wilderich Tuschmann
Organisation: KIT Department of Mathematics
Part of: M-MATH-102940 - Comparison Geometry

Type	Credits	Recurrence	Version
Oral examination	5	Irregular	1

Prerequisites
Keine

T 4.35 Course: Comparison of Numerical Integrators for Nonlinear Dispersive Equations [T-MATH-109040]

Responsible: Prof. Dr Katharina Schratz
Organisation: KIT Department of Mathematics
Part of: M-MATH-104426 - Comparison of Numerical Integrators for Nonlinear Dispersive Equations

Type	Credits	Recurrence	Version
Oral examination	4	Irregular	1

Prerequisites
none

T 4.36 Course: Complex Analysis [T-MATH-105849]

Responsible: PD Dr. Gerd Herzog
Prof. Dr. Michael Plum
Prof. Dr. Wolfgang Reichel
Dr. Christoph Schmoeger
Prof. Dr. Roland Schnaubelt
Prof. Dr. Lutz Weis

Organisation: KIT Department of Mathematics

Part of: M-MATH-102878 - Complex Analysis

Type	Credits	Version
Oral examination	8	1

T 4.37 Course: Compressive Sensing [T-MATH-105894]

Responsible: Prof. Dr. Andreas Rieder
Organisation: KIT Department of Mathematics
Part of: M-MATH-102935 - Compressive Sensing

Type	Credits	Recurrence	Version
Oral examination	5	Irregular	1

T 4.38 Course: Computational Economics [T-WIWI-102680]

Responsible: Dr. rer. nat. Pradyumn Kumar Shukla
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	3

Events					
WS 19/20	2590458	Computational Economics	2 SWS	Lecture (V)	Shukla
WS 19/20	2590459	Excercises to Computational Economics	1 SWS	Practice (Ü)	Shukla
Exams					
SS 2019	7900030	Computational Economics		Prüfung (PR)	Shukla
WS 19/20	7900005	Computational Economics		Prüfung (PR)	Shukla

Competence Certificate
The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation). By successful completion of the exercises (§4 (2), 3 SPO 2007 respectively §4 (3) SPO 2015) a bonus can be obtained. If the grade of the written exam is at least 4.0 and at most 1.3, the bonus will improve it by one grade level (i.e. by 0.3 or 0.4). The bonus only applies to the first and second exam of the semester in which it was obtained.

Prerequisites
None

Annotation
The credits have been changed to 5 starting summer term 2016.

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

V Computational Economics

2590458, WS 19/20, 2 SWS, Language: English, Open in study portal

Lecture (V)

Notes
Examining complex economic problems with classic analytical methods usually requires making numerous simplifying assumptions, for example that agents behave rationally or homogeneously. Recently, widespread availability of computing power gave rise to a new field in economic research that allows the modeling of heterogeneity and forms of bounded rationality: Computational Economics. Within this new discipline, computer based simulation models are used for analyzing complex economic systems. In short, an artificial world is created which captures all relevant aspects of the problem under consideration. Given all exogenous and endogenous factors, the modelled economy evolves over time and different scenarios can be analyzed. Thus, the model can serve as a virtual testbed for hypothesis verification and falsification.

Learning objectives:

The student

- understands the methods of Computational Economics and applies them on practical issues,
- evaluates agent models considering bounded rational behaviour and learning algorithms,
- analyses agent models based on mathematical basics,
- knows the benefits and disadvantages of the different models and how to use them,
- examines and argues the results of a simulation with adequate statistical methods,
- is able to support the chosen solutions with arguments and can explain them.

T 4.39 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

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	3

Events					
WS 19/20	2500015	Computational Risk and Asset Management	4 SWS	Lecture (V)	Ulrich

Competence Certificate
The assessment consists of a written exam (90 minutes) according to §4(2) of the examination regulation.

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

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

V Computational Risk and Asset Management

2500015, WS 19/20, 4 SWS, Language: English, Open in study portal

Lecture (V)

Description
The aim of this course is to master real-world challenges of computational risk and asset management and provide students with a skill set to incorporate different portfolio objectives into the investment process. It enables students to solve such challenges independently in Python.

Learning Content
The course covers several topics, among them:

Quantitative Portfolio Strategies: Extensions to Mean-Variance Portfolio Optimization

Return Densities: Forecasting with Traditional and Machine Learning Approaches, Monte Carlo Simulation

Financial Economics: Rationalizing Risk Premiums via Stochastic Discount Factor

Multi-Asset Valuation: DCF Approach, No-Arbitrage and Ito Calculus

Workload
The total workload for this course is approximately 180 hours.

T 4.40 Course: Computer-Assisted Analytical Methods for Boundary and Eigenvalue Problems [T-MATH-105854]

Responsible: Prof. Dr. Michael Plum
Organisation: KIT Department of Mathematics
Part of: M-MATH-102883 - Computer-Assisted Analytical Methods for Boundary and Eigenvalue Problems

Type	Credits	Version
Oral examination	8	1

T 4.41 Course: Continuous Time Finance [T-MATH-105930]

Responsible: Prof. Dr. Nicole Bäuerle
Prof. Dr. Vicky Fasen-Hartmann

Organisation: KIT Department of Mathematics

Part of: M-MATH-102860 - Continuous Time Finance

Type	Credits	Version
Oral examination	8	1

Events					
SS 2019	0159400	Finanzmathematik in stetiger Zeit	4 SWS	Lecture (V)	Bäuerle
SS 2019	0159500	Übungen zu 0159400	2 SWS	Practice (Ü)	Bäuerle
Exams					
SS 2019	77220	Continuous Time Finance		Prüfung (PR)	Bäuerle

T 4.42 Course: Control Theory [T-MATH-105909]

Responsible: Prof. Dr. Roland Schnaubelt
Prof. Dr. Lutz Weis

Organisation: KIT Department of Mathematics

Part of: M-MATH-102941 - Control Theory

Type	Credits	Version
Oral examination	6	1

Prerequisites
none

T 4.43 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

Type	Credits	Recurrence	Version
Written examination	4,5	Irregular	1

Events					
SS 2019	2550120	Konvexe Analysis	SWS	Lecture (V)	Stein
Exams					
SS 2019	7900067_SS2019_HK	Convex Analysis		Prüfung (PR)	Stein

Competence Certificate
The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation.

The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

Prerequisites
None

Recommendation
It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Annotation
The lecture is offered irregularly. The curriculum of the next three years is available online (www.ior.kit.edu).

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

V Konvexe Analysis

2550120, SS 2019, SWS, Open in study portal

Lecture (V)

Learning Content
Convex Analysis deals with properties of convex functions and convex sets, in particular with respect to the minimization of convex functions over convex sets. That the involved functions are not necessarily assumed to be differentiable allows a number a applications which are not covered by techniques from smooth optimization, e.g. approximation problems with respect to the Manhattan or maximum norms, classification problems or the theory of statistical estimates. The lecture develops along another, geometrically simple example, where a nonsmooth obstacle set is to be described by a single smooth convex constraint such that minimal and maximal distances to the obstacle can be computed. The lecture is structured as follows:

- Introductory examples and terminology
- Convex subdifferential, Lipschitz continuity and the safety margin
- Normal cones, error bounds and the maximal distance

Literature
Elective literature:

- J. Borwein, A. Lewis, Convex Analysis and Nonlinear Optimization: Theory and Examples (2 ed.), Springer, 2006.
- S. Boyd, L. Vandenberghe, Convex Optimization, Cambridge University Press, 2004.
- O. Güler, Foundations of Optimization, Springer, 2010.
- J.-B. Hiriart-Urruty, C. Lemarechal, Fundamentals of Convex Analysis, Springer, 2001.
- R.T. Rockafellar, Convex Analysis, Princeton University Press, 1970.
- R.T. Rockafellar, R.J.B. Wets, Variational Analysis, Springer, Berlin, 1998.

T 4.44 Course: Convex Geometry [T-MATH-105831]

Responsible: Prof. Dr. Daniel Hug
Organisation: KIT Department of Mathematics
Part of: M-MATH-102864 - Convex Geometry

Type	Credits	Version
Oral examination	8	1

T 4.45 Course: Corporate Financial Policy [T-WIWI-102622]

Responsible: Prof. Dr. Martin Ruckes
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101480 - Finance 3
M-WIWI-101483 - Finance 2
M-WIWI-101502 - Economic Theory and its Application in Finance

Type	Credits	Recurrence	Version
Written examination	4,5	see Annotations	1

Exams				
SS 2019	7900073	Corporate Financial Policy	Prüfung (PR)	Ruckes

Competence Certificate
The assessment of this course is a written examination (following §4(2), 1 SPO) of 60 mins.

The exam is offered each semester.

Prerequisites
None

Annotation
The course will exceptionally be held in the winter semester 2019/2020. Usually, however, the event takes place in the summer semester.

T 4.46 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

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	2

Events					
SS 2019	2530218	Corporate Risk Management	SWS	Lecture (V)	Ruckes, Hoang
SS 2019	2530219	Übung zu Corporate Risk Management	SWS	Practice (Ü)	Silbereis, Ruckes, Hoang
WS 19/20	2530220		SWS	Practice (Ü)	Ruckes, Hoang, Silbereis
Exams					
SS 2019	7900259	Corporate Risk Management		Prüfung (PR)	Ruckes

Competence Certificate
The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation. The exam is offered each semester. If there are only a small number of participants registered for the exam, we reserve the right to hold an oral examination instead of a written one.

Prerequisites
None

Recommendation
None

Annotation
The course is offered as a block course in the summer term.

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

V Corporate Risk Management **Lecture (V)**
2530218, SS 2019, SWS, Language: English, Open in study portal

Learning Content

- Stochastic basics
- Firm decisions under risk - expected utility theory
- The value motive for corporate risk management
- Common risk measures from practice (e.g. Cash-flow at Risk)
- Operational and financial risk management instruments
- The risk management organization (central vs. decentral)
- External risk reporting (e.g. obligations and incentives)

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

Literature

- Friberg, Richard. *Managing Risk and Uncertainity: A Strategic Approach*. Cambridge, MA: Managing RIsk and Uncertainity, 2015.
- Stulz, René M. *Risk Management & Derivatives*. Mason, Ohio: Cengage Learning, Inc, 2002.
- Jorion, Philippe. *Value at Risk, 3rd Ed: The new Benchmark for Managing Financial Risk*. 3 ed. New York: General Finance & Investing, 2006.

V **Übung zu Corporate Risk Management** **Practice (Ü)**

2530219, SS 2019, SWS, Language: English, Open in study portal

Learning Content

- Stochastic basics
- Firm decisions under risk - expected utility theory
- The value motive for corporate risk management
- Common risk measures from practice (e.g. Cash-flow at Risk)
- Operational and financial risk management instruments
- The risk management organization (central vs. decentral)
- External risk reporting (e.g. obligations and incentives)

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

Literature

- Friberg, Richard. *Managing Risk and Uncertainity: A Strategic Approach*. Cambridge, MA: Managing RIsk and Uncertainity, 2015.
- Stulz, René M. *Risk Management & Derivatives*. Mason, Ohio: Cengage Learning, Inc, 2002.
- Jorion, Philippe. *Value at Risk, 3rd Ed: The new Benchmark for Managing Financial Risk*. 3 ed. New York: General Finance & Investing, 2006.

V **Practice (Ü)**

2530220, WS 19/20, SWS, Language: English, Open in study portal

Learning Content

- Stochastic basics
- Firm decisions under risk - expected utility theory
- The value motive for corporate risk management
- Common risk measures from practice (e.g. Cash-flow at Risk)
- Operational and financial risk management instruments
- The risk management organization (central vs. decentral)
- External risk reporting (e.g. obligations and incentives)

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

Literature

- Friberg, Richard. *Managing Risk and Uncertainity: A Strategic Approach*. Cambridge, MA: Managing RIsk and Uncertainity, 2015.
- Stulz, René M. *Risk Management & Derivatives*. Mason, Ohio: Cengage Learning, Inc, 2002.
- Jorion, Philippe. *Value at Risk, 3rd Ed: The new Benchmark for Managing Financial Risk*. 3 ed. New York: General Finance & Investing, 2006.

T 4.47 Course: Country Manager Simulation [T-WIWI-106137]

Responsible: Dr. Sven Feurer
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101490 - Marketing Management

Type	Credits	Recurrence	Version
Examination of another type	1,5	Each winter term	2

Events					
WS 19/20	2572172	Country Manager	1 SWS	Block (B)	Feurer

Competence Certificate
Alternative exam assessment (30 minutes presentation).

Prerequisites
If the course is selected within the module "Sales Management", the following courses may not be started in this module: price negotiations and sales presentations, case studies in sales and pricing.

Annotation
The course language is English. In order to participate in this course, you need to apply. Applications are usually accepted at the start of the lecture period in winter term. Detailed information on the application process is usually provided on the website of the Marketing and Sales Research Group (marketing.iism.kit.edu) shortly before the lecture period in winter term starts.
Please note that only one of the 1.5-ECTS courses can be chosen in this Module.
Please note: The number of participants for this course is limited. The Marketing and Sales Research Group typically provides the possibility to attend a course with 1,5 ECTS in the respective module to all students. Participation in a specific course cannot be guaranteed.

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

V Country Manager

2572172, WS 19/20, 1 SWS, Language: English, Open in study portal

Block (B)

Learning Content
Understanding Culture
Understanding International Buyer Behavior
Market Entry Decisions
International Marketing and Sales Management (adaptation vs. differentiation)

Annotation

- The course language is English.
- In order to participate in this course, you need to apply. Applications are usually accepted at the start of the lecture period in winter term. Detailed information on the application process is usually provided on the website of the Marketing and Sales Research Group (marketing.iism.kit.edu) shortly before the lecture period in winter term starts.
- Please note that only one of the 1.5 ECTS courses can be chosen in the module.
- Please note: The number of participants for this course is limited. The Marketing and Sales Research Group typically provides the possibility to attend a course with 1,5 ECTS in the respective module to all students. Participation in a specific course cannot be guaranteed.

Workload
Total workload for 1.5 ECTS: ca. 45 hours

Literature
Homburg, Christian (2016), Marketingmanagement, 6. ed., Wiesbaden.

T 4.48 Course: Credit Risk [T-WIWI-102645]

Responsible: Prof. Dr. Marliese Uhrig-Homburg
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101480 - Finance 3
M-WIWI-101483 - Finance 2

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2530565	Credit Risk	3 SWS	Lecture / Practice (VÜ)	Uhrig-Homburg, Mitarbeiter
Exams					
SS 2019	7900113	Credit Risk		Prüfung (PR)	Uhrig-Homburg

Competence Certificate
The assessment consists of a written exam (75 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation and may be supplemented by a non exam assessment according to § 4 paragraph 2 Nr. 3. The examination is offered every semester and can be repeated at every regular examination date.
A bonus can be acquired through successful participation in the practice. If the grade of the written examination is between 4.0 and 1.3, the bonus improves the grade by up to one grade level (0.3 or 0.4). Details will be announced in the lecture.

Prerequisites
None

Recommendation
Knowledge from the course "Derivatives" is very helpful.

Annotation
See German version.

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

V Credit Risk

Lecture / Practice (VÜ)

2530565, WS 19/20, 3 SWS, Language: German, Open in study portal

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

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

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

Literature

- Lando, D., Credit risk modeling: Theory and Applications, Princeton Univ. Press, (2004).
- Uhrig-Homburg, M., Fremdkapitalkosten, Bonitätsrisiken und optimale Kapitalstruktur, Beiträge zur betriebswirtschaftlichen Forschung 92, Gabler Verlag, (2001).

Elective literature:

- Bluhm, C., Overbeck, L., Wagner, C. , Introduction to Credit Risk Modelling, 2nd Edition, Chapman & Hall, CRC Financial Mathematics Series, (2010).
- Duffie, D., Singleton, K.J., Credit Risk: Pricing, Measurement and Management, Princeton Series of Finance, Prentice Hall, (2003).

T 4.49 Course: Critical Information Infrastructures [T-WIWI-109248]

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

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

Events					
WS 19/20	2511400	Critical Information Infrastructures	2 SWS	Lecture (V)	Sunyaev, Dehling, Lins
WS 19/20	2511401	Exercises to Critical Information Infrastructures	1 SWS	Practice (Ü)	Sunyaev, Dehling, Lins
Exams					
SS 2019	7900061	Critical Information Infrastructures		Prüfung (PR)	Sunyaev
WS 19/20	7900067	Critical Information Infrastructures		Prüfung (PR)	Sunyaev

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.

Prerequisites
None.

Annotation
New lecture from winter semester 2018/2019.

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

V Critical Information Infrastructures

Lecture (V)

2511400, WS 19/20, 2 SWS, Language: English, Open in study portal

Notes
The course critical information infrastructures introduces students to the world of these complex sociotechnical systems that permeate societies on a global scale. Students will learn to handle the complexities involved in the design, development, operation and evaluation of critical information infrastructures. In the beginning of the lecture, critical information infrastructures will be introduced on a general level.

The following sessions will focus on an in-depth exploration of selected cases that represent current challenges in research and practice. Students will work (in a group) on a selected case and have to write a seminar paper.

There will be a short introduction to the topics for the course paper on the following topic areas. In addition, it will be possible to propose your own topics as a group in the topic areas:

- **Blockchain**
- **Cloud Computing**
- **Digital Health**
- **Fog Computing**
- **Information Privacy**
- **Certification of critical IT-Services**

In addition to introductions to the topics, an online course is also offered to introduce students to scientific writing. This means to learn how to quote, how a scientific work is structured, and in which form the results of one's research are presented. Since we offer topics in this course that also correspond to the research interests in our research group, there may also be the opportunity to work on the topics in more depth in the course of a final thesis. Students can choose a topic from a variety of topics of the topics presented, and write a course paper in a group of four students.

Learning objectives:

Students know concepts and technologies relevant for the design and reliable operation of critical information infrastructures and can leverage them to develop solutions for real-world challenges.

Notes:

Please note the changed course structure. The course will be held as a block course.

The number of participants is limited. Please register via the WiWi portal: https://portal.wiwi.kit.edu/ys/3073

Please make sure that your are available at the following dates if you would like to attend the course:

- Introduction: 4 dates on which you have to participate
    - 17.10.2019, 11.30 to 13.00: Foundations of Critical Information Infrastructures. (Geb. 05.20, R1C-02)
    - 24.10.2019, 11.30 to 13.00: Introduction to topics (Geb. 05.20, R1C-02)
    - 31.10.2019: 11.30 - 13.00: Socio-Technical/Socio-Material Information Systems & Design Science Research (Geb. 05.20, R1C-02)
    - 07.11.2019, 11.30 to 13.00: The Critical Information Infrastructures Landscape (Geb. 05.20, R1C-02)
- Intermediate presentations with compulsory attendance: 13.12.2019, 10am to 4pm (Geb. 05.20, R1C-02). Exact times will be announced later.
- Final presentations with compulsory attendance: 07.02.2020, 10am to 4pm (Geb. 05.20, R1C-02). Exact times will be announced later.
- Submission of the course paper: Expected on 02.02.2019. Final date will be announced in the course.

Further information on the course structure will be announced in the first session. Depending on the number of participants the individual sessions can have a shorter duration.

The meetings will take place at the Institute AIFB, KIT Campus South, Kollegiengebäude am Kronenplatz (Geb. 05.20) in Kaiserstr. 89.

The number of participants is limited to 24 students. The registration period is from 31.08.2019 to 29.09.2019. Participation slots are expected to be allocated on 01.10.2019 and must be accepted by the student by 06.10.2019. If the slot is not accepted, the free places will be offered to the students in the waiting list.

If you have any questions regarding this registration, please contact sebastian.lins@kit.edu or dehling@kit.edu.

T 4.50 Course: Data Mining and Applications [T-WIWI-103066]

Responsible: Rheza Nakhaeizadeh
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101638 - Econometrics and Statistics I
M-WIWI-101639 - Econometrics and Statistics II

Type	Credits	Recurrence	Version
Oral examination	4,5	Each summer term	2

Events					
SS 2019	2520375	Data Mining and Applications	2/4 SWS	Lecture (V)	Nakhaeizadeh
Exams					
SS 2019	7900102	Data Mining and Applications (Lecture)		Prüfung (PR)	Nakhaeizadeh

Competence Certificate

- Conduction of a larger emprical study in groups
- reporting of milestones
- final presentation (app. 45 minutes)

Prerequisites
None

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

V Data Mining and Applications

2520375, SS 2019, 2/4 SWS, Language: German, Open in study portal

Lecture (V)

Learning Content
Part one: Data Mining

Why Data Mining?

- What is Data Mining?
- History of Data Mining
- Conferences and Journals on Data Mining
- Potential Applications
- Data Mining Process:
- Business Understanding
- Data Understanding
- Data Preparation
- Modeling
- Evaluation
- Deployment
- Interdisciplinary aspects of Data Mining
- Data Mining tasks
- Data Mining Algorithms (Decision Trees, Association Rules,
- Regression, Clustering, Neural Networks)
- Fuzzy Mining
- OLAP and Data Warehouse
- Data Mining Tools
- Trends in Data Mining

Part two: Examples of application of Data Mining

- Success parameters of Data Mining Projects
- Application in industry
- Application in Commerce

Workload
The total workload for this course is approximately 135 hours. For further information see German version.

Literature
U. Fayyad, G. Piatetsky-Shapiro, P. Smyth, R. Uthurusamy, editors, Advances in Knowledge Discovery and Data Mining, AAAI/MIT Press, 1996 (order on-line from Amazon.com or from MIT Press).

- Jiawei Han, Micheline Kamber, Data Mining : Concepts and Techniques, 2nd edition, Morgan Kaufmann, ISBN 1558609016, 2006.
- David J. Hand, Heikki Mannila and Padhraic Smyth, Principles of Data Mining , MIT Press, Fall 2000
- Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Springer Verlag, 2001.
- Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Addison wesley (May, 2005). Hardcover: 769 pages. ISBN: 0321321367
- Ripley, B.D. (1996) Pattern Recognition and Neural Networks, Cambridge: Cambridge University Press.
- Ian witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, 2nd Edition, Morgan Kaufmann, ISBN 0120884070, 2005.

T 4.51 Course: Database Systems and XML [T-WIWI-102661]

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

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	2

Events					
WS 19/20	2511202	Database Systems and XML	2 SWS	Lecture (V)	Oberweis
WS 19/20	2511203	Exercises Database Systems and XML	1 SWS	Practice (Ü)	Oberweis, Fritsch, Schüler
Exams					
SS 2019	7900046	Database Systems and XML		Prüfung (PR)	Oberweis
WS 19/20	7900007	Database Systems and XML		Prüfung (PR)	Oberweis

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:

V Database Systems and XML

2511202, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture (V)

Notes
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.

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

T 4.52 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

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2530550	Derivatives	2 SWS	Lecture (V)	Uhrig-Homburg
SS 2019	2530551	Übungen zu Derivate	1 SWS	Practice (Ü)	Uhrig-Homburg, Eska
Exams					
SS 2019	7900111	Derivatives		Prüfung (PR)	Uhrig-Homburg

Competence Certificate
The assessment takes place in the form of a written examination (75 minutes) according to §4(2), 1 SPO. The examination takes place during the semester break. The examination is offered every semester and can be repeated at any regular examination date. A bonus can be acquired through successful participation in the excercises. 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:

V Derivatives

2530550, SS 2019, 2 SWS, Language: German, Open in study portal

Lecture (V)

Description
The lecture deals with the application areas and valuation of financial derivatives. After an overview of the most important derivatives and their relevance, forwards and futures are analysed. Then, an introduction to the Option Pricing Theory follows. The main emphasis is on option valuation in discrete and continuous time models. Finally, construction and usage of derivatives are discussed, e.g. in the context of risk management.

Learning Content
The lecture deals with the application areas and valuation of financial derivatives. After an overview of the most important derivatives and their relevance, forwards and futures are analysed. Then, an introduction to the Option Pricing Theory follows. The main emphasis is on option valuation in discrete and continuous time models. Finally, construction and usage of derivatives are discussed, e.g. in the context of risk management.

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

Literature

- Hull (2012): Options, Futures, & Other Derivatives, Prentice Hall, 8th Edition

Elective literature:

Cox/Rubinstein (1985): Option Markets, Prentice Hall

T 4.53 Course: Differential Geometry [T-MATH-102275]

Responsible: Dr. Sebastian Grensing
Prof. Dr. Enrico Leuzinger
Prof. Dr. Wilderich Tuschmann

Organisation: KIT Department of Mathematics

Part of: M-MATH-101317 - Differential Geometry

Type	Credits	Recurrence	Version
Written examination	8	Each summer term	1

Events					
SS 2019	0100300	Differential Geometry	4 SWS	Lecture (V)	Tuschmann
SS 2019	0100310	Tutorial for 0100300 (Differential Geometry)	2 SWS	Practice (Ü)	Tuschmann
Exams					
SS 2019	7700033	Differential Geometry - Exam		Prüfung (PR)	Leuzinger, Tuschmann, Grensing, Dahmen

T 4.54 Course: Digital Health [T-WIWI-109246]

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

Type	Credits	Recurrence	Version
Examination of another type	4,5	Each winter term	3

Events					
WS 19/20	2511402	Digital Health	2 SWS	Lecture (V)	Sunyaev, Thiebes
Exams					
SS 2019	7900062	Digital Health		Prüfung (PR)	Sunyaev
WS 19/20	7900068	Digital Health		Prüfung (PR)	Sunyaev

Competence Certificate
Alternative exam assessment (written elaboration, presentation, peer review, oral participation) according to §4(2),3 of the examination regulation. Details of the grading will be announced at the beginning of the course.

Prerequisites
None.

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

V Digital Health
2511402, WS 19/20, 2 SWS, Language: German/English, Open in study portal

Lecture (V)

Notes
The course Digital Health offers students a possibility to gain insight into current developments in the digitalization of the health care system. Students will first be introduced to the basics and challenges of the digitalization of the health care system. After the introduction lecture, the course aims to give insights into current topics in the field of digital health and offers students an opportunity to prepare a scientific paper in a group of up to three students.

There will be a short introduction lecture on all topics with regard to the written assignments. It is possible for students to write their paper in one of the following topics. Furthermore, groups of students have the possibility to propose their own topics.

- **Artificial Intelligence**
- **Blockchain**
- **Cloud Computing**
- **Gamification**
- **Genomics**
- **Information Privacy**

In addition to introduction lectures on the topics, an online course is offered to introduce students to scientific writing. This includes learning how to quote, how a scientific paper is structured and in which form the results of one's research are presented. Since we offer topics that also correspond to the research interests of our research associates, there may also be the opportunity to investigate these topics more deeply in a master thesis. Students can give their preferences for the topics offered and are afterwards assigned to groups of up to three students based on their preferences.

Learning objectives:

Students are familiar with the current developments and challenges of digitization in the health care sector, can independently develop corresponding solutions, and discuss their developed solutions in groups.

Workload:

4,5 ECTS = approx. 135 hours.

Comments:

The number of participants is limited. Please register via the WiWi portal: https://portal.wiwi.kit.edu/ys/3107

Please keep the following dates available if you are planning to attend the course:

- **Introduction:** 3 dates you have to attend
  - **10.2019, 15.45 to 17.15:** Foundations of Digital Health. (Geb. 05.20, R1C-03)
  - **10.2019, 15.45 to 17.15:** Cloud Computing, Genomics, Information Privacy (Geb. 05.20, R1C-03)
  - **11.2019, 15.45 to 17.15:** Blockchain, Artificial Intelligence, Gamification (Geb. 05.20, R1C-03)
- **Intermediate presentation** to be attended: 04.12.2019, 10:00 to 16:00 (Building 05.20, R1A-11). Exact times will be announced soon.
- **Final presentation to be attended:** 02.2020 and 27.02.2020, 09:00 to 19:00 (Building 05.20, R1C-03). Exact times will be announced soon.
- **Submission of the written assignment:** Estimated on 12.02.2019. Final date will be announced in the event.

Further information on the procedure will be announced in the first lecture. Depending on the number of participants, each session may have a shorter duration.

The meetings will take place at the Institute AIFB, KIT-Campus Süd, Kollegiengebäude am Kronenplatz (building 05.20), Kaiserstr. 89.

The number of participants is limited to 30 students. The registration period is from **31.08.2019 to 17.10.2019**. The places are expected to be allocated on **18.10.2019** and must be accepted by the students by **22.10.2019**. If the allocation is not accepted, the free places will be offered to the students in the waiting list.

If you have any questions regarding this registration, please contact scott.thiebes@kit.edu or manuel.schmidt-kraepelin@kit.edu.

T 4.55 Course: Digital Transformation of Organizations [T-WIWI-106201]

Responsible: Prof. Dr. Alexander Mädche
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-104068 - Information Systems in Organizations

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

Events					
SS 2019	2540556	Digital Transformation of Organizations	3 SWS	Lecture (V)	Mädche
Exams					
SS 2019	791000001	Digital Transformation of Organizations		Prüfung (PR)	Mädche

Competence Certificate
The assessment consists of a written exam of 1 hour length and by submitting written papers as part of the exercise. Details will be announced at the beginning of the course.

Prerequisites
None

Annotation
The course will be held in English.

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

V Digital Transformation of Organizations

2540556, SS 2019, 3 SWS, Language: English, Open in study portal

Lecture (V)

Description
During the last decades we witnessed a growing importance of Information Technology (IT) in the business world along with faster and faster innovation cycles. IT has become core for businesses from an operational company-internal and external customer perspective. Today, IT is considered as key enabler of operational excellence ranging from the enrichment of routine working tasks (e.g., enterprise resource planning systems) to e-enabled integration of entire business eco-systems (e.g., e-supply chains). Complementing this primarily company-internal perspective on IT, we have recently have seen a massive growth of digital extensions of existing products and services across all industries. The disruptive potential of IT has already transformed selected key industries, e.g. media or retail, and its impact is continuously growing in all areas of business and society.
Large-scale information systems (IS) in organizations strongly interplay with work practices of individual employees as well as organizational structures shaping and being shaped by individuals' behavior. Thus, successful implementation of IS requires dealing with transformation beyond technology. The ability to implement and use IS in a way supporting its overall value proposition has become a central success determinant. Accordingly, the course "Management of Information Systems" course is designed to provide a comprehensive insight into theoretical foundations, concepts, tools, and current practice of IS. The lecture is complemented with a case study. Students get the opportunity to analyze and propose solutions for a selected real-world IS implementation.

Learning Content

- Definition and key concepts of Information Systems
- Introduction of different types of application systems (organizational process & information-centric systems, customer-centric systems, supplier-centric systems and people-centric systems) and their characteristics
- The digital transformation process: The pre-implementation, implementation and post-implementation phase covering facets such as business/IT alignment, packaged software selection, IS implementation projects, as well as adoption & use of IS
- Practice-oriented case study focusing on real-world IS scenarios

Literature

Daft, R. L. (2009). Organization theory and design. Cengage learning.

Laudon, K. C. and Laudon, J. P. (2014). Management Information Systems: Managing the Digital Firm, 13th Edition, Pearson.

Sambamurthy, V and Zmud, R. Z. (2012). Guiding the Digital Transformation of Organizations. Legerity Digital Press, ISBN 978-0-9857955-0-4.

T 4.56 Course: Discrete Time Finance [T-MATH-105839]

Responsible: Prof. Dr. Nicole Bäuerle
Prof. Dr. Vicky Fasen-Hartmann
Organisation: KIT Department of Mathematics
Part of: M-MATH-102919 - Discrete Time Finance

Type	Credits	Version
Written examination	8	1

Events					
WS 19/20	0108400	Finanzmathematik in diskreter Zeit	4 SWS	Lecture (V)	Fasen-Hartmann
WS 19/20	0108500	Übungen zu 0108400	2 SWS	Practice (Ü)	Fasen-Hartmann

Prerequisites
none

T 4.57 Course: Discrete-Event Simulation in Production and Logistics [T-WIWI-102718]

Responsible: Prof. Dr. Stefan Nickel
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-102805 - Service Operations
M-WIWI-102832 - Operations Research in Supply Chain Management

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2550488	Ereignisdiskrete Simulation in Produktion und Logistik	3 SWS	Lecture (V)	Spieckermann
Exams					
SS 2019	7900136	Discrete-Event Simulation in Production and Logistics		Prüfung (PR)	Nickel

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:

V Ereignisdiskrete Simulation in Produktion und Logistik — Lecture (V)
2550488, SS 2019, 3 SWS, Language: German, Open in study portal

Learning Content
Simulation of production and logistics systems is an interdisciplinary subject connecting expert knowledge from production management and operations research with mathematics/statistics as well as computer science and software engineering. With completion of this course, students know statistical foundations of discrete simulation, are able to classify and apply related software applications, and know the relation between simulation and optimization as well as a number of application examples. Furthermore, students are enabled to structure simulation studies and are aware of specific project scheduling issues.

Annotation
Basic knowledge as conveyed in the module "Introduction toOperations Research" is assumed.

Besides knowledge of Operations Research students are assumed to be familiar with the following topics:

- Introduction in Statistics
- Programming basics (algorithms and data structures)
- Basic knowledge in production and logistics

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

Literature

- Banks J., Carson II J. S., Nelson B. L., Nicol D. M. (2010) Discrete-event system simulation, 5.Aufl., Pearson, Upper Saddle River.
- Eley, M. (2012): Simulation in der Logistik - Einführung in die Erstellung ereignisdiskreter Modelle unter Verwendung des Werkzeuges "Plant Simulation“, Springer, Berlin und Heidelberg
- Kosturiak, J. und M. Gregor (1995): Simulation von Produktionssystemen. Springer, Wien und New York.
- Law, A. M. (2015): Simulation Modeling and Analysis. 5th Edition, McGraw-Hill, New York usw.
- Liebl, F. (1995): Simulation. 2. Auflage, Oldenbourg, München.
- Noche, B. und S. Wenzel (1991): Marktspiegel Simulationstechnik. In: Produktion und Logistik. TÜV Rheinland, Köln.
- Pidd, M. (2004): Computer Simulation in Management Science. 5th Edition, Wiley, Chichester.
- Robinson S (2004) Simulation: the practice of model development and use. John Wiley & Sons, Chichester
- VDI (2014): Simulation von Logistik-, Materialfluß- und Produktionssystemen. VDI Richtlinie 3633, Blatt 1, VDI-Verlag, Düsseldorf.

T 4.58 Course: Dispersive Equations [T-MATH-109001]

Responsible: Prof. Dr. Wolfgang Reichel
Organisation: KIT Department of Mathematics
Part of: M-MATH-104425 - Dispersive Equations

Type	Credits	Recurrence	Version
Oral examination	6	Irregular	1

Prerequisites
none

T 4.59 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

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2560402	Dynamic Macroeconomics	2 SWS	Lecture (V)	Scheffel
WS 19/20	2560403	Übung zu Dynamic Macroeconomics	1 SWS	Practice (Ü)	Krause
Exams					
SS 2019	7900231	Dynamic Macroeconomics		Prüfung (PR)	Scheffel

Competence Certificate
The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

Prerequisites
None.

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

V Dynamic Macroeconomics
2560402, WS 19/20, 2 SWS, Language: English, Open in study portal

Lecture (V)

Description
The course Dynamic Macroeconomics addresses macroeconomic questions on an advanced level. The main focus of this course is on dynamic programming and its fundamental role in modern macroeconomics. After starting with the necessary mathematical tools, several applications in labor economics, economic growth, and asset pricing are introduced. The course pursues a hands-on approach so that students not only gain theoretical insights but also learn numerical tools to solve dynamic economic models using the modern programming language Python.

Workload
The total workload for this course is approximately 135 hours. For further information see German version.

Literature
Literature and lecture notes are provided during the course.

T 4.60 Course: Dynamical Systems [T-MATH-106114]

Responsible: Prof. Dr. Jens Rottmann-Matthes
Organisation: KIT Department of Mathematics
Part of: M-MATH-103080 - Dynamical Systems

Type	Credits	Recurrence	Version
Oral examination	8	Irregular	1

Prerequisites
none

T 4.61 Course: Efficient Energy Systems and Electric Mobility [T-WIWI-102793]

Responsible: PD Dr. Patrick Jochem
Prof. Dr. Russell McKenna
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101452 - Energy Economics and Technology

Type	Credits	Recurrence	Version
Written examination	3,5	Each summer term	1

Events					
SS 2019	2581006	Efficient Energy Systems and Electric Mobility	2 SWS	Lecture (V)	Jochem, McKenna
Exams					
SS 2019	7981006	Efficient Energy Systems and Electric Mobility		Prüfung (PR)	Fichtner

Competence Certificate
See German version.

Prerequisites
None

Recommendation
None

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

V Efficient Energy Systems and Electric Mobility

Lecture (V)

2581006, SS 2019, 2 SWS, Language: English, Open in study portal

Learning Content
This lecture series combines two of the most central topics in the field of energy economics at present, namely energy efficiency and electric mobility. The objective of the lecture is to provide an introduction and overview to these two subject areas, including theoretical as well as practical aspects, such as the technologies, political framework conditions and broader implications of these for national and international energy systems.

The energy efficiency part of the lecture provides an introduction to the concept of energy efficiency, the means of affecting it and the relevant framework conditions. Further insights into economy-wide measurements of energy efficiency, and associated difficulties, are given with recourse to several practical examples. The problems associated with market failures in this area are also highlighted, including the Rebound Effect. Finally and by way of an outlook, perspectives for energy efficiency in diverse economic sectors are examined.

The electric mobility part of the lecture examines all relevant issues associated with an increased penetration of electric vehicles including their technology, their impact on the electricity system (power plants and grid), their environmental impact as well as their optimal integration in the future private electricity demand (i.e. smart grids and V2G). Besides technical aspects the user acceptance and behavioral aspects are also discussed.

Workload
The total workload for this course is approximately 105.0 hours. For further information see German version.

Literature
Will be anounced in the lecture.

T 4.62 Course: eFinance: Information Systems for Securities Trading [T-WIWI-109941]

Responsible: Prof. Dr. Christof Weinhardt
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101480 - Finance 3
M-WIWI-101483 - Finance 2

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	2

Events					
WS 19/20	2540454	eFinance: Information Systems for Securities Trading	2 SWS	Lecture (V)	Weinhardt, Notheisen
WS 19/20	2540455	Übungen zu eFinance: Wirtschaftsinformatik für den Wertpapierhandel	1 SWS	Practice (Ü)	Jaquart, Soufi

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.

Prerequisites
see below

Recommendation
None

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

V eFinance: Information Systems for Securities Trading

Lecture (V)

2540454, WS 19/20, 2 SWS, Language: English, Open in study portal

Description
The theoretical part of the course examines the New Institutions Economics which provides a theoretically found explanation for the existence of markets and intermediaries. Building upon the foundations of the market micro structure, several key parameters and factors of electronic trading are examined. These insights gained along a structured securities trading process are complemented and verified by the analysis of prototypical trading systems developed at the institute as well as selected trading systems used by leading exchanges in the world. In the more practical-oriented second part of the lecture, speakers from practice will give talks about financial trading systems and link the theoretical findings to real-world systems and applications.

Learning Content
The theoretical part of the course examines the New Institutions Economics which provides a theoretically found explanation for the existence of markets and intermediaries. Building upon the foundations of the market micro structure, several key parameters and factors of electronic trading are examined. These insights gained along a structured securities trading process are complemented and verified by the analysis of prototypical trading systems developed at the institute as well as selected trading systems used by leading exchanges in the world. In the more practical-oriented second part of the lecture, speakers from practice will give talks about financial trading systems and link the theoretical findings to real-world systems and applications.

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

Literature

- Picot, Arnold, Christine Bortenlänger, Heiner Röhrl (1996): "Börsen im Wandel". Knapp, Frankfurt
- Harris, Larry (2003): "Trading and Exchanges - Market Microstructure for Practitioners"". Oxford University Press, New York

Elective literature:

- Gomber, Peter (2000): "Elektronische Handelssysteme - Innovative Konzepte und Technologien". Physika Verlag, Heidelberg
- Schwartz, Robert A., Reto Francioni (2004): "Equity Markets in Action - The Fundamentals of Liquidity, Market Structure and Trading". Wiley, Hoboken, NJ

T 4.63 Course: Emerging Trends in Digital Health [T-WIWI-110144]

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

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

Competence Certificate
The alternative exam assessment consists of a final thesis.

Prerequisites
None.

Annotation
The course is usually held as a block course.

T 4.64 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-101472 - Informatics

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

Competence Certificate
The alternative exam assessment consists of a final thesis.

Prerequisites
None.

Annotation
The course is usually held as a block course.

T 4.65 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

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2581003	Energy and Environment	2 SWS	Lecture (V)	Karl
SS 2019	2581004	Übungen zu Energie und Umwelt	1 SWS	Practice (Ü)	Seddig, Keles
Exams					
SS 2019	7981003	Energy and Environment		Prüfung (PR)	Fichtner

Competence Certificate
The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

Prerequisites
None.

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

V Energy and Environment

Lecture (V)

2581003, SS 2019, 2 SWS, Language: German, Open in study portal

Learning Content
The focus of the lecture is put on environmental impacts of fossil fuel conversion and related assessment methods. The list of topics is given below.

- Fundamentals of energy conversion
- Air pollutant formation from fossil fuel combustion
- Control of air pollutant emissions from fossil-fuelled power plants.
- Measures to improve conversion efficiency of fossil fuelled power plants.
- External effects of energy supply (Life Cycle Assessment of selected energy systems)
- Integrated Assessment models supporting the European Thematic Strategy on Air
- Cost-effectiveness analyses and cost-benefit analyses of air pollution control measures
- Monetary evaluation of external effects of energy supply (external costs)

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

Literature
Thr references for further reading are included in the lecture documents (see ILIAS)

T 4.66 Course: Energy Market Engineering [T-WIWI-107501]

Responsible: Prof. Dr. Christof Weinhardt
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-103720 - eEnergy: Markets, Services and Systems

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2540464	Energy Market Engineering	2 SWS	Lecture (V)	Weinhardt, Staudt
SS 2019	2540465	Übung zu Energy Market Engineering	1 SWS	Practice (Ü)	Staudt, vom Scheidt
Exams					
SS 2019	79852	Energy Market Engineering		Prüfung (PR)	Weinhardt

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:

V Energy Market Engineering
2540464, SS 2019, 2 SWS, Language: German, Open in study portal

Lecture (V)

Learning Content
This lecture discusses different design options for electricity markets. We will focus on different approaches of nodal and zonal pricing as well as single price mechanisms and capacity markets. After a short recap of German and European market designs, the different design options will be discussed scientifically and with the help of examples. Furthermore, we will evaluate alternative market design options like microgrids. Besides the fundamental functioning of those markets, we will introduce and discuss methodological knowledge to evaluate market design options.

Annotation
The lecture has also been added in the IIP Module *Basics of Liberalised Energy Markets*.

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

Literature

- Erdmann G, Zweifel P. *Energieökonomik, Theorie und Anwendungen*. Berlin Heidelberg: Springer; 2007.
- Grimm V, Ockenfels A, Zoettl G. Strommarktdesign: Zur Ausgestaltung der Auktionsregeln an der EEX *. *Zeitschrift für Energiewirtschaft*. 2008:147-161.
- Stoft S. *Power System Economics: Designing Markets for Electricity*. IEEE; 2002.,
- Ströbele W, Pfaffenberger W, Heuterkes M. *Energiewirtschaft: Einführung in Theorie und Politik*. 2nd ed. München: Oldenbourg Verlag; 2010:349.

T 4.67 Course: Energy Networks and Regulation [T-WIWI-107503]

Responsible: Prof. Dr. Christof Weinhardt
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-103720 - eEnergy: Markets, Services and Systems

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2540494	Energy Networks and Regulation	2 SWS	Lecture (V)	Rogat
WS 19/20	2540495	Übung zu Energy Networks and Regulation	1 SWS	Practice (Ü)	Rogat
Exams					
WS 19/20	7900198	Energy Networks and Regulation		Prüfung (PR)	Weinhardt

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:

V Energy Networks and Regulation

2540494, WS 19/20, 2 SWS, Open in study portal

Lecture (V)

Learning Content
The lecture “Energy Networks and Regulation” provides insights into the regulatory framework of electricity and gas. It touches upon the way the grids are operated and how regulation affects almost all grid activities. The lecture also addresses approaches of grid companies to cope with regulation on a managerial level. We analyze how the system influences managerial decisions and strategies such as investment or maintenance. Furthermore, we discuss how the system affects the operator’s abilities to deal with the massive challenges lying ahead (“Energiewende”, redispatch, European grid integration, electric vehicles etc.). Finally, we look at current developments and major upcoming challenges, e.g., the smart meter rollout. Covered topics include:

- Grid operation as a heterogeneous landscape: big vs. small, urban vs. rural, TSO vs. DSO.
- Objectives of regulation: Fair price calculation and high standard access conditions.
- The functioning of incentive regulation
- Amendment to the incentive regulation: its merits, its flaws
- The revenue cap and how it is adjusted according to certain exogenous factors
- Grid tariffs: How are they calculated, what is the underlying rationale, do we need a reform (and which)?
- Exogenous costs shifted (arbitrarily) into the grid, e.g. feed-in tariffs for renewable energy or decentralized supply.

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

Literature
Averch, H.; Johnson, L.L (1962). Behavior of the firm under regulatory constraint, in: American Economic Review, 52 (5), S. 1052 – 1069.

Bundesnetzagentur (2006): Bericht der Bundesnetzagentur nach § 112a EnWG zur Einführung der Anreizregulierung nach § 21a EnWG, http://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Energie/Unternehmen_Institutionen/Netzentgelte/Anreizregulierung/BerichtEinfuehrgAnreizregulierung.pdf?__blob=publicationFile&v=3.

Bundesnetzagentur (2015): Evaluierungsbericht nach § 33 Anreizregulierungsverordnung, https://www.bmwi.de/Redaktion/DE/Downloads/A/anreizregulierungsverordnung-evaluierungsbericht.pdf?__blob=publicationFile&v=1.

Filippini, M.; Wild, J.; Luchsinger, C. (2001) : Regulierung der Verteilnetzpreise zu Beginn der Marktöffnung. Erfahrungen in Norwegen und Schweden, Bundesamt für Energie, Bern, http://www.iaea.org/inis/collection/NCLCollectionStore/_Public/34/066/34066585.pdf.

Gómez, T. (2013): Monopoly Regulation, in: Pérez-Arriaga, I.J. (Hg.): Regulation of the Power Sector, S. 151 – 198, Springer-Verlag, London.

Gómez, T. (2013): Electricity Distribution, in: Pérez-Arriaga, I.J. (Hg.): Regulation of the Power Sector, S. 199 – 250, Springer-Verlag, London.

Pérez-Arriaga, I.J. (2013): Challenges in Power Sector Regulation, in: Pérez-Arriaga, I.J. (Hg.): Regulation of the Power Sector, S. 647 – 678, Springer-Verlag, London.

Rivier, M.; Pérez-Arriaga, I.J.; Olmos, L. (2013): Electricity Transmission, in: Pérez-Arriaga, I.J. (Hg.): Regulation of the Power Sector, S. 251 – 340, Springer-Verlag, London.

T 4.68 Course: Energy Systems Analysis [T-WIWI-102830]

Responsible: Dr. Armin Ardone
Prof. Dr. Wolf Fichtner

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-101452 - Energy Economics and Technology

Type	Credits	Recurrence	Version
Written examination	3	Each winter term	1

Events					
WS 19/20	2581002	Energy Systems Analysis	2 SWS	Lecture (V)	Ardone, Keles, Dengiz, Yilmaz
Exams					
SS 2019	7981002	Energy Systems Analysis		Prüfung (PR)	Fichtner

Competence Certificate
The assessment consists of a written exam according to Section 4(2), 1 of the examination regulation.

Prerequisites
None

Recommendation
None

Annotation
Since 2011 the lecture is offered in winter term. Exams can still be taken in summer term.

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

V Energy Systems Analysis

Lecture (V)

2581002, WS 19/20, 2 SWS, Language: English, Open in study portal

Learning Content
1. Overview and classification of energy systems modelling approaches
2. Usage of scenario techniques for energy systems analysis
3. Unit commitment of power plants
4. Interdependencies in energy economics
5. Scenario-based decision making in the energy sector
6. Visualisation and GIS techniques for decision support in the energy sector

Annotation
Since 2011 the lecture is offered in winter term. Exams can still be taken in summer term.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

T 4.69 Course: Engineering FinTech Solutions [T-WIWI-106193]

Responsible: Prof. Dr Maxim Ulrich
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-103247 - Intelligent Risk and Investment Advisory
M-WIWI-103261 - Disruptive FinTech Innovations
M-WIWI-105036 - FinTech Innovations

Type	Credits	Recurrence	Version
Examination of another type	9	Each term	4

Events					
WS 19/20	2500020	Engineering FinTech Solutions	6 SWS	Practical course (P)	Ulrich
Exams					
SS 2019	7900125	Engineering FinTech Solutions		Prüfung (PR)	Ulrich
SS 2019	7900287	Engineering FinTech Solutions		Prüfung (PR)	Ulrich

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

Prerequisites
In order to take the course "Engineering FinTech Solutions", students must have completed the module "Data Science for Finance".

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

V Engineering FinTech Solutions

Practical course (P)

2500020, WS 19/20, 6 SWS, Language: English, Open in study portal

Description
This project invites students to either pursue their own FinTech innovation project or to contribute to the Chair's ongoing innovation projects.

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

Workload
The total workload for this course is approximately 270 hours. This consists of regular meetings with members of the research group and time for independent work on the software project.

T 4.70 Course: Enterprise Architecture Management [T-WIWI-102668]

Responsible: Thomas Wolf
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	2

Events					
WS 19/20	2511600	Enterprise Architecture Management	2 SWS	Lecture (V)	Wolf
WS 19/20	2511601	Exercises to Enterprise Architecture Management	1 SWS	Practice (Ü)	Wolf
Exams					
SS 2019	7900043	Enterprise Architecture Management		Prüfung (PR)	Wolf
WS 19/20	7900010	Enterprise Architecture Management		Prüfung (PR)	Oberweis

Competence Certificate
Please note that the exam for first writers will be offered for the last time in winter semester 2019/2020. A last examination possibility exists in the summer semester 2020 (only for repeaters).

The assessment of this course is a written (60 min.) or (if necessary) oral examination (30 min.) according to §4(2) of the examination regulation.

Prerequisites
None

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

V Enterprise Architecture Management

Lecture (V)

2511600, WS 19/20, 2 SWS, Language: German, Open in study portal

Notes
The following topics will be covered: components of enterprise architecture, enterprise strategy including methods to develop strategies, business process (re)engineering, methods to implement changes within enterprises (management of change).

Learning objectives:

Students understand the connection between enterprise strategy, business processes and business objects and IT architecture; they know methods to depict these connections and how they can be developed based on each other.

4.71 Course: Evolution Equations [T-MATH-105844]

Responsible: Prof. Dr. Roland Schnaubelt
Prof. Dr. Lutz Weis

Organisation: KIT Department of Mathematics

Part of: M-MATH-102872 - Evolution Equations

Type	Credits	Version
Oral examination	8	1

T 4.72 Course: Experimental Economics [T-WIWI-102614]

Responsible: Prof. Dr. Christof Weinhardt
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101505 - Experimental Economics
M-WIWI-102970 - Decision and Game Theory

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2540489	Experimental Economics	2 SWS	Lecture (V)	Peukert, Dorner
WS 19/20	2540493	Übung zu Experimentelle Wirtschaftsforschung	1 SWS	Practice (Ü)	Greif-Winzrieth, Pietruska
Exams					
SS 2019	7900104	Experimental Economics		Prüfung (PR)	Weinhardt

Competence Certificate
The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulations). By successful completion of the exercises (§4 (2), 3 SPO 2007 respectively §4 (3) SPO 2015) a bonus can be obtained. If the grade of the written exam is at least 4.0 and at most 1.3, the bonus will improve it by one grade level (i.e. by 0.3 or 0.4).

Prerequisites
None

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

V Experimental Economics

Lecture (V)

2540489, WS 19/20, 2 SWS, Language: German, Open in study portal

Learning Content
Experimental Economics have become a separate field in Economics. Nearly all fields of the economic discipline use economic experiments to verify theoretical results. Besides being used for emprical validation, this method is applied in political and strategic consulting. The lecture gives an introduction to experimental methods in economics and shows differences to experiments in natural sciences. Scientific studies are used to show exemplary applications.

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

Literature

- Strategische Spiele; S. Berninghaus, K.-M. Ehrhart, W. Güth; Springer Verlag, 2nd ed., 2006.
- Handbook of Experimental Economics; J. Kagel, A. Roth; Princeton University Press, 1995.
- Experiments in Economics; J.D. Hey; Blackwell Publishers, 1991.
- Experimental Economics; D.D. Davis, C.A. Holt; Princeton University Press, 1993.
- Experimental Methods: A Primer for Economists; D. Friedman, S. Sunder; Cambridge University Press, 1994.

T 4.73 Course: Exponential Integrators [T-MATH-107475]

Responsible: Prof. Dr. Marlis Hochbruck
Organisation: KIT Department of Mathematics
Part of: M-MATH-103700 - Exponential Integrators

Type	Credits	Recurrence	Version
Oral examination	6	Irregular	1

Prerequisites
none

T 4.74 Course: Extremal Graph Theory [T-MATH-105931]

Responsible: Prof. Dr. Maria Aksenovich
Organisation: KIT Department of Mathematics
Part of: M-MATH-102957 - Extremal Graph Theory

Type	Credits	Recurrence	Version
Oral examination	8	Each term	1

T 4.75 Course: Extreme Value Theory [T-MATH-105908]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-102939 - Extreme Value Theory

Type	Credits	Version
Oral examination	4	2

T 4.76 Course: Facility Location and Strategic Supply Chain Management [T-WIWI-102704]

Responsible: Prof. Dr. Stefan Nickel

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-101413 - Applications of Operations Research
M-WIWI-101414 - Methodical Foundations of OR
M-WIWI-102832 - Operations Research in Supply Chain Management

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	4

Exams				
SS 2019	7900233	Facility Location and Strategic Supply Chain Management	Prüfung (PR)	Nickel

Competence Certificate
Due to a research semester of Professor Nickel in WS 19/20, the course "Facility Location and Strategic Supply Chain Management" does NOT take place in WS 19/20. In particular, neither WS 19/20 nor SS 20 will offer an exam for the lecture. The follow-up exam to the lecture in WS 18/19 takes place in SS 19 and is exclusively for students in the second examination.

The assessment consists of a written exam (60 min) according to Section 4 (2), 1 of the examination regulation.

The exam takes place in every semester.

Prerequisite for admission to examination is the succesful completion of the online assessments.

Prerequisites
Prerequisite for admission to examination is the succesful completion of the online assessments.

Recommendation
None

Annotation
The lecture is held in every winter term. The planned lectures and courses for the next three years are announced online.

T 4.77 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

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2530205	Financial Analysis	2 SWS	Lecture (V)	Luedecke
SS 2019	2530206	Übungen zu Financial Analysis	2 SWS	Practice (Ü)	Luedecke
Exams					
SS 2019	7900075	Financial Analysis		Prüfung (PR)	Luedecke

Competence Certificate
See German version.

Prerequisites
None

Recommendation
Basic knowledge in corporate finance, accounting, and valuation is required.

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

V Financial Analysis

2530205, SS 2019, 2 SWS, Language: English, Open in study portal

Lecture (V)

Description
This lecture reviews the key financial statements according to international financial reporting standards and provides analytical tools to evaluate the income statement, the balance sheet, and the cash flow statement in order to measure a firm's liquidity, operational efficiency, and profitability.

Learning Content
Topics:

- Introduction to Financial Analysis
- Financial Reporting Standards
- Major Financial Statements and Other Information
- Recognition and Measurement Issues
- Analysis of Financial Statements
- Financial Reporting Quality

Literature

- Alexander, D. and C. Nobes (2017): Financial Accounting – An International Introduction, 6th ed., Pearson.
- Penman, S.H. (2013): Financial Statement Analysis and Security Valuation, 5th ed., McGraw Hill.

T 4.78 Course: Financial Econometrics [T-WIWI-103064]

Responsible: Prof. Dr. Melanie Schienle
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101638 - Econometrics and Statistics I
M-WIWI-101639 - Econometrics and Statistics II

Type	Credits	Recurrence	Version
Written examination	4,5	Irregular	2

Competence Certificate
The assessment consists of a written exam (90 minutes) (following §4(2), 1 of the examination regulation).

Prerequisites
The course T-MATH-105874 "Time Series Analysis" may not be chosen.

Recommendation
Knowledge of the contents covered by the course "Economics III: Introduction in Econometrics"[2520016]

Annotation
The course takes place each second summer term: 2018/2020....

T 4.79 Course: Financial Intermediation [T-WIWI-102623]

Responsible: Prof. Dr. Martin Ruckes
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101480 - Finance 3
M-WIWI-101483 - Finance 2
M-WIWI-101502 - Economic Theory and its Application in Finance

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2530232	Financial Intermediation	2 SWS	Lecture (V)	Ruckes
WS 19/20	2530233	Übung zu Finanzintermediation	1 SWS	Practice (Ü)	Ruckes, Hoang, Benz
Exams					
SS 2019	7900078	Financial Intermediation		Prüfung (PR)	Ruckes

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:

V Financial Intermediation
2530232, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture (V)

Description

- Arguments for the existence of financial intermediaries
- Bank loan analysis, relationship lending
- Competition in the banking sector
- Stability of the financial system
- The macroeconomic role of financial intermediation

Learning Content

- Arguments for the existence of financial intermediaries
- Bank loan analysis, relationship lending
- Stability of the financial system
- The macroeconomic role of financial intermediation
- Principles of the prudential regulation of banks

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

Literature
Elective literature:

- Hartmann-Wendels/Pfingsten/Weber (2014): Bankbetriebslehre, 6th edition, Springer Verlag.
- Freixas/Rochet (2008): Microeconomics of Banking, 2nd edition, MIT Press.

T 4.80 Course: Finite Element Methods [T-MATH-105857]

Responsible: Prof. Dr. Willy Dörfler
Prof. Dr. Marlis Hochbruck
Prof. Dr Tobias Jahnke
Prof. Dr. Andreas Rieder
Prof. Dr. Christian Wieners

Organisation: KIT Department of Mathematics

Part of: M-MATH-102891 - Finite Element Methods

Type	Credits	Version
Oral examination	8	1

Events					
WS 19/20	0110300	Finite Eelement Methods	4 SWS	Lecture (V)	Wieners
WS 19/20	0110310	Tutorial for 0110300 (Finite Element Methods)	2 SWS	Practice (Ü)	Wieners

T 4.81 Course: Finite Group Schemes [T-MATH-106486]

Responsible: Dr. Fabian Januszewski
Organisation: KIT Department of Mathematics
Part of: M-MATH-103258 - Finite Group Schemes

Type	Credits	Recurrence	Version
Oral examination	4	Once	1

T 4.82 Course: Fixed Income Securities [T-WIWI-102644]

Responsible: Prof. Dr. Marliese Uhrig-Homburg
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101480 - Finance 3
M-WIWI-101483 - Finance 2

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2530260	Fixed Income Securities	2 SWS	Lecture (V)	Uhrig-Homburg, Mitarbeiter
Exams					
SS 2019	7900112	Fixed Income Securities		Prüfung (PR)	Uhrig-Homburg

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

Prerequisites
None

Recommendation
Knowledge from the course "Derivatives" is very helpful.

Annotation
The oourse is offered as a block course.

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

V Fixed Income Securities

Lecture (V)

2530260, WS 19/20, 2 SWS, Language: German, Open in study portal

Description
The lecture deals with both German and international bond markets, which are an important source of funding for both the corporate and the public sector. After an overview of the most important bond markets, various definitions of return are discussed. Based on that, the concept of the yield curve is presented. The modelling of the dynamics of the term structure of interest rates provides the theoretical foundation for the valuation of interest rate derivatives, which is discussed in the last part of the lecture.

Learning Content
The lecture deals with both German and international bond markets, which are an important source of funding for both the corporate and the public sector. After an overview of the most important bond markets, various definitions of return are discussed. Based on that, the concept of the yield curve is presented. The modelling of the dynamics of the term structure of interest rates provides the theoretical foundation for the valuation of interest rate derivatives, which is discussed in the last part of the lecture.

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

Literature

- Bühler, W., Uhrig-Homburg, M., Rendite und Renditestruktur am Rentenmarkt, in Obst/Hintner, Geld-, Bank- und Börsenwesen - Handbuch des Finanzsystems, (2000), S.298-337.
- Sundaresan, S., Fixed Income Markets and Their Derivatives, Academic Press, 3rd Edition, (2009).

Elective literature:

- Hull, J., Options, Futures, & Other Derivatives, Prentice Hall, 8th Edition, (2012).

T 4.83 Course: Forecasting: Theory and Practice [T-MATH-105928]

Responsible: Prof. Dr. Tilmann Gneiting
Organisation: KIT Department of Mathematics
Part of: M-MATH-102956 - Forecasting: Theory and Practice

Type	Credits	Version
Oral examination	8	2

Events					
SS 2019	0178000	Forecasting: Theory and Practice II	2 SWS	Lecture (V)	Gneiting
SS 2019	0178010	Tutorial for 0178010 (Forecasting: Theory and Practice II)	1 SWS	Practice (Ü)	Gneiting
Exams					
SS 2019	7700010	Forecasting: Theory and Practice		Prüfung (PR)	Gneiting

T 4.84 Course: Foundations of Continuum Mechanics [T-MATH-107044]

Responsible: Prof. Dr. Christian Wieners
Organisation: KIT Department of Mathematics
Part of: M-MATH-103527 - Foundations of Continuum Mechanics

Type	Credits	Recurrence	Version
Oral examination	3	Once	1

Prerequisites
none

T 4.85 Course: Fourier Analysis [T-MATH-105845]

Responsible: Prof. Dr. Roland Schnaubelt
Prof. Dr. Lutz Weis

Organisation: KIT Department of Mathematics

Part of: M-MATH-102873 - Fourier Analysis

Type	Credits	Version
Written examination	8	1

Events					
SS 2019	0157600	Fourier analysis and its applications to PDEs	3 SWS	Lecture (V)	Liao
SS 2019	0157610	Tutorial for 0157600 (Fourier analysis and its applications to PDEs)	1 SWS	Practice (Ü)	Liao

T 4.86 Course: Fourier Analysis and its Applications to PDEs [T-MATH-109850]

Responsible: Jun.-Prof. Dr. Xian Liao
Organisation: KIT Department of Mathematics
Part of: M-MATH-104827 - Fourier Analysis and its Applications to PDEs

Type	Credits	Recurrence	Version
Oral examination	3	Irregular	2

Prerequisites
none

T 4.87 Course: Functional Analysis [T-MATH-102255]

Responsible: PD Dr. Gerd Herzog
Prof. Dr. Dirk Hundertmark
Prof. Dr. Tobias Lamm
Prof. Dr. Michael Plum
Prof. Dr. Wolfgang Reichel
Dr. Christoph Schmoeger
Prof. Dr. Roland Schnaubelt
Prof. Dr. Lutz Weis

Organisation: KIT Department of Mathematics

Part of: M-MATH-101320 - Functional Analysis

Type	Credits	Recurrence	Version
Written examination	8	Each winter term	2

Events					
WS 19/20	0104800	Functional Analysis	4 SWS	Lecture (V)	Frey
WS 19/20	0104810	Tutorial for 0104800 (Functional Analysis)	2 SWS	Practice (Ü)	Frey
Exams					
SS 2019	00028	Functional Analysis		Prüfung (PR)	Schnaubelt, Lamm, Hundertmark, Kunstmann

4.88 Course: Functions of Matrices [T-MATH-105906]

Responsible: PD Dr. Volker Grimm
Organisation: KIT Department of Mathematics
Part of: M-MATH-102937 - Functions of Matrices

Type	Credits	Version
Oral examination	8	1

Events					
WS 19/20	0115800	Functions of Matrices	4 SWS	Lecture (V)	Grimm
WS 19/20	0115810	Tutorial for 0115800 (Functions of Matrices)	2 SWS	Lecture (V)	Grimm

Prerequisites
none

T 4.89 Course: Functions of Operators [T-MATH-105905]

Organisation: KIT Department of Mathematics
Part of: M-MATH-102936 - Functions of Operators

Type	Credits	Version
Oral examination	6	1

T 4.90 Course: Generalized Regression Models [T-MATH-105870]

Responsible: Prof. Dr. Norbert Henze
Dr. Bernhard Klar

Organisation: KIT Department of Mathematics

Part of: M-MATH-102906 - Generalized Regression Models

Type	Credits	Version
Oral examination	4	2

Events					
SS 2019	0161400	Generalisierte Regressionsmodelle	2 SWS	Lecture (V)	Ebner
SS 2019	0161410	Übungen zu 0161400	1 SWS	Practice (Ü)	Ebner
Exams					
SS 2019	7700014	Generalized Regression Models		Prüfung (PR)	Ebner

T 4.91 Course: Geometric Group Theory [T-MATH-105842]

Responsible: Prof. Dr. Frank Herrlich
Prof. Dr. Enrico Leuzinger
Dr. Gabriele Link
Prof. Dr Roman Sauer
Prof. Dr. Petra Schwer
Prof. Dr. Wilderich Tuschmann

Organisation: KIT Department of Mathematics

Part of: M-MATH-102867 - Geometric Group Theory

Type	Credits	Recurrence	Version
Written examination	8	Irregular	1

Events					
SS 2019	0153300	Geometric Group Theory	4 SWS	Lecture (V)	Leuzinger
SS 2019	0153310	Tutorial for 0153300 (Geometric Group Theory)	2 SWS	Practice (Ü)	Leuzinger
Exams					
SS 2019	7700005	Geometric Group Theory - Exam		Prüfung (PR)	Leuzinger

T 4.92 Course: Geometric Numerical Integration [T-MATH-105919]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-102921 - Geometric Numerical Integration

Type	Credits	Version
Oral examination	6	1

Prerequisites
none

T 4.93 Course: Geometry of Schemes [T-MATH-105841]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-102866 - Geometry of Schemes

Type	Credits	Version
Oral examination	8	1

T 4.94 Course: Global Differential Geometry [T-MATH-105885]

Responsible: Dr. Sebastian Grensing
Prof. Dr. Wilderich Tuschmann

Organisation: KIT Department of Mathematics

Part of: M-MATH-102912 - Global Differential Geometry

Type	Credits	Version
Oral examination	8	1

Prerequisites
none

T 4.95 Course: Global Optimization I [T-WIWI-102726]

Responsible: Prof. Dr. Oliver Stein
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101413 - Applications of Operations Research
M-WIWI-101414 - Methodical Foundations of OR
M-WIWI-101473 - Mathematical Programming

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2550134	Globale Optimierung I	2 SWS	Lecture (V)	Stein
SS 2019	2550135	Übungen zu Globale Optimierung I+II	1 SWS	Practice (Ü)	Stein
Exams					
SS 2019	7900061_SS2019_HK	Global Optimization I		Prüfung (PR)	Stein

Competence Certificate
Success is in the form of a written examination (60 min.) (according to § 4(2), 1 SPO) and possibly of a compulsory prerequisite.

The exam is offered in the lecture of semester and the following semester.

The success check can be done also with the success control for "Global optimization II". In this case, the duration of the written exam is 120 min.

Prerequisites
None

Recommendation
None

Annotation
Part I and II of the lecture are held consecutively in the *same*semester.

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

V Globale Optimierung I

2550134, SS 2019, 2 SWS, Open in study portal

Lecture (V)

Learning Content
In many optimization problems from economics, engineering and natural sciences, numerical solution methods are only able to efficiently identify *local* optimizers, while it is much harder to find *globally* optimal points. This corresponds to the fact that by local search it is easy to find the summit of the closest mountain, but that the search for the summit of Mount Everest is rather elaborate.

Part I of the lecture treats methods for global optimization of convex functions under convex constraints. It is structured as follows:

- Introduction, examples, and terminology
- Existence results
- Optimality in convex optimization
- Duality, bounds, and constraint qualifications
- Numerical methods

Nonconvex optimization problems are treated in part II of the lecture.

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Literature

- W. Alt *Numerische Verfahren der konvexen, nichtglatten Optimierung* Teubner 2004
- C.A. Floudas *Deterministic Global Optimization* Kluwer 2000
- R. Horst, H. Tuy *Global Optimization* Springer 1996
- A. Neumaier *Interval Methods for Systems of Equations* Cambridge University Press 1990

T 4.96 Course: Global Optimization I and II [T-WIWI-103638]

Responsible: Prof. Dr. Oliver Stein
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101414 - Methodical Foundations of OR
M-WIWI-101473 - Mathematical Programming

Type	Credits	Recurrence	Version
Written examination	9	Each summer term	1

Events					
SS 2019	2550134	Globale Optimierung I	2 SWS	Lecture (V)	Stein
SS 2019	2550136	Globale Optimierung II	2 SWS	Lecture (V)	Stein
Exams					
SS 2019	7900063_SS2019_HK	Global Optimization I and II		Prüfung (PR)	Stein

Competence Certificate
The assessment of the lecture is a written examination (120 minutes) according to §4(2), 1 of the examination regulation and possibly of a compulsory prerequisite.

The examination is held in the semester of the lecture and in the following semester.

Prerequisites
None

Recommendation
None

Annotation
Part I and II of the lecture are held consecutively in the *same* semester.

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

V Globale Optimierung I

2550134, SS 2019, 2 SWS, Open in study portal

Lecture (V)

Learning Content
In many optimization problems from economics, engineering and natural sciences, numerical solution methods are only able to efficiently identify *local* optimizers, while it is much harder to find *globally* optimal points. This corresponds to the fact that by local search it is easy to find the summit of the closest mountain, but that the search for the summit of Mount Everest is rather elaborate.

Part I of the lecture treats methods for global optimization of convex functions under convex constraints. It is structured as follows:

- Introduction, examples, and terminology
- Existence results
- Optimality in convex optimization
- Duality, bounds, and constraint qualifications
- Numerical methods

Nonconvex optimization problems are treated in part II of the lecture.

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Literature

- W. Alt *Numerische Verfahren der konvexen, nichtglatten Optimierung* Teubner 2004
- C.A. Floudas *Deterministic Global Optimization* Kluwer 2000
- R. Horst, H. Tuy *Global Optimization* Springer 1996
- A. Neumaier *Interval Methods for Systems of Equations* Cambridge University Press 1990

V

Globale Optimierung II

2550136, SS 2019, 2 SWS, Open in study portal

Lecture (V)

Learning Content

In many optimization problems from economics, engineering and natural sciences, numerical solution methods are only able to efficiently identify *local* optimizers, while it is much harder to find *globally* optimal points. This corresponds to the fact that by local search it is easy to find the summit of the closest mountain, but that the search for the summit of Mount Everest is rather elaborate.

The global solution of convex optimization problems is subject of part I of the lecture.

Part II of the lecture treats methods for global optimization of nonconvex functions under nonconvex constraints. It is structured as follows:

- Introduction and examples
- Convex relaxation
- Interval arithmetic
- Convex relaxation via aBB method
- Branch and bound methods
- Lipschitz optimization

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Literature

- W. Alt *Numerische Verfahren der konvexen, nichtglatten Optimierung* Teubner 2004
- C.A. Floudas *Deterministic Global Optimization* Kluwer 2000
- R. Horst, H. Tuy *Global Optimization* Springer 1996
- A. Neumaier *Interval Methods for Systems of Equations* Cambridge University Press 1990

T 4.97 Course: Global Optimization II [T-WIWI-102727]

Responsible: Prof. Dr. Oliver Stein
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101414 - Methodical Foundations of OR
M-WIWI-101473 - Mathematical Programming

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	2

Events					
SS 2019	2550135	Übungen zu Globale Optimierung I+II	1 SWS	Practice (Ü)	Stein
SS 2019	2550136	Globale Optimierung II	2 SWS	Lecture (V)	Stein
Exams					
SS 2019	7900062_SS2019_HK	Global Optimization II		Prüfung (PR)	Stein

Competence Certificate
The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation and possibly of a compulsory prerequisite.

The examination is held in the semester of the lecture and in the following semester.

The examination can also be combined with the examination of "Global optimization I". In this case, the duration of the written examination takes 120 minutes.

Prerequisites
None

Annotation
Part I and II of the lecture are held consecutively in the *same*semester.

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

V Globale Optimierung II
2550136, SS 2019, 2 SWS, Open in study portal

Lecture (V)

Learning Content
In many optimization problems from economics, engineering and natural sciences, numerical solution methods are only able to efficiently identify *local* optimizers, while it is much harder to find *globally* optimal points. This corresponds to the fact that by local search it is easy to find the summit of the closest mountain, but that the search for the summit of Mount Everest is rather elaborate.

The global solution of convex optimization problems is subject of part I of the lecture.

Part II of the lecture treats methods for global optimization of nonconvex functions under nonconvex constraints. It is structured as follows:

- Introduction and examples
- Convex relaxation
- Interval arithmetic
- Convex relaxation via aBB method
- Branch and bound methods
- Lipschitz optimization

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Literature

- W. Alt *Numerische Verfahren der konvexen, nichtglatten Optimierung* Teubner 2004
- C.A. Floudas *Deterministic Global Optimization* Kluwer 2000
- R. Horst, H. Tuy *Global Optimization* Springer 1996
- A. Neumaier *Interval Methods for Systems of Equations* Cambridge University Press 1990

4.98 Course: Graph Theory [T-MATH-102273]

Responsible: Prof. Dr. Maria Aksenovich
Organisation: KIT Department of Mathematics
Part of: M-MATH-101336 - Graph Theory

Type	Credits	Recurrence	Version
Written examination	8	Irregular	1

Events					
WS 19/20	0104500	Graph Theory	4 SWS	Lecture (V)	Aksenovich
WS 19/20	0104510	Tutorial for 0104500 (Graph Theory)	2 SWS	Practice (Ü)	Aksenovich

Prerequisites
None

T 4.99 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	Credits	Recurrence	Version
Written examination	4,5	Irregular	2

Competence Certificate

The assessment is a 60 minutes written examination (according to §4(2), 1 of the examination regulation).

The examination is held in the term of the lecture and the following lecture.

Prerequisites

None

Recommendation

Basic knowledge as conveyed in the module "Introduction to Operations Research" is assumed.

Annotation

The course is offered irregularly. Planned lectures for the next three years can be found in the internet at http://dol.ior.kit.edu/english/Courses.php.

4.100 Course: Group Actions in Riemannian Geometry [T-MATH-105925]

Responsible: Prof. Dr. Wilderich Tuschmann
Organisation: KIT Department of Mathematics
Part of: M-MATH-102954 - Group Actions in Riemannian Geometry

Type	Credits	Version
Oral examination	5	1

Prerequisites
none

T 4.101 Course: Harmonic Analysis for Dispersive Equations [T-MATH-107071]

Responsible: Dr. Peer Kunstmann
Organisation: KIT Department of Mathematics
Part of: M-MATH-103545 - Harmonic Analysis for Dispersive Equations

Type	Credits	Recurrence	Version
Oral examination	8	Irregular	1

Prerequisites
none

4.102 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

Type	Credits	Recurrence	Version
Written examination	3	Each summer term	1

Exams				
SS 2019	7981001	Heat Economy	Prüfung (PR)	Fichtner

Competence Certificate
The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

Prerequisites
None.

Recommendation
None

Annotation
See German version.

4.103 Course: Homotopy Theory [T-MATH-105933]

Responsible: Prof. Dr Roman Sauer
Organisation: KIT Department of Mathematics
Part of: M-MATH-102959 - Homotopy Theory

Type	Credits	Version
Oral examination	8	1

T 4.104 Course: Human Factors in Security and Privacy [T-WIWI-109270]

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

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	2

Exams				
SS 2019	7900084	Human Factors in Security and Privacy	Prüfung (PR)	Volkamer
WS 19/20	7900113	Human Factors in Security and Privacy	Prüfung (PR)	Volkamer

Competence Certificate
The lecture will not be offered in the winter semester 2019/2020.

The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation or an oral exam (30 min) following §4, Abs. 2, 2 of the examination regulation.

The exam takes place every semester and can be repeated at every regular examination date.

Prerequisites
Successful participation in the exercises.

Recommendation
The prior attendance of the lecture "Information Security" is strongly recommended.

T 4.105 Course: Incentives in Organizations [T-WIWI-105781]

Responsible: Prof. Dr. Petra Nieken
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101500 - Microeconomic Theory
M-WIWI-101505 - Experimental Economics

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2573003	Incentives in Organizations	2 SWS	Lecture (V)	Nieken
SS 2019	2573004	Übung zu Incentives in Organizations	1 SWS	Practice (Ü)	Nieken, Mitarbeiter
Exams					
SS 2019	7900132	Incentives in Organizations		Prüfung (PR)	Nieken

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

In case of a small number of registrations, we might offer an oral exam instead of a written exam.

Prerequisites
None

Recommendation
Knowledge of microeconomics, game theory, and statistics is assumed.

Annotation
The course is carried out routinely in summer.

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

V Incentives in Organizations

2573003, SS 2019, 2 SWS, Language: English, Open in study portal

Lecture (V)

Notes
See Module Handbook

T 4.106 Course: Information Service Engineering [T-WIWI-106423]

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

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	2

Events					
SS 2019	2511606	Information Service Engineering	2 SWS	Lecture (V)	Sack
SS 2019	2511607	Übungen zu Information Service Engineering	1 SWS	Practice (Ü)	Sack
Exams					
SS 2019	7900070	Information Service Engineering		Prüfung (PR)	Sack
WS 19/20	7900071	Information Service Engineering		Prüfung (PR)	Sack

Competence Certificate
The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation or an oral exam (20 min) following §4, Abs. 2, 2 of the examination regulation.

The exam takes place every semester and can be repeated at every regular examination date.

Prerequisites
None

Annotation
New course starting summer term 2017.

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

V Information Service Engineering

Lecture (V)

2511606, SS 2019, 2 SWS, Language: English, Open in study portal

Learning Content
- Information, Natural Language and the Web

- Natural Language Processing

- NLP and Basic Linguistic Knowledge
- NLP Applications, Techniques & Challenges
- Evaluation, Precision and Recall
- Regular Expressions and Automata
- Tokenization
- Language Model and N-Grams
- Part-of-Speech Tagging

- Linked Data Engineering

- Knowledge Representations and Ontologies
- What's in an URI?
- Resource Description Framework (RDF)
- Creating new Models with RDFS
- Querying RDF(S) with SPARQL
- More Expressivity with Web Ontology Language (OWL)
- The Web of Data
- Vocabularies and Ontologies in the Web of Data
- Wikipedia, DBpedia, and Wikidata

- Information Retrieval

- Information Retrieval Models
- Retrieval Evaluation
- Web Information Retrieval
- Document Crawling, Text Processing, and Indexing
- Query Processing and Result Representation
- Question Answering

- Knowledge Mining

- From Data to Knowledge
- Data Mining
- Machine Learning Basics for Knowledge Mining
- Mining Knowledge from Wikipedia
- Named Entity Resolution

- Exploratory Search and Recommender Systems

- Semantic Search and Entity Centric Search
- Collaborative Filtering and Content Based Recommendations
- From Search to Intelligent Browsing
- Linked Data Based Exploratory Search
- Fact Ranking

Annotation
New lecture, since summer semester 2017

Literature

- D. Jurafsky, J.H. Martin, Speech and Language Processing, 2nd ed. Pearson Int., 2009.
- S. Hitzler, S. Rudolph, Foundations of Semantic Web Technologies, Chapman / Hall, 2009.
- R. Baeza-Yates, B. Ribeiro-Neto, Modern Information Retrieval, 2nd ed., Addison Wesley, 2010.#

T 4.107 Course: Innovationtheory and -Policy [T-WIWI-102840]

Responsible: Prof. Dr. Ingrid Ott
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101478 - Innovation and Growth

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2560236	Innovationtheory and -policy	SWS	Lecture (V)	Ott
SS 2019	2560237	Übung zu Innovationstheorie und -politik	SWS	Practice (Ü)	Ott, Eraydin
Exams					
SS 2019	7900107	Innovationtheory and -Policy		Prüfung (PR)	Ott

Competence Certificate
The assessment consists of a written exam (60 min) according to Section 4(2), 1 of the examination regulation. The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.
Students will be given the opportunity of writing and presenting a short paper during the lecture time to achieve a bonus on the exam grade. If the mandatory credit point exam is passed, the awarded bonus points will be added to the regular exam points. A deterioration is not possible by definition, and a grade does not necessarily improve, but is very likely to (not every additional point improves the total number of points, since a grade can not become better than 1). The voluntary elaboration of such a paper can not countervail a fail in the exam.

Prerequisites
None

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

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

V Innovationtheory and -policy
2560236, SS 2019, SWS, Language: German, Open in study portal

Lecture (V)

Learning Content

- Incentives for the emergence of innovations
- Patents
- Diffusion
- Impact of technological progress
- Innovation Policy

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

Literature
Excerpt:

- Aghion, P., Howitt, P. (2009), The Economics of Growth, MIT Press, Cambridge MA.
- de la Fuente, A. (2000), Mathematical Methods and Models for Economists. Cambridge University Press, Cambridge, UK.
- Klodt, H. (1995), Grundlagen der Forschungs- und Technologiepolitik. Vahlen, München.
- Linde, R. (2000), Allokation, Wettbewerb, Verteilung - Theorie, UNIBUCH Verlag, Lüneburg.
- Ruttan, V. W. (2001), Technology, Growth, and Development. Oxford University Press, Oxford.
- Scotchmer, S. (2004), Incentives and Innovation, MIT Press.
- Tirole, Jean (1988), The Theory of Industrial Organization, MIT Press, Cambridge MA.

T 4.108 Course: Integral Equations [T-MATH-105834]

Responsible: PD Dr. Tilo Arens
PD Dr. Frank Hettlich
Prof. Dr. Andreas Kirsch

Organisation: KIT Department of Mathematics

Part of: M-MATH-102874 - Integral Equations

Type	Credits	Recurrence	Version
Oral examination	8	Irregular	1

T 4.109 Course: Interactive Information Systems [T-WIWI-108461]

Responsible: Prof. Dr. Alexander Mädche
Dr. Stefan Morana
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-104068 - Information Systems in Organizations

Type	Credits	Recurrence	Version
Examination of another type	4,5	Each summer term	3

Events					
SS 2019	2540558	Interactive Systems	3 SWS	Lecture (V)	Mädche, Morana
Exams					
SS 2019	791000002	Interactive Systems		Prüfung (PR)	Mädche

Competence Certificate
The assessment consists of a written exam of 1 hour and by submitting written papers as part of the exercise.

Details will be announced at the beginning of the course.

Prerequisites
None

Annotation
This course replaces T-WIWI-106342 "Interactive Systems" starting summer term 2018.

The course is held in english.

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

V Interactive Systems
Lecture (V)
2540558, SS 2019, 3 SWS, Language: English, Open in study portal

Description
Advanced information and communication technologies make interactive systems ever-present in the users' private and business life. They are an integral part of smartphones, devices in the smart home, mobility vehicles as well as at the working place in production and administration (e.g. in the form of dashboards).

With the continuous growing capabilities of computers, the design of the interaction between human and computer becomes even more important. The aim of this course is to introduce the foundations, theoretical grounding, key concepts and principles as well as current practice of interactive systems. The contents of the course abstract from the technical implementation details. The students get the necessary knowledge to guide the successful implementation of interactive systems in business and private life.

Notes
The lecture is complemented with a capstone project assignment, where students analyze and review existing interactive systems and suggest areas of improvement / extensions.

Learning Content
· Basics

· Theoretical foundations

· Key concepts and design principles for specific interactive systems classes

· Capstone project

Literature
The lecture bases to a large extend on

· Benyon, D. (2014). Designing interactive systems: A comprehensive guide to HCI, UX and interaction design (3. ed.). Harlow: Pearson.

Additional literature will be provided in the lecture.

T 4.110 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

Type	Credits	Recurrence	Version
Written examination	3	Each summer term	1

Events					
SS 2019	2530570	International Finance	2 SWS	Lecture (V)	Walter, Uhrig-Homburg
Exams					
SS 2019	7900097	International Finance		Prüfung (PR)	Uhrig-Homburg

Competence Certificate
See German version.

Prerequisites
None

Recommendation
None

Annotation
See German version.

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

V International Finance

2530570, SS 2019, 2 SWS, Language: German, Open in study portal

Lecture (V)

Description
The main aspects of this course are the chances and the risks which are associated with international transactions. We carry outour analysis fromtwo distinctperspectives:First the point of view of an international investor second that, of an international corporation.Several alternativesto the management of foreignexchangerisks are shown. Due to the importance of foreign exchangerisks, the first part of the course deals withcurrency markets. Furthermore current exchange rate theories are discussed.

Learning Content
The main aspects of this course are the chances and the risks which are associated with international transactions. We carry out our analysis from two distinct perspectives: First the point of view of an international investor second that, of an international corporation. Several alternatives to the management of foreign exchange risks are shown. Due to the importance of foreign exchange risks, the first part of the course deals with currency markets. Furthermore current exchange rate theories are discussed.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Elective literature:

- Eiteman, D. et al., Multinational Business Finance, 13. edition, 2012.
- Solnik, B. and D. McLeavey, Global Investments, 6. edition, 2008.

T 4.111 Course: Introduction into Particulate Flows [T-MATH-105911]

Responsible: Prof. Dr. Willy Dörfler
Organisation: KIT Department of Mathematics
Part of: M-MATH-102943 - Introduction into Particulate Flows

Type	Credits	Version
Oral examination	3	1

Prerequisites
none

T 4.112 Course: Introduction to Geometric Measure Theory [T-MATH-105918]

Responsible: PD Dr. Steffen Winter
Organisation: KIT Department of Mathematics
Part of: M-MATH-102949 - Introduction to Geometric Measure Theory

Type	Credits	Version
Oral examination	6	1

Prerequisites
none

T 4.113 Course: Introduction to Homogeneous Dynamics [T-MATH-110323]

Responsible: Dr. Stefan Kühnlein
Organisation: KIT Department of Mathematics
Part of: M-MATH-105101 - Introduction to Homogeneous Dynamics

Type	Credits	Recurrence	Version
Oral examination	6	Irregular	1

Prerequisites
none

T 4.114 Course: Introduction to Kinetic Theory [T-MATH-108013]

Responsible: Prof. Dr. Martin Frank
Organisation: KIT Department of Mathematics
Part of: M-MATH-103919 - Introduction to Kinetic Theory

Type	Credits	Recurrence	Version
Oral examination	4	Each winter term	1

Events					
WS 19/20	0155450	Introduction to Kinetic Theory	2 SWS	Lecture (V)	Frank
WS 19/20	0155460	Tutorial for 0155450 (Introduction to Kinetic Theory)	1 SWS	Practice (Ü)	Frank
Exams					
SS 2019	7700050	Introduction to Kinetic Theory		Prüfung (PR)	Frank

Prerequisites
none

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

V Introduction to Kinetic Theory

0155450, WS 19/20, 2 SWS, Language: English, Open in study portal

Lecture (V)

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

4.115 Course: Introduction to Matlab and Numerical Algorithms [T-MATH-105913]

Responsible: Dr. Daniel Weiß
Prof. Dr. Christian Wieners

Organisation: KIT Department of Mathematics

Part of: M-MATH-102945 - Introduction to Matlab and Numerical Algorithms

Type	Credits	Version
Written examination	5	1

Prerequisites
none

T 4.116 Course: Introduction to Scientific Computing [T-MATH-105837]

Responsible: Prof. Dr. Willy Dörfler
Prof. Dr. Marlis Hochbruck
Prof. Dr Tobias Jahnke
Prof. Dr. Andreas Rieder
Prof. Dr. Christian Wieners

Organisation: KIT Department of Mathematics

Part of: M-MATH-102889 - Introduction to Scientific Computing

Type	Credits	Version
Oral examination	8	2

Events					
SS 2019	0165000	Einführung in das Wissenschaftliche Rechnen	3 SWS	Lecture (V)	Wieners
SS 2019	0166000	Praktikum zu 0165000	3 SWS	Practical course (P)	Wieners
Exams					
SS 2019	00015	Introduction to Scientific Computing		Prüfung (PR)	Wieners

T 4.117 Course: Introduction to Stochastic Optimization [T-WIWI-106546]

Responsible: Prof. Dr. Steffen Rebennack
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101414 - Methodical Foundations of OR
M-WIWI-102832 - Operations Research in Supply Chain Management
M-WIWI-103289 - Stochastic Optimization

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2550470	Einführung in die Stochastische Optimierung	2 SWS	Lecture (V)	Rebennack
SS 2019	2550471	Übung zur Einführung in die Stochastische Optimierung	1 SWS	Practice (Ü)	Rebennack, Assistenten
Exams					
SS 2019	7900198	Introduction to Stochastic Optimization		Prüfung (PR)	Rebennack

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.

T 4.118 Course: Inverse Problems [T-MATH-105835]

Responsible: PD Dr. Tilo Arens
PD Dr. Frank Hettlich
Prof. Dr. Andreas Kirsch
Prof. Dr. Andreas Rieder

Organisation: KIT Department of Mathematics

Part of: M-MATH-102890 - Inverse Problems

Type	Credits	Version
Oral examination	8	1

Events					
WS 19/20	0105100	Inverse Problems	4 SWS	Lecture (V)	Griesmaier
WS 19/20	0105110	Tutorial for 0105100 (Inverse Problems)	2 SWS	Practice (Ü)	Griesmaier

T 4.119 Course: Key Moments in Geometry [T-MATH-108401]

Responsible: Prof. Dr. Wilderich Tuschmann
Organisation: KIT Department of Mathematics
Part of: M-MATH-104057 - Key Moments in Geometry

Type	Credits	Recurrence	Version
Oral examination	5	Irregular	1

Prerequisites
none

T 4.120 Course: Knowledge Discovery [T-WIWI-102666]

Responsible: Prof. Dr. York Sure-Vetter
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	2

Events					
WS 19/20	2511302	Knowledge Discovery	2 SWS	Lecture (V)	Sure-Vetter, Färber
WS 19/20	2511303	Exercises to Knowledge Discovery	1 SWS	Practice (Ü)	Sure-Vetter, Färber, Weller
Exams					
SS 2019	7900039	Knowledge Discovery		Prüfung (PR)	Sure-Vetter
WS 19/20	7900013	Knowledge Discovery		Prüfung (PR)	Sure-Vetter

Competence Certificate
The assessment consists of an 1h written exam following §4, Abs. 2, 1 of the examination regulation.

Students can be awarded a bonus on their final grade if they successfully complete special assignments.

Prerequisites
None

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

V Knowledge Discovery

Lecture (V)

2511302, WS 19/20, 2 SWS, Language: English, Open in study portal

Notes
The lecture provides an overview of machine learning and data mining techniques for knowledge discovery from large data sets. These techniques are examined in respect of algorithms, applicability to different data representations and application in the real world.

Knowledge discovery is a well-established field with a large community investigating methods for the discovery of patterns and regularities in large data sets, including relational databases and unstructured text.

A variety of methods are available to assist in extracting patterns that, if interpreted, provide valuable, possibly previously unknown, insights. This information can be predictive or descriptive in nature.

This lecture provides an overview of this field. The lecture imparts specific techniques and methods, challenges and current and future research workin this field.

Topics of the lectures comprise the whole Machine Learning and Data Mining process like CRISP, data warehousing, OLAP-techniques, learning algorithms, visualization and empircial evaluation. Covered learning techniques range from traditional approaches like decision trees, neural networks and support vector machines to selected approaches resulting from current research. Discussed learning problems are amongst others feauturevector-based learning, text mining and social network analysis.

Learning obectives:

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 preperation and postprocessing: 60 hours
- Exam and exam preperation: 30 hours

V Exercises to Knowledge Discovery

2511303, WS 19/20, 1 SWS, Language: English, Open in study portal

Practice (Ü)

Notes
The exercises are related to the lecture Knowledge Discovery.

Multiple exercises are held that capture the topics, held in the lecture Knowledge Discovery, and discuss them in detail. Thereby, practical examples are given to the students in order to transfer theoretical aspects into practical implementation.

Topics of the lectures comprise the whole Machine Learning and Data Mining process like CRISP, data warehousing, OLAP-techniques, learning algorithms, visualization and empircial evaluation. Covered learning techniques range from traditional approaches like decision trees, neural networks and support vector machines to selected approaches resulting from current research. Discussed learning problems are amongst others feauturevector-based learning, text mining and social network analysis.

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.

T 4.121 Course: L2-Invariants [T-MATH-105924]

Responsible: Dr. Holger Kammeyer
Prof. Dr Roman Sauer

Organisation: KIT Department of Mathematics

Part of: M-MATH-102952 - L2-Invariants

Type	Credits	Version
Oral examination	5	1

Prerequisites
none

T 4.122 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

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2550475	Large-Scale Optimization	2 SWS	Lecture (V)	Rebennack
SS 2019	2550476	Übung zu Large-Scale Optimization	1 SWS	Practice (Ü)	Rebennack, Assistenten
Exams					
SS 2019	7900197	Large-scale Optimization		Prüfung (PR)	Rebennack

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.

T 4.123 Course: Lie Groups and Lie Algebras [T-MATH-108799]

Responsible: Prof. Dr. Enrico Leuzinger
Organisation: KIT Department of Mathematics
Part of: M-MATH-104261 - Lie Groups and Lie Algebras

Type	Credits	Recurrence	Version
Oral examination	8	Irregular	1

T 4.124 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-101472 - Informatics

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	2

Events					
WS 19/20	2511500	Machine Learning 1 - Fundamental Methods	2 SWS	Lecture (V)	Zöllner
WS 19/20	2511501	Exercises to Machine Learning 1 - Fundamental Methods	1 SWS	Practice (Ü)	Zöllner
Exams					
SS 2019	7900154	Machine Learning 1 - Basic Methods		Prüfung (PR)	Zöllner
WS 19/20	7900076	Machine Learning 1 - Basic Methods		Prüfung (PR)	Zöllner

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 Machine Learning 1 - Fundamental Methods

Lecture (V)

2511500, WS 19/20, 2 SWS, Language: German, Open in study portal

Notes
The field of knowledge acquisition and machine learning is a rapidly expanding field of knowledge and the subject of numerous research and development projects. The acquisition of knowledge can take place in different ways. Thus a system can benefit from experiences already made, it can be trained, or it draws conclusions from extensive background knowledge.

The lecture covers symbolic learning methods such as inductive learning (learning from examples, learning by observation), deductive learning (explanation-based learning) and learning from analogies, as well as sub-symbolic techniques such as neural networks, support vector machines and genetic algorithms. The lecture introduces the basic principles and structures of learning systems and examines the algorithms developed so far. The structure and operation of learning systems is presented and explained with some examples, especially from the fields of robotics and image processing.

Learning obectives:

- 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 of machine learning.

T 4.125 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-101472 - Informatics
M-WIWI-101637 - Analytics and Statistics

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	2

Events					
SS 2019	2511502	Machine Learning 2 - Advanced methods	2 SWS	Lecture (V)	Zöllner
SS 2019	2511503	Exercises for Machine Learning 2 - Advanced Methods	1 SWS	Practice (Ü)	Zöllner
Exams					
SS 2019	7900080	Machine Learning 2 – Advanced Methods		Prüfung (PR)	Zöllner
WS 19/20	7900050	Machine Learning 2 – Advanced Methods		Prüfung (PR)	Zöllner

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 Machine Learning 2 - Advanced methods

2511502, SS 2019, 2 SWS, Language: German, Open in study portal

Lecture (V)

Description
The field of machine decision-making and inference procedures, taking into account uncertainties and incomplete knowledge, is a rapidly expanding field of knowledge and the subject of numerous research and development projects.

The focus of this lecture is on the embedding and application of machine-learning methods in decision and inference systems starting with methods of dimension reduction, feature selection/evaluation via semi-supervised learning to methods of probabilistic inference (e.g. Dempster Shafer information fusion, dynamic and object-oriented Bayesian networks, POMDP, etc).

The lecture introduces the basic principles and structures and explains algorithms developed so far. The structure and operation of the procedures and methods are presented and explained using a number of application scenarios, in particular from the field of technical (semi-)autonomous systems.

Notes
The first exercise will take place on 08.05.2019.

Learning Content
The subject area of ??machine intelligence and, in particular, machine learning, taking into account real challenges of complex application domains, is a rapidly expanding field of knowledge and the subject of numerous research and development projects.

The lecture "Machine Learning 2" deals with advanced methods of machine learning such as semi-supervised and active learning, deep neural networks (deep learning), pulsed networks, hierarchical approaches, e.g. As well as dynamic, probabilistic relational methods. Another focus is the embedding and application of machine learning methods in real systems.

The lecture introduces the latest basic principles as well as extended basic structures and elucidates previously developed algorithms. The structure and the mode of operation of the methods and methods are presented and explained by means of some application scenarios, especially in the field of technical (sub) autonomous systems (robotics, neurorobotics, image processing, etc.).

Literature
The slides are available as a PDF

Related Literature

- Artificial Intelligence: A Modern Approach - Peter Norvig and Stuart J. Russell
- Machine Learning - Tom Mitchell
- Pattern Recognition and Machine Learning - Christopher M. Bishop
- Reinforcement Learning: An Introduction - Richard S. Sutton and Andrew G. Barto
- Deep Learning - Ian Goodfellow, Yoshua Bengio, Aaron Courville

Further (specific) literature on individual topics will be given in the lecture.

V **Exercises for Machine Learning 2 - Advanced Methods** **Practice (Ü)**
2511503, SS 2019, 1 SWS, Open in study portal

Notes
The first exercise will take place on 08.05.2019.

T 4.126 Course: Management of IT-Projects [T-WIWI-102667]

Responsible: Dr. Roland Schätzle
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	3

Events					
SS 2019	2511214	Management of IT-Projects	2 SWS	Lecture (V)	Schätzle
SS 2019	2511215	Übungen zu Management von Informatik-Projekten	1 SWS	Practice (Ü)	Schätzle
Exams					
SS 2019	7900045	Management of IT-Projects		Prüfung (PR)	Oberweis
WS 19/20	7900014	Management of IT-Projects		Prüfung (PR)	Oberweis

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.

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.

The exact details will be announced in the lecture.

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:

V Management of IT-Projects

2511214, SS 2019, 2 SWS, Language: German, Open in study portal

Lecture (V)

Learning Content
The lecture deals with the general framework, impact factors and methods for planning, handling, and controlling of IT projects. Especially following topics are addressed:

- project environment
- project organisation
- project planning including the following items:
  - plan of the project structure
  - flow chart
  - project schedule
  - plan of resources
- effort estimation
- project infrastructur
- project controlling
- risk management
- feasibility studies
- decision processes, conduct of negotiations, time management.

Workload
Lecture 30h
Exercise 15h

Preparation of lecture 30h
Preparation of exercises 30h
Exam preparation 44h
Exam &1h

Total: 150h

Literature

- B. Hindel, K. Hörmann, M. Müller, J. Schmied. Basiswissen Software-Projektmanagement. dpunkt.verlag 2004
- Project Management Institute Standards Committee. A Guide to the Project Management Body of Knowledge (PMBoK guide). Project Management Institute. Four Campus Boulevard. Newton Square. PA 190733299. U.S.A.

Further literature is given in each lecture individually.

T 4.127 Course: Market Research [T-WIWI-107720]

Responsible: Prof. Dr. Martin Klarmann
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101490 - Marketing Management

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2571150	Market Research	2 SWS	Lecture (V)	Klarmann
SS 2019	2571151	Market Research Tutorial	1 SWS	Practice (Ü)	Honold
Exams					
SS 2019	7900015	Market Research		Prüfung (PR)	Klarmann
SS 2019	7900203	Market Research		Prüfung (PR)	Klarmann

Competence Certificate
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

Prerequisites
None

Recommendation
None

Annotation
Please note that this course has to be completed successfully by students interested in master thesis positions at the Marketing & Sales Research Group.

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

V Market Research

2571150, SS 2019, 2 SWS, Language: English, Open in study portal

Lecture (V)

Learning Content
Within the lecture, essential statistical methods for measuring customer attitudes (e.g. satisfaction measurement), understanding customer behavior and making strategic decisions will be discussed. The practical use as well as the correct handling of different survey methods will be taught, such as experiments and surveys. To analyze the collected data, various analysis methods are presented, including hypothesis tests, factor analyses, cluster analyses, variance and regression analyses. Building on this, the interpretation of the results will be discussed.

Topics addressed in this course are for example:

- Theoretical foundations of market research
- Statistical foundations of market research
- Measuring customer attitudes
- Understanding customer reactions
- Strategical decision making

Annotation
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

Workload
The total workload for this course is approximately 135.0 hours.

Presence time: 30 hours

Preparation and wrap-up of the course: 45.0 hours

Exam and exam preparation: 60.0 hours

Literature

Homburg, Christian (2016), Marketingmanagement, 6th. ed., Wiesbaden.

T 4.128 Course: Marketing Strategy Business Game [T-WIWI-102835]

Responsible: Prof. Dr. Martin Klarmann
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101490 - Marketing Management

Type	Credits	Recurrence	Version
Examination of another type	1,5	Each summer term	1

Events					
SS 2019	2571183	Marketing Strategy Business Game	1 SWS	Block (B)	Klarmann, Assistenten
Exams					
SS 2019	7900022	Marketing Strategy Business Game		Prüfung (PR)	Klarmann

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.

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

V Marketing Strategy Business Game

2571183, SS 2019, 1 SWS, Language: German, Open in study portal

Block (B)

Learning Content
Using Markstrat, a marketing strategy business game, students work in groups representing a company that competes on a simulated market against the other groups' companies.

Annotation

- Please note that only one of the courses from the election block can be chosen in the module.
- Please note: The number of participants for this course is limited. The Marketing and Sales Research Group typically provides the possibility to attend a course with 1.5 ECTS in the respective module to all students. Participation in a specific course cannot be guaranteed.
- In order to participate in this course, you need to apply. Applications are usually accepted at the start of the lecture period in summer term. Detailed information on the application process is usually provided on the website of the Marketing and Sales Research Group (marketing.iism.kit.edu) shortly before the lecture period in summer term starts.

Workload
The total workload for this course is approximately 45.0 hours. For further information see German version.

Literature
Homburg, Christian (2016), Marketingmanagement, 6. ed., Wiesbaden.

T 4.129 Course: Markov Decision Processes [T-MATH-105921]

Responsible: Prof. Dr. Nicole Bäuerle
Organisation: KIT Department of Mathematics
Part of: M-MATH-102907 - Markov Decision Processes

Type	Credits	Version
Oral examination	5	1

Events					
SS 2019	0159900	Brownsche Bewegung	2 SWS	Lecture (V)	Bäuerle
SS 2019	0159910	Übungen zu 0159900 (Brownsche Bewegung)	1 SWS	Practice (Ü)	Bäuerle

Prerequisites
none

T 4.130 Course: Master Thesis [T-MATH-105878]

Responsible: Dr. Sebastian Grensing
Organisation: KIT Department of Mathematics
Part of: M-MATH-102917 - Master Thesis

Type	Credits	Version
Final Thesis	30	1

Exams				
SS 2019	8105-10003	Risk management with weighted Value-at-Risk		Bäuerle
SS 2019	8105-10007	A fast marching algorithm for the factorized eikonal equation		Rieder
SS 2019	8105-10009	A new class of tests for multivariate normality by means of a characterization based on the Laplacian operator		Henze
SS 2019	8105-10010	Moduli Spaces of Ricci flat Riemannian Metrics on K3 Surfaces		Tuschmann
SS 2019	8105-10011	Interpretation of point forecasts as state-dependent functionals with application to ECMWF HRES precipitation forecasts and TRMM observations over the tropics		Gneiting
SS 2019	8105-10012	Noch nicht feststehend		Klar
SS 2019	8105-10013	Polynomial growth solutions to elliptic and parabolic partial differential equations on Riemannian manifolds		Lamm
SS 2019	8105-10015	On subgraphs with minimum degree restrictions		Aksenovich
SS 2019	8105-10016	Computer-assisted existence proofs for second-order boundary value problems with discontinuous leading coefficients		Plum
SS 2019	8105-10017	Mathematical modeling of psychological factors in portfolio optimization problems		Bäuerle
WS 19/20	8105-10018	wird nachgereicht		Leuzinger
SS 2019	8276-10003	Rough and fractional Heston models		Bäuerle
SS 2019	8276-10006	Quasi-random numbers for copula models		Bäuerle
SS 2019	8276-10011	Bitcoin Options - Pricing and Comparison with traditional Equity Option Markets		Uhrig-Homburg
SS 2019	8276-10012	Neural Network Prediction of Monthly Return Distributions Using Financial Ratios		Ulrich
SS 2019	8276-10013	Topic Modeling for Patent Data		Ott

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

T 4.131 Course: Mathematical Methods in Signal and Image Processing [T-MATH-105862]

Responsible: Prof. Dr. Andreas Rieder
Organisation: KIT Department of Mathematics
Part of: M-MATH-102897 - Mathematical Methods in Signal and Image Processing

Type	Credits	Version
Oral examination	8	1

Prerequisites
none

T 4.132 Course: Mathematical Methods of Imaging [T-MATH-106488]

Responsible: Prof. Dr. Andreas Rieder
Organisation: KIT Department of Mathematics
Part of: M-MATH-103260 - Mathematical Methods of Imaging

Type	Credits	Recurrence	Version
Oral examination	5	Irregular	1

Prerequisites
None

T 4.133 Course: Mathematical Modelling and Simulation in Practise [T-MATH-105889]

Responsible: PD Dr. Gudrun Thäter
Organisation: KIT Department of Mathematics
Part of: M-MATH-102929 - Mathematical Modelling and Simulation in Practise

Type	Credits	Version
Oral examination	4	2

Events					
WS 19/20	0109400	Mathematical Modelling and Simulation	2 SWS	Lecture (V)	Thäter
WS 19/20	0109410	Tutorial for 0109400	1 SWS	Practice (Ü)	Thäter

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

V Mathematical Modelling and Simulation

Lecture (V)

0109400, WS 19/20, 2 SWS, Language: English, Open in study portal

Literature
Hans-Joachim Bungartz e.a.: Modeling and Simulation: An Application-Oriented Introduction, Springer, 2013 (English)

T 4.134 Course: Mathematical Statistics [T-MATH-105872]

Responsible: Prof. Dr. Norbert Henze
Dr. Bernhard Klar

Organisation: KIT Department of Mathematics

Part of: M-MATH-102909 - Mathematical Statistics

Type	Credits	Version
Oral examination	4	1

Prerequisites

none

T 4.135 Course: Mathematical Topics in Kinetic Theory [T-MATH-108403]

Responsible: Prof. Dr. Dirk Hundertmark
Organisation: KIT Department of Mathematics
Part of: M-MATH-104059 - Mathematical Topics in Kinetic Theory

Type	Credits	Recurrence	Version
Oral examination	4	Irregular	1

Prerequisites
none

T 4.136 Course: Maxwell's Equations [T-MATH-105856]

Responsible: PD Dr. Tilo Arens
PD Dr. Frank Hettlich
Prof. Dr. Andreas Kirsch

Organisation: KIT Department of Mathematics

Part of: M-MATH-102885 - Maxwell's Equations

Type	Credits	Version
Oral examination	8	1

T 4.137 Course: Medical Imaging [T-MATH-105861]

Responsible: Prof. Dr. Andreas Rieder
Organisation: KIT Department of Mathematics
Part of: M-MATH-102896 - Medical Imaging

Type	Credits	Version
Oral examination	8	1

Prerequisites
none

4.138 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	Credits	Recurrence	Version
Written examination	4,5	Irregular	1

Events					
WS 19/20	2550138	Mixted Integer Programming I	SWS	Lecture (V)	Stein
WS 19/20	2550139	Exercises Mixted Integer Programming I	SWS	Practice (Ü)	Stein

Competence Certificate
The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation.

The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

The examination can also be combined with the examination of *Mixed Integer Programming II* [25140]. In this case, the duration of the written examination takes 120 minutes.

Prerequisites
None

Recommendation
It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Annotation
The lecture is offered irregularly. The curriculum of the next three years is available online (kop.ior.kit.edu).

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

V Mixted Integer Programming I

2550138, WS 19/20, SWS, Open in study portal

Lecture (V)

Learning Content
Many optimization problems from economics, engineering and natural sciences are modeled with continuous as well as discrete variables. Examples are the energy minimal design of a chemical process in which several reactors may be switched on or off, or the time minimal covering of a distance with a vehicle equipped with a gear shift. While optimal points can be defined straightforwardly, for their numerical identification an interplay of ideas from discrete and continuous optimization is necessary.

The lecture treats methods for the numerical solution of linear optimization problems which depend on continuous as well as discrete variables. It is structured as follows:

- Existence results and concepts of linear as well as convex optimization
- LP relaxation and error bounds for rounding
- Gomory's cutting plane method
- Benders decomposition

Part II of the lecture treats nonlinear mixed integer programs.

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Literature

- C.A. Floudas, Nonlinear and Mixed-Integer Optimization: Fundamentals and Applications, Oxford University Press, 1995
- J. Kallrath: Gemischt-ganzzahlige Optimierung, Vieweg, 2002
- D. Li, X. Sun: Nonlinear Integer Programming, Springer, 2006
- G.L. Nemhauser, L.A. Wolsey, Integer and Combinatorial Optimization, Wiley, 1988
- M. Tawarmalani, N.V. Sahinidis, Convexification and Global Optimization in Continuous and Mixed-Integer Nonlinear Programming, Kluwer, 2002.

T 4.139 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

Type	Credits	Recurrence	Version
Written examination	4,5	Irregular	1

Competence Certificate
The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation.

The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

The examination can also be combined with the examination of*Mixed Integer Programming I*[2550138]. In this case, the duration of the written examination takes 120 minutes.

Prerequisites
None

Recommendation
It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Annotation
The lecture is offered irregularly. The curriculum of the next three years is available online (kop.ior.kit.edu).

T 4.140 Course: Modeling and OR-Software: Advanced Topics [T-WIWI-106200]

Responsible: Prof. Dr. Stefan Nickel
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-102832 - Operations Research in Supply Chain Management

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

Events					
WS 19/20	2550490	Modellieren und OR-Software: Fortgeschrittene Themen	3 SWS	Practical course (P)	Pomes, Zander, Bakker

Competence Certificate
The assessment is a 120 minutes examination, including a written and a practical part (according to §4(2), 1 of the examination regulation).

The examination is held in the term of the software laboratory and the following term.

Prerequisites
None.

Recommendation
Basic knowledge as conveyed in the module *Introduction to Operations Research* is assumed.

Successful completion of the course *Modeling and OR-Software: Introduction*.

Annotation
Due to capacity restrictions, registration before course start is required. For further information see the webpage of the course.

The lecture is held in every term. The planned lectures and courses for the next three years are announced online.

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

V Modellieren und OR-Software: Fortgeschrittene Themen

2550490, WS 19/20, 3 SWS, Language: German, Open in study portal

Practical course (P)

Learning 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 progamming languages are OPL and ILOG Script.

Annotation
The lecture is for Master students who have already attended the introduction or have achieved comparable knowledge e.g. in a Bachelor thesis.
Interested students are requested to send an e-mail to Anika Pomes (anika.pomes@kit.edu) from now until 29.09.2019, including the Bachelor's and the current Master's grade transcripts. If the introduction has not been checked, please let us know how the necessary knowledge has been obtained.

For further information see the webpage of the course.

The lecture is offered in every winter term. The planned lectures and courses for the next three years are announced online.

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

T 4.141 Course: Modeling and OR-Software: Introduction [T-WIWI-106199]

Responsible: Prof. Dr. Stefan Nickel
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101413 - Applications of Operations Research

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

Events					
SS 2019	2550490	Modellieren und OR-Software: Einführung	3 SWS	Practical course (P)	Nickel, Bakker
Exams					
SS 2019	7900234	Modeling and OR-Software: Introduction		Prüfung (PR)	Nickel

Competence Certificate
The assessment is a 120 minutes examination, including a written and a practical part (according to §4(2), 1 of the examination regulation).

The examination is held in the term of the software laboratory and the following term.

Prerequisites
None

Recommendation
Firm knowledge of the contents from the lecture *Introduction to Operations Research I* [2550040] of the module *Operations Research*.

Annotation
Due to capacity restrictions, registration before course start is required. For further information see the webpage of the course.

The lecture is offered in every term. The planned lectures and courses for the next three years are announced online.

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

V Modellieren und OR-Software: Einführung

2550490, SS 2019, 3 SWS, Language: German, Open in study portal

Practical course (P)

Learning Content
The task of solving combinatorial and nonlinear optimization problems imposes much higher requirements on suggested solution approaches as in linear programming.

During the course of this software laboratory, students get to know important methods from combinatorial optimization, e.g. Branch & Cut- or Column Generation methods and are enabled to solve problems with the software system IBM ILOG CPLEX Optimization Studio and the corresponding modeling language OPL. In addition, issues of nonlinear optimization, e.g. quadratic optimization, are addressed. As an important part of the software laboratory, students get the possibility to model combinatorial and nonlinear problems and implement solution approaches in the software system.

The software laboratory also introduces some of the most frequently used modelling and programming languages that are used in practice to solve optimization problems.

Annotation
Due to capacity restrictions, registration before course start is required. For further information see the webpage of the course.

The lecture is held irregularly. The planned lectures and courses for the next three years are announced online.

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

T 4.142 Course: Monotonicity Methods in Analysis [T-MATH-105877]

Responsible: PD Dr. Gerd Herzog
Organisation: KIT Department of Mathematics
Part of: M-MATH-102887 - Monotonicity Methods in Analysis

Type	Credits	Version
Oral examination	3	1

Events					
SS 2019	0103000	Monotoniemethoden in der Analysis	2 SWS	Lecture (V)	Herzog
Exams					
SS 2019	7700021	Monotonicity Methods in Analysis		Prüfung (PR)	Herzog

T 4.143 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

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Competence Certificate
The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation. A bonus program can improve the grade by one grade level (i.e. by 0.3 or 0.4).

The exam is offered every semester. Re-examinations are offered only for repeaters.

Prerequisites
None

Recommendation
The course covers highly advanced statistical methods with a quantitative focus. Hence, participants are necessarily expected to have advanced statistical knowledge, e.g. acquired in the course "Advanced Statistics". Without this, participation in the course is not advised.

Previous attendance of the course Analysis of Multivariate Data is recommended. Alternatively, the script can be provided to interested students.

T 4.144 Course: Nature-Inspired Optimization Methods [T-WIWI-102679]

Responsible: Dr. rer. nat. Pradyumn Kumar Shukla
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	2

Events					
SS 2019	2511106	Nature-Inspired Optimization Methods	2 SWS	Lecture (V)	Shukla
SS 2019	2511107	Übungen zu Nature-Inspired Optimization Methods	1 SWS	Practice (Ü)	Shukla
Exams					
SS 2019	7900026	Nature-Inspired Optimization Methods		Prüfung (PR)	Shukla
WS 19/20	7900016	Nature-Inspired Optimisation Methods		Prüfung (PR)	Shukla

Competence Certificate
The assessment consists of a written exam (60 min) (according to Section 4(2), 1 of the examination regulation) and an additional written examination called "bonus exam", 60 min (according Section 4(2), 3 of the examination regulation) or a selection of exersices . The bonus exam may be split into several shorter written tests.

The grade of this course is the achieved grade in the written examination. If this grade is at least 4.0 and at most 1.3, a passed bonus exam will improve it by one grade level (i.e. by 0.3 or 0.4).

Prerequisites
None

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

V Nature-Inspired Optimization Methods — Lecture (V)
2511106, SS 2019, 2 SWS, Language: English, Open in study portal

Learning Content
Many optimization problems are too complex to be solved to optimality. A promising alternative is to use stochastic heuristics, based on some fundamental principles observed in nature. Examples include evolutionary algorithms, ant algorithms, or simulated annealing. These methods are widely applicable and have proven very powerful in practice. During the course, such optimization methods based on natural principles are presented, analyzed and compared. Since the algorithms are usually quite computational intensive, possibilities for parallelization are also investigated.

T 4.145 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

Type	Credits	Recurrence	Version
Written examination	4,5	Irregular	1

Events					
WS 19/20	2521300		2 SWS	Lecture (V)	Schienle
WS 19/20	2521301		2 SWS	Practice (Ü)	Schienle, Görgen

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

T 4.146 Course: Nonlinear Analysis [T-MATH-107065]

Responsible: Prof. Dr. Tobias Lamm
Organisation: KIT Department of Mathematics
Part of: M-MATH-103539 - Nonlinear Analysis

Type	Credits	Recurrence	Version
Oral examination	8	Irregular	1

Prerequisites
none

4.147 Course: Nonlinear Maxwell Equations [T-MATH-110283]

Responsible: Prof. Dr. Roland Schnaubelt
Organisation: KIT Department of Mathematics
Part of: M-MATH-105066 - Nonlinear Maxwell Equations

Type	Credits	Recurrence	Version
Oral examination	8	Irregular	1

Prerequisites
none

T 4.148 Course: Nonlinear Maxwell Equations [T-MATH-106484]

Responsible: Prof. Dr. Roland Schnaubelt
Organisation: KIT Department of Mathematics
Part of: M-MATH-103257 - Nonlinear Maxwell Equations

Type	Credits	Recurrence	Version
Oral examination	3	Irregular	1

Prerequisites
Keine

T 4.149 Course: Nonlinear Optimization I [T-WIWI-102724]

Responsible: Prof. Dr. Oliver Stein
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101414 - Methodical Foundations of OR
M-WIWI-101473 - Mathematical Programming

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	4

Events					
WS 19/20	2550111	Nonlinear Optimization I	2 SWS	Lecture (V)	Stein
WS 19/20	2550112	Exercises Nonlinear Optimization I + II	SWS	Practice (Ü)	Stein
Exams					
SS 2019	7900064_SS2019_NK	Nonlinear Optimization I		Prüfung (PR)	Stein

Competence Certificate
The assessment consits of a written exam (60 minutes) according to Section 4(2), 1 of the examination regulation and possibly of a compulsory prerequisite.

The exam takes place in the semester of the lecture and in the following semester.

The examination can also be combined with the examination of*Nonlinear OptimizationII*[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:

V Nonlinear Optimization I

2550111, WS 19/20, 2 SWS, Open in study portal

Lecture (V)

Learning Content
The lecture treats the minimization of smooth nonlinear functions under nonlinear constraints. For such problems, which occur very often in economics, engineering, and natural sciences, we derive optimality conditions that form the basis for numerical solution methods. The lecture is structured as follows:

- Introduction, examples, and terminology
- Existence results for optimal points
- First and second order optimality condtions for unconstrained problems
- Optimality conditions for unconstrained convex problems
- Numerical methods for unconstrained problems (line search, steepest descent method, variable metric methods, Newton method, Quasi Newton methods, CG method, trust region method)

Constrained problems are the contents of part II of the lecture.

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Annotation
Part I and II of the lecture are held consecutively in the*same*semester.

Literature
Elective literature:

- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993
- O. Güler, Foundations of Optimization, Springer, 2010
- H.Th. Jongen, K. Meer, E. Triesch, Optimization Theory, Kluwer, 2004
- J. Nocedal, S. Wright, Numerical Optimization, Springer, 2000

T 4.150 Course: Nonlinear Optimization I and II [T-WIWI-103637]

Responsible: Prof. Dr. Oliver Stein
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101414 - Methodical Foundations of OR
M-WIWI-101473 - Mathematical Programming

Type	Credits	Recurrence	Version
Written examination	9	Each winter term	6

Events					
WS 19/20	2550111	Nonlinear Optimization I	2 SWS	Lecture (V)	Stein
WS 19/20	2550112	Exercises Nonlinear Optimization I + II	SWS	Practice (Ü)	Stein
WS 19/20	2550113	Nonlinear Optimization II	2 SWS	Lecture (V)	Stein
Exams					
SS 2019	7900066_SS2019_NK	Nonlinear Optimization I and II		Prüfung (PR)	Stein

Competence Certificate
The assessment consits of a written exam (120 minutes) according to Section 4(2), 1 of the examination regulation and possibly of a compulsory prerequisite.

The exam takes place in the semester of the lecture and in the following semester.

Prerequisites
None.

Annotation
Part I and II of the lecture are held consecutively in the **same** semester.

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

V Nonlinear Optimization I
2550111, WS 19/20, 2 SWS, Open in study portal

Lecture (V)

Learning Content
The lecture treats the minimization of smooth nonlinear functions under nonlinear constraints. For such problems, which occur very often in economics, engineering, and natural sciences, we derive optimality conditions that form the basis for numerical solution methods. The lecture is structured as follows:

- Introduction, examples, and terminology
- Existence results for optimal points
- First and second order optimality condtions for unconstrained problems
- Optimality conditions for unconstrained convex problems
- Numerical methods for unconstrained problems (line search, steepest descent method, variable metric methods, Newton method, Quasi Newton methods, CG method, trust region method)

Constrained problems are the contents of part II of the lecture.

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Annotation
Part I and II of the lecture are held consecutively in the*same*semester.

Literature
Elective literature:

- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993
- O. Güler, Foundations of Optimization, Springer, 2010
- H.Th. Jongen, K. Meer, E. Triesch, Optimization Theory, Kluwer, 2004
- J. Nocedal, S. Wright, Numerical Optimization, Springer, 2000

V Nonlinear Optimization II

2550113, WS 19/20, 2 SWS, Open in study portal

Lecture (V)

Learning Content
The lecture treats the minimization of smooth nonlinear functions under nonlinear constraints. For such problems, which occur very often in economics, engineering, and natural sciences, we derive optimality conditions that form the basis for numerical solution methods. Part I of the lecture treats unconstrained optimization problems. Part II of the lecture is structured as follows:

- Topology and first order approximations of the feasible set
- Theorems of the alternative, first and second order optimality conditions for constrained problems
- Optimality conditions for constrained convex problems
- Numerical methods for constrained problems (penalty method, multiplier method, barrier method, interior point method, SQP method, quadratic optimization)

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Annotation
Part I and II of the lecture are held consecutively in the*same*semester.

Literature
Elective literature:

- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993
- O. Güler, Foundations of Optimization, Springer, 2010
- H.Th. Jongen, K. Meer, E. Triesch, Optimization Theory, Kluwer, 2004
- J. Nocedal, S. Wright, Numerical Optimization, Springer, 2000

T 4.151 Course: Nonlinear Optimization II [T-WIWI-102725]

Responsible: Prof. Dr. Oliver Stein
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101414 - Methodical Foundations of OR
M-WIWI-101473 - Mathematical Programming

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	3

Events					
WS 19/20	2550112	Exercises Nonlinear Optimization I + II	SWS	Practice (Ü)	Stein
WS 19/20	2550113	Nonlinear Optimization II	2 SWS	Lecture (V)	Stein
Exams					
SS 2019	7900065_SS2019_NK	Nonlinear Optimization II		Prüfung (PR)	Stein

Competence Certificate
The assessment consits of a written exam (60 minutes) according to Section 4(2), 1 of the examination regulation and possibly of a compulsory prerequisite.

The exam takes place in the semester of the lecture and in the following semester.

The exam can also be combined with the examination of *Nonlinear OptimizationI* [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:

V Nonlinear Optimization II

2550113, WS 19/20, 2 SWS, Open in study portal

Lecture (V)

Learning Content
The lecture treats the minimization of smooth nonlinear functions under nonlinear constraints. For such problems, which occur very often in economics, engineering, and natural sciences, we derive optimality conditions that form the basis for numerical solution methods. Part I of the lecture treats unconstrained optimization problems. Part II of the lecture is structured as follows:

- Topology and first order approximations of the feasible set
- Theorems of the alternative, first and second order optimality conditions for constrained problems
- Optimality conditions for constrained convex problems
- Numerical methods for constrained problems (penalty method, multiplier method, barrier method, interior point method, SQP method, quadratic optimization)

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Annotation
Part I and II of the lecture are held consecutively in the*same*semester.

Literature
Elective literature:

- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993
- O. Güler, Foundations of Optimization, Springer, 2010
- H.Th. Jongen, K. Meer, E. Triesch, Optimization Theory, Kluwer, 2004
- J. Nocedal, S. Wright, Numerical Optimization, Springer, 2000

T 4.152 Course: Nonparametric Statistics [T-MATH-105873]

Responsible: Prof. Dr. Norbert Henze
Dr. Bernhard Klar

Organisation: KIT Department of Mathematics

Part of: M-MATH-102910 - Nonparametric Statistics

Type	Credits	Version
Oral examination	4	2

Events					
WS 19/20	0162300	Nichtparametrische Statistik	2 SWS	Lecture (V)	Ebner
WS 19/20	0162310	Übungen zu 0162300 (Nichtparametrische Statistik)	1 SWS	Practice (Ü)	Ebner

4.153 Course: Numerical Continuation Methods [T-MATH-105912]

Responsible: Prof. Dr. Jens Rottmann-Matthes
Organisation: KIT Department of Mathematics
Part of: M-MATH-102944 - Numerical Continuation Methods

Type	Credits	Version
Oral examination	5	1

Prerequisites
none

T 4.154 Course: Numerical Linear Algebra for Scientific High Performance Computing [T-MATH-107497]

Responsible: Dr. Hartwig Anzt
Organisation: KIT Department of Mathematics
Part of: M-MATH-103709 - Numerical Linear Algebra for Scientific High Performance Computing

Type	Credits	Recurrence	Version
Examination of another type	3	Irregular	1

Prerequisites
none

T 4.155 Course: Numerical Linear Algebra in Image Processing [T-MATH-108402]

Responsible: PD Dr. Volker Grimm
Organisation: KIT Department of Mathematics
Part of: M-MATH-104058 - Numerical Linear Algebra in Image Processing

Type	Credits	Recurrence	Version
Oral examination	6	Irregular	1

Prerequisites
none

T 4.156 Course: Numerical Methods for Differential Equations [T-MATH-105836]

Responsible: Prof. Dr. Willy Dörfler
Prof. Dr. Marlis Hochbruck
Prof. Dr Tobias Jahnke
Prof. Dr. Andreas Rieder
Prof. Dr. Christian Wieners

Organisation: KIT Department of Mathematics

Part of: M-MATH-102888 - Numerical Methods for Differential Equations

Type	Credits	Version
Written examination	8	1

Events					
WS 19/20	0110700	Numerische Methoden für Differentialgleichungen	4 SWS	Lecture (V)	Hochbruck
WS 19/20	0110800	Übungen zu 0110700	2 SWS	Practice (Ü)	Hochbruck
Exams					
SS 2019	7700009	Numerical Methods for Differential Equations		Prüfung (PR)	Wieners

T 4.157 Course: Numerical Methods for Hyperbolic Equations [T-MATH-105900]

Responsible: Prof. Dr. Willy Dörfler
Organisation: KIT Department of Mathematics
Part of: M-MATH-102915 - Numerical Methods for Hyperbolic Equations

Type	Credits	Version
Oral examination	6	1

Events					
SS 2019	0160800	Numerical methods for hyperbolic equations	3 SWS	Lecture (V)	Dörfler
SS 2019	0160810	Tutorial for 0160800 (Numerical Methods for Hyperbolic Equations)	1 SWS	Practice (Ü)	Dörfler
Exams					
SS 2019	7700048	Numerical Methods for Hyperbolic Equations		Prüfung (PR)	Dörfler

Prerequisites
none

T 4.158 Course: Numerical Methods for Integral Equations [T-MATH-105901]

Responsible: PD Dr. Tilo Arens
PD Dr. Frank Hettlich
Prof. Dr. Andreas Kirsch

Organisation: KIT Department of Mathematics

Part of: M-MATH-102930 - Numerical Methods for Integral Equations

Type	Credits	Version
Oral examination	8	1

Exams				
SS 2019	7700072	Numerical Methods for Integral Equations	Prüfung (PR)	Arens

T 4.159 Course: Numerical Methods for Maxwell's Equations [T-MATH-105920]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-102931 - Numerical Methods for Maxwell's Equations

Type	Credits	Version
Oral examination	6	1

T 4.160 Course: Numerical Methods for Time-Dependent Partial Differential Equations [T-MATH-105899]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-102928 - Numerical Methods for Time-Dependent Partial Differential Equations

Type	Credits	Version
Oral examination	8	1

T 4.161 Course: Numerical Methods in Computational Electrodynamics [T-MATH-105860]

Responsible: Prof. Dr. Willy Dörfler
Prof. Dr. Marlis Hochbruck
Prof. Dr Tobias Jahnke
Prof. Dr. Andreas Rieder
Prof. Dr. Christian Wieners

Organisation: KIT Department of Mathematics

Part of: M-MATH-102894 - Numerical Methods in Computational Electrodynamics

Type	Credits	Version
Oral examination	6	1

Prerequisites
none

T 4.162 Course: Numerical Methods in Fluid Mechanics [T-MATH-105902]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-102932 - Numerical Methods in Fluid Mechanics

Type	Credits	Version
Oral examination	4	1

Events					
SS 2019	0161600	Numerical Methods in Fluidmechanics	2 SWS	Lecture (V)	Dörfler
SS 2019	0161610	Tutorial for 0161600	1 SWS	Practice (Ü)	Dörfler
Exams					
SS 2019	7700037	Numerical Methods in Fluid Mechanics		Prüfung (PR)	Dörfler

T 4.163 Course: Numerical Methods in Mathematical Finance [T-MATH-105865]

Responsible: Prof. Dr Tobias Jahnke
Organisation: KIT Department of Mathematics
Part of: M-MATH-102901 - Numerical Methods in Mathematical Finance

Type	Credits	Version
Oral examination	8	1

Exams				
SS 2019	7700055	Numerical Methods in Mathematical Finance	Prüfung (PR)	Jahnke

Prerequisites
none

T 4.164 Course: Numerical Methods in Mathematical Finance II [T-MATH-105880]

Responsible: Prof. Dr Tobias Jahnke
Organisation: KIT Department of Mathematics
Part of: M-MATH-102914 - Numerical Methods in Mathematical Finance II

Type	Credits	Version
Oral examination	8	1

Competence Certificate
Mündliche Prüfung im Umfang von ca. 30 Minuten

Prerequisites
none

T 4.165 Course: Numerical Optimisation Methods [T-MATH-105858]

Responsible: Prof. Dr. Willy Dörfler
Prof. Dr. Marlis Hochbruck
Prof. Dr Tobias Jahnke
Prof. Dr. Andreas Rieder
Prof. Dr. Christian Wieners

Organisation: KIT Department of Mathematics

Part of: M-MATH-102892 - Numerical Optimisation Methods

Type	Credits	Version
Oral examination	8	1

T 4.166 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

Type	Credits	Recurrence	Version
Written examination	4,5	Irregular	2

Competence Certificate
The assessment is a 60 minutes written examination (according to §4(2), 1 of the examination regulation).

The examination is held in the term of the lecture and the following lecture.

Prerequisites
None

Recommendation
Basic knowledge as conveyed in the module "Introduction to Operations Research" is assumed.

Annotation
The course is offered irregularly. Planned lectures for the next three years can be found in the internet at http://dol.ior.kit.edu/english/Courses.php.

T 4.167 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

Type	Credits	Recurrence	Version
Written examination	4,5	Irregular	2

Events					
SS 2019	2550480	Operations Research in Supply Chain Management	2 SWS	Lecture (V)	Nickel
SS 2019	2550481	Übungen zu OR in Supply Chain Management	1 SWS	Practice (Ü)	Dunke
Exams					
SS 2019	7900128	Operations Research in Supply Chain Management		Prüfung (PR)	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 and in the lectures Facility Location and Strategic SCM,Tactical and operational SCMis assumed.

Annotation
The course is offered irregularly. Planned lectures for the next three years can be found in the internet at http://dol.ior.kit.edu/english/Courses.php.

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

V Operations Research in Supply Chain Management

Lecture (V)

2550480, SS 2019, 2 SWS, Language: English, Open in study portal

Learning Content
Supply Chain Management constitutes a general tool for logistics process planning in supply networks. To an increasing degree quantitative decision support is provided by methods and models from Operations Research. The lecture "OR in Supply Chain Management" conveys concepts and approaches for solving practical problems and presents an insight to current research topics. The lecture's focus is set on modeling and solution methods for applications originating in different domains of a supply chain. The emphasis is put on mathematical methods like mixed integer programming, valid inequalities or column generation, and the derivation of optimal solution strategies.

In form and content, the lecture addresses all levels of Supply Chain Management: After a short introduction, the tactical and operational level will be discussed with regard to inventory models, scheduling as well as cutting and packing. The strategic level will be discussed in terms of layout planning. Another main focus of the lecture is the application of methods from online optimization. This optimization discipline has gained more and more importance in the optimization of supply chains over the several past years due to an increasing amount of dynamic data flows.

Annotation
The course is offered irregularly. Planned lectures for the next three years can be found in the internet at http://dol.ior.kit.edu/english/Courses.php.

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

Literature

- Simchi-Levi, D.; Chen, X.; Bramel, J.: The Logic of Logistics: Theory, Algorithms, and Applications for Logistics and Supply Chain Management, 2nd edition, Springer, 2005
- Simchi-Levi, D.; Kaminsky, P.; Simchi-Levi, E.: Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies, McGraw-Hill, 2000
- Silver, E. A.; Pyke, D. F.; Peterson, R.: Inventory Management and Production Planning and Scheduling, 3rd edition, Wiley, 1998
- Blazewicz, J.: Handbook on Scheduling - From Theory to Applications, Springer, 2007
- Pinedo, M. L.: Scheduling - Theory, Algorithms, and Systems (3rd edition), Springer, 2008
- Dyckhoff, H.; Finke, U.: Cutting and Packing in Production and Distribution - A Typology and Bibliography, Physica-Verlag, 1992
- Borodin, A.; El-Yaniv, R.: Online Computation and Competitive Analysis, Cambridge University Press, 2005
- Francis, R. L.; McGinnis, L. F.; White, A.: Facility Layout and Location: An Analytical Approach, 2nd edition, Prentice-Hall, 1992

T 4.168 Course: Optimisation and Optimal Control for Differential Equations [T-MATH-105864]

Organisation: KIT Department of Mathematics
Part of: M-MATH-102899 - Optimisation and Optimal Control for Differential Equations

Type	Credits	Version
Oral examination	4	1

Events					
SS 2019	0164200	Optimierung und optimale Kontrolle bei Differentialgleichungen	2 SWS	Lecture (V)	Thäter
SS 2019	0164210	Übungen zu 0164210 (Optimierung und Optimale Kontrolle bei Differentialgleichungen)	1 SWS	Practice (Ü)	Thäter
Exams					
SS 2019	00022	Optimisation and Optimal Control for Differential Equations		Prüfung (PR)	Thäter

Prerequisites
none

T 4.169 Course: Optimization in Banach Spaces [T-MATH-105893]

Responsible: Prof. Dr. Andreas Kirsch
Organisation: KIT Department of Mathematics
Part of: M-MATH-102924 - Optimization in Banach Spaces

Type	Credits	Version
Oral examination	8	1

Prerequisites
none

T 4.170 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

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2550140	Optimization Models and Application	2 SWS	Lecture (V)	Sudermann-Merx

Competence Certificate
The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

The prerequisite for participation in the exam is the achievement of a minimum number of points in delivery sheets. Details will be announced at the beginning of the course.

Prerequisites
None.

4.171 Course: Optimization under Uncertainty [T-WIWI-106545]

Responsible: Prof. Dr. Steffen Rebennack
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101413 - Applications of Operations Research
M-WIWI-103289 - Stochastic Optimization

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	2

Events					
WS 19/20	2550464	Optimierungsansätze unter Unsicherheit	SWS	Lecture (V)	Rebennack
WS 19/20	2550465	Übungen zu Optimierungsansätze unter Unsicherheit	SWS	Practice (Ü)	Rebennack, Füllner
WS 19/20	2550466		2 SWS	Practice (Ü)	Rebennack, Füllner
Exams					
SS 2019	7900202	Optimization under Uncertainty		Prüfung (PR)	Rebennack

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.

T 4.172 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

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2520320	Paneldaten	2 SWS	Lecture (V)	Heller
SS 2019	2520321	Übungen zu Paneldaten	2 SWS	Practice (Ü)	Heller
Exams					
SS 2019	7900115	Panel Data		Prüfung (PR)	Heller

Prerequisites
None

T 4.173 Course: Parallel Computing [T-MATH-102271]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-101338 - Parallel Computing

Type	Credits	Version
Oral examination	5	1

T 4.174 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

Type	Credits	Recurrence	Version
Written examination	4,5	Irregular	1

Exams				
SS 2019	7900068_SS2019_NK	Parametric Optimization	Prüfung (PR)	Stein

Competence Certificate
The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation.
The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

Prerequisites
None

Recommendation
It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Annotation
The lecture is offered irregularly. The curriculum of the next three years is available online (www.ior.kit.edu).

4.175 Course: Percolation [T-MATH-105869]

Responsible: Prof. Dr. Günter Last
Organisation: KIT Department of Mathematics
Part of: M-MATH-102905 - Percolation

Type	Credits	Version
Oral examination	6	1

Prerequisites
none

T 4.176 Course: Poisson Processes [T-MATH-105922]

Responsible: Prof. Dr. Vicky Fasen-Hartmann
Prof. Dr. Daniel Hug
Prof. Dr. Günter Last

Organisation: KIT Department of Mathematics

Part of: M-MATH-102922 - Poisson Processes

Type	Credits	Version
Oral examination	5	1

Events					
SS 2019	0152700	Der Poisson-Prozess	2 SWS	Lecture (V)	Winter
Exams					
SS 2019	7700011	Poisson Processes		Prüfung (PR)	Winter

Prerequisites
none

T 4.177 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

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2520357	Portfolio and Asset Liability Management	2 SWS	Lecture (V)	Safarian
SS 2019	2520358	Übungen zu Portfolio and Asset Liability Management	2 SWS	Practice (Ü)	Safarian
Exams					
SS 2019	7900116	Portfolio and Asset Liability Management		Prüfung (PR)	Safarian

Competence Certificate
The assessment of this course consists of a written examination (following §4(2), 1 SPOs, 180 min.) and of possible additional assignments during the course (§4 (2), 3 SPO 2007 respectively §4 (3) SPO 2015).

Prerequisites
None

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

V Portfolio and Asset Liability Management

Lecture (V)

2520357, SS 2019, 2 SWS, Language: English, Open in study portal

Description
Portfolio theory: principles of investment, Markowitz- portfolio analysis, Modigliani-Miller theorems and absence of arbitrage, efficient markets, capital asset pricing model (CAPM), multi factorial CAPM, arbitragepricing theory (APT), arbitrage and hedging, multi factorial models, equity-portfolio management, passive strategies, active investment

Asset liability: statistical portfolio analysis in stock allocation, measures of success, dynamic multi seasonal models, models in building scenarios, stochastic programming in bond and liability management, optimal investment strategies, integrated asset liability management

Learning Content
Portfolio theory: principles of investment, Markowitz- portfolio analysis, Modigliani-Miller theorems and absence of arbitrage, efficient markets, capital asset pricing model (CAPM), multi factorial CAPM, arbitragepricing theory (APT), arbitrage and hedging, multi factorial models, equity-portfolio management, passive strategies, active investment

Asset liability: statistical portfolio analysis in stock allocation, measures of success, dynamic multi seasonal models, models in building scenarios, stochastic programming in bond and liability management, optimal investment strategies, integrated asset liability management

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

Literature
To be announced in lecture.

Elective literature:

To be announced in lecture.

T 4.178 Course: Potential Theory [T-MATH-105850]

Responsible: PD Dr. Tilo Arens
PD Dr. Frank Hettlich
Prof. Dr. Andreas Kirsch
Prof. Dr. Wolfgang Reichel

Organisation: KIT Department of Mathematics

Part of: M-MATH-102879 - Potential Theory

Type	Credits	Version
Oral examination	8	1

T 4.179 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

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

Events					
SS 2019	2550498	Practical seminar: Health Care Management	5 SWS		Nickel, Reuter-Oppermann
Exams					
SS 2019	7900014	Practical Seminar: Health Care Management (with Case Studies)		Prüfung (PR)	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://dol.ior.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 toOperations Research* is assumed.

Annotation
The credits have been reduced to 4,5 starting summer term 2016.

The lecture is offered every term.

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

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

V Practical seminar: Health Care Management
2550498, SS 2019, 5 SWS, Language: German, Open in study portal

Learning Content
Processes in a hospital are often grown historically ("We have always done it this way"), so that there has not been the need to analyze processes until reforms of the health system have put increasing pressure on hospitals. Consequently, nowadays hospitals look for possibilities to improve their processes. The students are confronted with case studies and are asked to develop a solution. Therefore they have to collect and analyze relevant data , processes and structures. When developing the solution the students have to bear in mind that besides the economic efficiency also the quality of care and patient satisfaction (e.g. measured in waiting time) may not be neglected in the health care sector.

Annotation
The lecture is offered every term.

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

Workload
The total workload for this course is approximately135 hours. For further information see German version.

Literature
Elective literature:

- Fleßa: Grundzüge der Krankenhausbetriebslehre, Oldenbourg, 2007
- Fleßa: Grundzüge der Krankenhaussteuerung, Oldenbourg, 2008
- Hall: Patient flow: reducing delay in healthcare delivery, Springer, 2006

T 4.180 Course: Practical Seminar: Information Systems and Service Design [T-WIWI-108437]

Responsible: Prof. Dr. Alexander Mädche
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-104068 - Information Systems in Organizations

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

Events					
SS 2019	2540554	Practical Seminar: Information Systems & Service Design	3 SWS	Lecture (V)	Mädche
Exams					
SS 2019	7900261	Information Systems and Design (ISSD) Seminar		Prüfung (PR)	Mädche
SS 2019	7900262	Practical Seminar: Information Systems and Service Design / Seminarpraktikum: Information Systems und Service Design		Prüfung (PR)	Mädche
SS 2019	7900265	Interactive Analytics Seminar		Prüfung (PR)	Mädche

Competence Certificate
The assessment of this course is according to §4(2), 3 SPO in form of a written documentation, a presentation of the outcome of the conducted practical components and an active participation in class. Please take into account that, beside the written documentation, also a practical component (e.g. implementation of a prototype) is part of the course. Please examine the course description for the particular tasks. The final mark is based on the graded and weighted attainments (such as the written documentation, presentation, practical work and an active participation in class). In the winter terms, the course is only offered as a seminar.

Prerequisites
None.

Recommendation
Attending the course „Digital Service Design“ is recommended, but not mandatory.

Annotation
The course is held in English.

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

V Practical Seminar: Information Systems & Service Design

2540554, SS 2019, 3 SWS, Open in study portal

Lecture (V)

Description
Contemporary trends of every increasing digitalization in businesses lead to new challenges and fusion of technologies blurring the lines between the digital, physical and biological spheres, thereby calling for a new approaches for corporate management. Recently, physician Michio Kaku put it like the following: “The destiny of computers – like other mass technologies like electricity, paper, and running water- is to become invisible, that is, to disappear into the fabric of our lives, to be everywhere and nowhere, silently and seamlessly carrying out our wishes.” Michio Kaku (2016)

In the Practical Seminar Digital Service Design students address a real-world challenge in businesses and apply digital service design practices and tools. Furthermore, during the time of the seminar the students prototypical implement a running digital service.

Real-world challenges will vary over time. This time, the challenges are from the domain of **Future Corporate Management.** The practical seminar is carried out in close cooperation with SAP SE and leverages state-of-the-art digital platforms for prototyping.

Learning Content

- Foundations
- Digital Service Design Challenges in Future Corporate Management
- Basics of Digital Service Design practices and tools
- Prototyping and development Digital Services
- Delivering digital service prototypes

T 4.181 Course: Predictive Mechanism and Market Design [T-WIWI-102862]

Responsible: Prof. Dr. Johannes Philipp Reiß
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101505 - Experimental Economics

Type	Credits	Recurrence	Version
Written examination	4,5	Irregular	1

Events					
WS 19/20	2520402	Predictive Mechanism and Market Design	2 SWS	Lecture (V)	Reiß
WS 19/20	2520403		SWS	Practice (Ü)	Reiß

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.

T 4.182 Course: Pricing [T-WIWI-102883]

Responsible: Dr. Sven Feurer
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101490 - Marketing Management

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2572157	Pricing	2 SWS	Lecture (V)	Klarmann
WS 19/20	2572169	Übung zu Pricing	1 SWS	Practice (Ü)	Moosbrugger
Exams					
SS 2019	7900081	Pricing		Prüfung (PR)	Feurer
WS 19/20	7900138	Pricing		Prüfung (PR)	Klarmann

Competence Certificate
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

Prerequisites
None

Recommendation
None

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

V Pricing

Lecture (V)

2572157, WS 19/20, 2 SWS, Language: German, Open in study portal

Learning Content
This course addresses central elements and peculiarities of pricing goods and services. The topics are below others:

- Price demand functions
- Concept of the price elasticity of demand
- Key concepts of behavioral pricing
- Decision-making areas in pricing

Annotation
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

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

T 4.183 Course: Probability Theory and Combinatorial Optimization [T-MATH-105923]

Responsible: Prof. Dr. Daniel Hug
Prof. Dr. Günter Last

Organisation: KIT Department of Mathematics

Part of: M-MATH-102947 - Probability Theory and Combinatorial Optimization

Type	Credits	Version
Oral examination	8	1

Prerequisites
none

T 4.184 Course: Process Mining [T-WIWI-109799]

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

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	2

Events					
SS 2019	2511204	Process Mining	2 SWS	Lecture (V)	Oberweis
SS 2019	2511205	Exercise Process Mining	1 SWS	Practice (Ü)	Oberweis, Ullrich
Exams					
SS 2019	7900048	Process Mining		Prüfung (PR)	Oberweis
WS 19/20	7900033	Process Mining		Prüfung (PR)	Oberweis

Competence Certificate
The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation in the first week after lecture period.

Prerequisites
None

Annotation
Former name (up to winter semester 2018/1019) "Workflow Management".

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

V Process Mining

2511204, SS 2019, 2 SWS, Language: German, Open in study portal

Lecture (V)

Learning Content
The area of process mining covers approaches which aim at deducting new knowledge on the basis of logfiles generated by information systems. Such information systems are e.g., workflow-management-systems which are used for an efficient control of processes in enterprises and organisations. The lecture introduces the foundations of processes and respective modeling and analysis techniques. In the following, the foundations of process mining and the three classical types of approaches - discovery, conformance and enhancement - will be taught. In addition to the theoretical basics, tools, application scenarios in practice and open research questions are covered as well.

Workload
Lecture 30h
Exercise 15h

Preparation of lecture 30h
Preparation of exercises 30h
Exam preparation 44h
Exam 1h

Total: 150h

Literature

- W. van der Aalst, H. van Kees: Workflow Management: Models, Methods and Systems, Cambridge, The MIT Press, 2002.
- W. van der Aalst: Process Mining: Data Science in Action. Springer, 2016.
- J. Carmona, B. van Dongen, A. Solti, M. Weidlich: Conformance Checking: Relating Processes and Models. Springer, 2018.
- A. Drescher, A. Koschmider, A. Oberweis: Modellierung und Analyse von Geschäftsprozessen: Grundlagen und Übungsaufgaben mit Lösungen. De Gruyter Studium, 2017.
- A. Oberweis: Modellierung und Ausführung von Workflows mit Petri-Netzen. Teubner-Reihe Wirtschaftsinformatik, B.G. Teubner Verlag, 1996.
- R. Peters, M. Nauroth: Process-Mining: Geschäftsprozesse: smart, schnell und einfach, Springer, 2019.
- F. Schönthaler, G.Vossen, A. Oberweis, T. Karle: Business Processes for Business Communities: Modeling Languages, Methods, Tools. Springer, 2012.
- M. Weske: Business Process Management: Concepts, Languages, Architectures. Springer, 2012.
-

Further literature is given in the lecture.

T 4.185 Course: Product and Innovation Management [T-WIWI-109864]

Responsible: Prof. Dr. Martin Klarmann
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101490 - Marketing Management

Type	Credits	Recurrence	Version
Written examination	3	Each summer term	1

Events					
SS 2019	2571154	Product and Innovation Management	2 SWS	Lecture (V)	Klarmann
Exams					
SS 2019	7900024	Product- and Innovation Management		Prüfung (PR)	Klarmann
SS 2019	7900204	Product and Innovation Management		Prüfung (PR)	Klarmann

Competence Certificate
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

Prerequisites
None

Annotation
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

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

V Product and Innovation Management

2571154, SS 2019, 2 SWS, Language: English, Open in study portal

Lecture (V)

Learning Content
This course addresses topics around the management of new as well as existing products. After the foundations of product management, especially the product choice behavior of customers, students get to know in detail different steps of the innovation process. Another section regards the management of the existing product portfolio.

Annotation
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

Workload
Total effort for 3 credit points: approx. 90 hours

Presence time: 30 hours

Preparation and wrap-up of LV: 45.0 hours

Exam and exam preparation: 15.0 hours

Literature
Homburg, Christian (2016), Marketingmanagement, 6. ed., Wiesbaden.

T 4.186 Course: Project Centered Software-Lab [T-MATH-105907]

Responsible: PD Dr. Gudrun Thäter
Organisation: KIT Department of Mathematics
Part of: M-MATH-102938 - Project Centered Software-Lab

Type	Credits	Version
Examination of another type	4	1

Events					
SS 2019	0161700	Projektorientiertes Softwarepraktikum	4 SWS	Practical course (P)	Thäter, Krause, Klemens
Exams					
SS 2019	7700054	Project Centered Software-Lab		Prüfung (PR)	Krause

Prerequisites
none

T 4.187 Course: Project Lab Cognitive Automobiles and Robots [T-WIWI-109985]

Responsible: Prof. Dr.-Ing. Johann Marius Zöllner
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

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

Events					
WS 19/20	2512501	Project lab Cognitive automobiles and robots	3 SWS	Practical course (P)	Zöllner
Exams					
WS 19/20	7900107	Advanced Lab Cognitive Automobile and Robots		Prüfung (PR)	Zöllner

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 Project lab Cognitive automobiles and robots

2512501, WS 19/20, 3 SWS, Language: German/English, Open in study portal

Practical course (P)

Notes
Learning objectives:

- Students can practically apply knowledge from the Machine Learning lecture in a selected field of current research in robotics or cognitive automobiles.
- The students master the analysis and solution of corresponding problems in the team.
- The students can evaluate, document and present their concepts and results.

Workload:

The workload of 4.5 credits consists of time of attendance at the test site for the practical implementation of the chosen solution, as well as the time for literature research and planning / specification of the planned solution. In addition, a short report and a presentation of the work carried out will be prepared.

4.188 Course: Project Lab Machine Learning [T-WIWI-109983]

Responsible: Prof. Dr.-Ing. Johann Marius Zöllner
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

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

Events					
SS 2019	2512500	Projektpraktikum Maschinelles Lernen	3 SWS	Practical course (P)	Zöllner
Exams					
SS 2019	7900086	Project Lab Machine Learning		Prüfung (PR)	Zöllner

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

T 4.189 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

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2561127	Public Management	3 SWS	Lecture / Practice (VÜ)	Wigger
Exams					
SS 2019	790puma	Public Management		Prüfung (PR)	Wigger
WS 19/20	790puma	Public Management		Prüfung (PR)	Wigger

Competence Certificate
The assessment consists of an 1h written exam following Art. 4, para. 2, clause 1 of the examination regulation. The grade for this course equals the grade of the written exam.

Prerequisites
None

Recommendation
Basic knowledge of Public Finance is required.

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

V Public Management
2561127, WS 19/20, 3 SWS, Language: German, Open in study portal

Lecture / Practice (VÜ)

Learning Content
The lecture "Public Management" deals with the economic theory of public sector administration. It is divided into four parts. The first section gives an overview of the legal framework of governmental administration in the Federal Republic of Germany and introduces the classical theory of administration as developed by Weber. Part two studies concepts of public decision-making, which have a significant impact on the operation of public sector administrations and where one focus is on consistency problems of collective decision-making. The third chapter deals with efficiency problems arising in conventionally organized public administrations and companies. X-inefficiency, information and control problems, the isolated consideration of income-spending-relations as well as rent-seeking problems will be considered. In section four the concept of New Public Management, which is a new approach to public sector administration that is mainly based in contract theory, is introduced. Its foundations in institutional economics are developed, with a focus on the specific incentive structures in self-administered administrations. Finally, the achievements of New Public Management approaches are discussed.

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

Literature
Elective literature:

- Damkowski, W. and C. Precht (1995): Public Management; Kohlhammer
- Richter, R. and E.G. Furubotn (2003): Neue Institutionenökonomik; 3rd edition; Mohr
- Schedler, K. and I. Proeller (2003): New Public Management; 2nd edition; UTB
- Mueller, D.C. (2009): Public Choice III; Cambridge University Press
- Wigger, B.U. (2006): Grundzüge der Finanzwissenschaft; 2nd edition; Springer

T 4.190 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	Credits	Recurrence	Version
Examination of another type	3	Each winter term	1

Events					
WS 19/20	2500016	Python for Computational Risk and Asset Management	2 SWS	Practical course (P)	Ulrich

Competence Certificate
The assessment is carried out in form of twelve weekly Python programming tasks and offered each winter term. The grade of this course is determined by the points achieved in the programming tasks.

Prerequisites
None.

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

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

V Python for Computational Risk and Asset Management

2500016, WS 19/20, 2 SWS, Language: English, Open in study portal

Practical course (P)

Description
The aim of this course is to provide students with strong knowledge in Python to independently solve real-world data problems related to automated robo investment advisory.

Learning Content
The course covers several topics from a programming perspective, among them:

Quantitative Portfolio Strategies: Extensions to Mean-Variance Portfolio Optimization

Return Densities: Forecasting with Traditional and Machine Learning Approaches, Monte Carlo Simulation

Financial Economics: Rationalizing Risk Premiums via Stochastic Discount Factor

Multi-Asset Valuation: DCF Approach, No-Arbitrage and Ito Calculus

Workload
The total workload for this course is approximately 90 hours.

T 4.191 Course: Random Graphs [T-MATH-105929]

Responsible: Dr. Matthias Schulte
Organisation: KIT Department of Mathematics
Part of: M-MATH-102951 - Random Graphs

Type	Credits	Version
Oral examination	6	1

Prerequisites
none

T 4.192 Course: Ruin Theory [T-MATH-108400]

Responsible: Prof. Dr. Vicky Fasen-Hartmann
Organisation: KIT Department of Mathematics
Part of: M-MATH-104055 - Ruin Theory

Type	Credits	Recurrence	Version
Oral examination	4	Irregular	1

Prerequisites
none

T 4.193 Course: Scattering Theory [T-MATH-105855]

Responsible: PD Dr. Tilo Arens
PD Dr. Frank Hettlich
Prof. Dr. Andreas Kirsch

Organisation: KIT Department of Mathematics

Part of: M-MATH-102884 - Scattering Theory

Type	Credits	Version
Oral examination	8	1

Events					
SS 2019	0156000	Streutheorie	4 SWS	Lecture (V)	Griesmaier
SS 2019	0156010	Übungen zu 0156000 (Streutheorie)	2 SWS	Lecture (V)	Griesmaier
Exams					
SS 2019	77202	Streutheorie		Prüfung (PR)	Griesmaier

4.194 Course: Selected Issues in Critical Information Infrastructures [T-WIWI-109251]

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

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

Events					
SS 2019	2513401	Selected Issues in Critical Information Infrastructures	SWS	Seminar (S)	Sunyaev, Lins
Exams					
SS 2019	7900114	Selected Issues in Critical Information Infrastructures		Prüfung (PR)	Sunyaev

Competence Certificate
Alternative exam assessment (§ 4(2), 3 SPO). Details will be announced in the respective course.

Prerequisites
None.

Annotation
T-WIWI-109251 "Selected Issues in Critical Information Infrastructures" serves to credit an extracurricular course in the module "Critical Digital Infrastructures".

T 4.195 Course: Selected Topics in Harmonic Analysis [T-MATH-109065]

Responsible: Prof. Dr. Dirk Hundertmark
Organisation: KIT Department of Mathematics
Part of: M-MATH-104435 - Selected Topics in Harmonic Analysis

Type	Credits	Recurrence	Version
Oral examination	3	Irregular	1

Prerequisites
none

T 4.196 Course: Semantic Web Technologies [T-WIWI-102874]

Responsible: Prof. Dr. York Sure-Vetter
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	2

Events					
SS 2019	2511310	Semantic Web Technologies	2 SWS	Lecture (V)	Sure-Vetter, Acosta Deibe, Käfer
SS 2019	2511311	Exercises to Semantic Web Technologies	1 SWS	Practice (Ü)	Sure-Vetter, Acosta Deibe, Käfer
Exams					
SS 2019	7900028	Semantic Web Technologies		Prüfung (PR)	Sure-Vetter
WS 19/20	7900022	Semantic Web Technologies		Prüfung (PR)	Sure-Vetter

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:

V Semantic Web Technologies

2511310, SS 2019, 2 SWS, Language: English, Open in study portal

Lecture (V)

Description
The aim of the Semantic Web is to make the meaning (semantics) of data on the web usable in intelligent systems, e.g. in e-commerce and internet portals

Central concepts are the representation of knowledge in form of RDF and ontologies, the access via Linked Data, as well as querying the data by using SPARQL. This lecture provides the foundations of knowledge representation and processing for the corresponding technologies and presents example applications.

Learning Content
The following topics are covered:

- Resource Description Framework (RDF) and RDF Schema (RDFS)
- Web Architecture and Linked Data
- Web Ontology Language (OWL)
- Query language SPARQL
- Rule languages
- Applications

Workload

- The total workload for this course is approximately 150 hours
- Time of presentness: 45 hours
- Time of preperation and postprocessing: 67.5 hours
- Exam and exam preperation: 37.5 hours

Literature

- Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, York Sure: Semantic Web – Grundlagen. Springer, 2008.
- John Domingue, Dieter Fensel, James A. Hendler (Editors). Handbook of Semantic Web Technologies. Springer, 2011.

Additional Literature

- S. Staab, R. Studer (Editors). Handbook on Ontologies. International Handbooks in Information Systems. Springer, 2003.
- Tim Berners-Lee. Weaving the Web. Harper, 1999 geb. 2000 Taschenbuch.
- Ian Jacobs, Norman Walsh. Architecture of the World Wide Web, Volume One. W3C Recommendation 15 December 2004. http://www.w3.org/TR/webarch/
- Dean Allemang. Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL. Morgan Kaufmann, 2008.
- Tom Heath and Chris Bizer. Linked Data: Evolving the Web into a Global Data Space. Synthesis Lectures on the Semantic Web: Theory and Technology, 2011.

V **Exercises to Semantic Web Technologies** **Practice (Ü)**
2511311, SS 2019, 1 SWS, Language: English, Open in study portal

Description
Multiple exercises are held that capture the topics, held in the lecture Semantic Web Technologies, and discuss them in detail. Thereby, practical examples are given to the students in order to transfer theoretical aspects into practical implementation.

Learning Content
The following topics are covered:

- Resource Description Framework (RDF) and RDF Schema (RDFS)
- Web Architecture and Linked Data
- Web Ontology Language (OWL)
- Query language SPARQL
- Rule languages
- Applications

Workload
The total workload for the lecture Semantic Web Technologiesis given out on the description of the lecture.

Literature

- Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, York Sure: Semantic Web – Grundlagen. Springer, 2008.
- John Domingue, Dieter Fensel, James A. Hendler (Editors). Handbook of Semantic Web Technologies. Springer, 2011.

Additional Literature

- S. Staab, R. Studer (Editors). Handbook on Ontologies. International Handbooks in Information Systems. Springer, 2003.
- Tim Berners-Lee. Weaving the Web. Harper, 1999 geb. 2000 Taschenbuch.
- Ian Jacobs, Norman Walsh. Architecture of the World Wide Web, Volume One. W3C Recommendation 15 December 2004. http://www.w3.org/TR/webarch/
- Dean Allemang. Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL. Morgan Kaufmann, 2008.
- Tom Heath and Chris Bizer. Linked Data: Evolving the Web into a Global Data Space. Synthesis Lectures on the Semantic Web: Theory and Technology, 2011.

T 4.197 Course: Seminar in Business Administration A (Master) [T-WIWI-103474]

Responsible: Professorenschaft des Fachbereichs Betriebswirtschaftslehre
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-102971 - Seminar

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

Events					
SS 2019	2400121	Interactive Analytics Seminar	2 SWS		Beigl, Mädche, Pescara, Toreini
SS 2019	2500006	Seminar Human Resource Management (Master)	2 SWS	Seminar (S)	Nieken, Mitarbeiter
SS 2019	2500007	Seminar Human Resources and Organizations (Master)	2 SWS	Seminar (S)	Nieken, Mitarbeiter
SS 2019	2530372	Automated Financial Advisory	2 SWS	Seminar (S)	Ulrich
SS 2019	2530374	Applied Risk and Asset Management	2 SWS	Seminar (S)	Ulrich
SS 2019	2530580	Seminar in Finance (Master, Prof. Uhrig-Homburg)	2 SWS	Seminar (S)	Uhrig-Homburg, Hofmann, Reichenbacher, Eska
SS 2019	2540510	Masterseminar Big Data Mining in Finance	2 SWS	Seminar (S)	Geyer-Schulz
SS 2019	2540559	Digital Service Design Seminar	3 SWS	Seminar (S)	Mädche
SS 2019	2550493	Hospital Management	2 SWS	Block (B)	Hansis
SS 2019	2577915	Strategische Unternehmensführung	2 SWS	Seminar (S)	Klopfer
SS 2019	2579904	Seminar Management Accounting	2 SWS	Seminar (S)	Hammann, Disch
SS 2019	2579905	Special Topics in Management Accounting	2 SWS	Seminar (S)	Mickovic, Riar
SS 2019	2581977	Seminar Produktionswirtschaft und Logistik II	2 SWS	Seminar (S)	Schultmann
WS 19/20	2500006	Seminar Human Resource Management (Master)	2 SWS	Seminar (S)	Nieken, Mitarbeiter
WS 19/20	2500007	Seminar Human Resources and Organizations (Master)	2 SWS	Seminar (S)	Nieken, Mitarbeiter
WS 19/20	2500029	Seminar in Data Science for Finance	2 SWS	Seminar (S)	Ulrich
WS 19/20	2530293		2 SWS	Seminar (S)	Ruckes, Hoang, Benz, Strych, Luedecke, Silbereis, Stengel, Schubert
WS 19/20	2540473	Data Science in Service Management	2 SWS	Seminar (S)	Haubner, Frankenhauser, Gröschel
WS 19/20	2540475	Electronic Markets & User behavior	2 SWS	Seminar (S)	Dorner, Knierim, Dann, Jaquart
WS 19/20	2540477	Digital Experience and Participation	2 SWS	Seminar (S)	Straub, Peukert, Hoffmann, Kloker, Pusmaz, Willrich, Kloepper, Fegert, Greif-Winzrieth
WS 19/20	2540478	Smart Grids and Energy Markets	2 SWS	Seminar (S)	Dinther, Staudt, Richter, Huber, vom Scheidt, Golla

WS 19/20	2540510	Masterseminar in Data Science and Machine Learning	2 SWS	Seminar (S)	Geyer-Schulz, Schweigert, Schweizer, Nazemi
WS 19/20	2540557	Literature Review Seminar: Information Systems and Service Design	3 SWS	Seminar (S)	Mädche
WS 19/20	2540559	Digital Service Design Seminar	3 SWS	Seminar (S)	Mädche
WS 19/20	2572181		2 SWS	Seminar (S)	Klarmann
WS 19/20	2573010	Seminar: Human Resources and Organizations (Bachelor)	2 SWS	Seminar (S)	Nieken, Mitarbeiter
WS 19/20	2573011	Seminar: Human Resource Management (Bachelor)	2 SWS	Seminar (S)	Nieken, Mitarbeiter
WS 19/20	2577915	Strategische Unternehmensführung	2 SWS	Seminar (S)	Klopfer
WS 19/20	2581976	Seminar in Production and Operations Management I	2 SWS	Seminar (S)	Glöser-Chahoud, Schultmann
WS 19/20	2581977	Seminar in Production and Operations Management II	2 SWS	Seminar (S)	Volk, Schultmann
WS 19/20	2581978	Seminar in Production and Operations Management III	2 SWS	Seminar (S)	Wiens, Schultmann
WS 19/20	2581980		2 SWS	Seminar (S)	Keles, Fett, Yilmaz
WS 19/20	2581981		2 SWS	Seminar (S)	Ardone, Ruppert, Sandmeier, Slednev
WS 19/20	2581990		2 SWS	Seminar (S)	Schultmann, Schumacher
Exams					
SS 2019	00019	Seminar Digital Service Innovation		Prüfung (PR)	Satzger
SS 2019	7500148	Proseminar: Practical Seminar: Interactive Analytics		Prüfung (PR)	Beigl, Mädche
SS 2019	7900008	Hospital Management		Prüfung (PR)	Nickel
SS 2019	7900017	Soziale Innovationen unter die Lupe genommen		Prüfung (PR)	Weissenberger-Eibl
SS 2019	7900052	Entrepreneurship Research		Prüfung (PR)	Terzidis
SS 2019	7900055	Roadmapping		Prüfung (PR)	Weissenberger-Eibl
SS 2019	7900093	Seminar in Business Administration A		Prüfung (PR)	Weinhardt
SS 2019	7900126	Seminar Strategic Management		Prüfung (PR)	Lindstädt
SS 2019	7900127	Seminar in Finance (Master)		Prüfung (PR)	Uhrig-Homburg
SS 2019	7900180	Seminar in Business Administration		Prüfung (PR)	Weinhardt
SS 2019	7900214	Seminar Business Data Analytics (Master)		Prüfung (PR)	Weinhardt
SS 2019	7900242	Applied Risk and Asset Management		Prüfung (PR)	Ulrich
SS 2019	7900244	Digital Service Design Seminar		Prüfung (PR)	Mädche
SS 2019	7900256	Seminar Electronic Markets & User Behavior		Prüfung (PR)	Weinhardt
SS 2019	7900261	Information Systems and Design (ISSD) Seminar		Prüfung (PR)	Mädche
SS 2019	7900262	Practical Seminar: Information Systems and Service Design / Seminarpraktikum: Information Systems und Service Design		Prüfung (PR)	Mädche
SS 2019	7900265	Interactive Analytics Seminar		Prüfung (PR)	Mädche
SS 2019	7900284	Digital Transformation and Business Models		Prüfung (PR)	Weissenberger-Eibl
SS 2019	79-2579904-02	Seminar Management Accounting (Master)		Prüfung (PR)	Wouters
SS 2019	79-2579905-02	Seminar Special Topics in Management Accounting (Master)		Prüfung (PR)	Wouters
SS 2019	7981976	Seminar in Production and Operations Management I		Prüfung (PR)	Schultmann
SS 2019	7981978	Seminar in Production and Operations Management III		Prüfung (PR)	Schultmann

SS 2019	7981979	Seminar Energy Economics I	Prüfung (PR)	Fichtner
SS 2019	7981981	Seminar Energy Economics III	Prüfung (PR)	Fichtner
WS 19/20	7900017	Seminar Smart Grid and Energy Markets	Prüfung (PR)	Weinhardt
WS 19/20	7900159	Seminar in Marketing and Sales	Prüfung (PR)	Klarmann
WS 19/20	7900163	Seminar Human Resource Management (Master)	Prüfung (PR)	Nieken
WS 19/20	7900164	Seminar Human Resources and Organizations (Master)	Prüfung (PR)	Nieken
WS 19/20	7900165	Seminar Digital Experience and Participation	Prüfung (PR)	Weinhardt

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:

V **Seminar Human Resource Management (Master)** — **Seminar (S)**
2500006, SS 2019, 2 SWS, Open in study portal

Notes
See Module Handbook

V **Seminar Human Resources and Organizations (Master)** — **Seminar (S)**
2500007, SS 2019, 2 SWS, Open in study portal

Notes
See Module Handbook

V **Automated Financial Advisory** — **Seminar (S)**
2530372, SS 2019, 2 SWS, Language: English, Open in study portal

Learning Content
At the beginning of the semester, a selection of seminar topics will be discussed with each student of the seminar.

Workload
The total workload for this course is approximately 90 hours.

Literature
Literature will be distributed during the first lecture.

V **Seminar in Finance (Master, Prof. Uhrig-Homburg)** **Seminar (S)**
2530580, SS 2019, 2 SWS, Language: German, Open in study portal

Learning Content
Within this seminar different topics of current concern are treated. These topics have their foundations in the contents of certain lectures.

The topics of the seminar are published on the website of the involved finance chairs at the end of the foregoing semester.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced at the end of the foregoing semester.

V **Masterseminar Big Data Mining in Finance** **Seminar (S)**
2540510, SS 2019, 2 SWS, Language: German/English, Open in study portal

Literature
Literature:

- Goodfellow, I., Bengio, Y., & Courville, A. (2017). Deep Learning. MIT Press.
- Jean, N., Burke, M., Xie, M., Davis, W. M., Lobell, D. B., & Ermon, S. (2016). Combining satellite imagery and machine learning to predict poverty. *Science*, *353*(6301), 790-794.
- LeCun, Y., Bengio, Y., & Hinton, G. (2015). Deep learning. N*ature*, *521*(7553), 436-444.
- Leskovec, J., Rajaraman, A., & Ullman, J. D. (2014). Mining of Massive Datasets. Cambridge University Press.
- Lopez De Prado, M. (2018). Advances in Financial Machine Learning. John Wiley & Sons

V **Hospital Management** **Block (B)**
2550493, SS 2019, 2 SWS, Language: German, Open in study portal

Description
The seminar 'Hospital Management' presents internal organization structures, work conditions and work environments at the example of hospitals und relates this to common and expected conditions of other service industries.

Covered topics include normative environment, intra-organizational structure, personnel management, quality, external networking and market appearance. The course consists of two full-day sessions.

Learning Content
The seminar 'Hospital Management' presents internal organization structures, work conditions and work environments at the example of hospitals und relates this to common and expected conditions of other service industries.

Covered topics include normative environment, intra-organizational structure, personnel management, quality, external networking and market appearance. The course consists of two full-day sessions.

Annotation
It is planned to offer the course every semester.

Workload
The total workload for this course is approximately 90 hours.

V **Seminar Management Accounting** **Seminar (S)**
2579904, SS 2019, 2 SWS, Language: English, Open in study portal

Notes
see Module Handbook

Learning Content
The course will be a mix of lectures, discussions, and student presentations. Students will write a paper in small groups, and present this in the final week. You are to a large extent free to select your own topic. The seminar course is concentrated in four meetings that are spread throughout the semester.

Meeting 1: Introductory lecture. You need to conduct a first literature search and at the end of the first week you should identify (provisionally) the topic for your paper.

Meeting 2 and 3: The purpose of the second week is to define the topics and research questions in much more detail. Different types of papers may be selected: literature review, research paper, descriptive case study, or teaching case. Students will present their ideas and all participants should ask questions, help each other focus, offer ideas, etc.

Meeting 4: In the third week we are going to present and discuss the final papers.

Annotation
Maximum of 24 students.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced in the course.

V	**Special Topics in Management Accounting** 2579905, SS 2019, 2 SWS, Language: English, Open in study portal	**Seminar (S)**

Notes
see Module Handbook

Learning Content
The course will be a mix of lectures, discussions, and student presentations. Students will write a paper in small groups, and present this in the final week. Topics are selectively prediscibed. The seminar course is concentrated in four meetings that are spread throughout the semester.

Meeting 1: Introductory lecture. You need to conduct a first literature search and at the end of the first week you should identify (provisionally) the topic for your paper.

Meeting 2 and 3: The purpose of the second week is to define the topics and research questions in much more detail. Different types of papers may be selected: literature review, research paper, descriptive case study, or teaching case. Students will present their ideas and all participants should ask questions, help each other focus, offer ideas, etc.

Meeting 4: In the third week we are going to present and discuss the final papers.

Annotation
Maximum of 24 students.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced in the course.

V	**Seminar Human Resource Management (Master)** 2500006, WS 19/20, 2 SWS, Open in study portal	**Seminar (S)**

Notes
See Module Handbook

V	**Seminar Human Resources and Organizations (Master)** 2500007, WS 19/20, 2 SWS, Open in study portal	**Seminar (S)**

Notes
See Module Handbook

V

Seminar in Data Science for Finance

2500029, WS 19/20, 2 SWS, Language: English, Open in study portal

Seminar (S)

Description
The aim of this seminar is to master real-world challenges of computational risk and asset management. The CRAM team offers a wide range of topics across different asset classes and different stages of the investment process.

Learning Content
Students will work on a quantitative problem related to risk and asset management. This seminar is ideally suited for students who want to deepen and apply their statistics / programming skills and knowledge about financial markets. Industry-relevant problems will be solved with financial data and modern statistical tools in close collaboration with a supervisor. Topics which students solved in the past include the option-based pricing of dividends during the Euro crisis, the estimation of risk neutral moments with high-frequent data and the application of a particle filter to estimate stochastic volatility. The current topics will be presented during the first meeting.

V

Data Science in Service Management

2540473, WS 19/20, 2 SWS, Language: German/English, Open in study portal

Seminar (S)

Notes
wird auf deutsch und englisch gehalten

V

Masterseminar in Data Science and Machine Learning

2540510, WS 19/20, 2 SWS, Language: German, Open in study portal

Seminar (S)

Workload
The total workload for this course is approximately 90 hours (3 ECTS). Depending on the realization of the work, the times may vary. The main focus is always on working independently.

V

Digital Service Design Seminar

2540559, WS 19/20, 3 SWS, Open in study portal

Seminar (S)

Description
Contemporary trends of every increasing digitalization in businesses lead to new challenges and fusion of technologies blurring the lines between the digital, physical and biological spheres, thereby calling for a new approaches for corporate management. Recently, physician Michio Kaku put it like the following: "The destiny of computers – like other mass technologies like electricity, paper, and running water- is to become invisible, that is, to disappear into the fabric of our lives, to be everywhere and nowhere, silently and seamlessly carrying out our wishes." Michio Kaku (2016)

In the Practical Seminar Digital Service Design students address a real-world challenge in businesses and apply digital service design practices and tools. Furthermore, during the time of the seminar the students prototypical implement a running digital service.

Real-world challenges will vary over time. This time, the challenges are from the domain of **Future Corporate Management.** The practical seminar is carried out in close cooperation with SAP SE and leverages state-of-the-art digital platforms for prototyping.

Learning Content

- Foundations
- Digital Service Design Challenges in Future Corporate Management
- Basics of Digital Service Design practices and tools
- Prototyping and development Digital Services
- Delivering digital service prototypes

V

2572181, WS 19/20, 2 SWS, Language: German, Open in study portal

Seminar (S)

Learning Content
The seminary teaches students to gain a systematic overview of a field of literature in Marketing - an important prerequisite for a successful master thesis. Central aspects are identification of relevant literature sources, systematization of the field, working out central insights, writing comprehensively, and identification of research gaps.

Annotation
Students interested in master thesis positions at the chair of marketing should participate in the marketing seminar. For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu)

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
will be announced in the seminary.

V	**Seminar: Human Resources and Organizations (Bachelor)** 2573010, WS 19/20, 2 SWS, Open in study portal	**Seminar (S)**

Notes
See Module Handbook

V	**Seminar: Human Resource Management (Bachelor)** 2573011, WS 19/20, 2 SWS, Open in study portal	**Seminar (S)**

Notes
See Module Handbook

T 4.198 Course: Seminar in Business Administration B (Master) [T-WIWI-103476]

Responsible: Professorenschaft des Fachbereichs Betriebswirtschaftslehre
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-102972 - Seminar

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

Events					
SS 2019	2500006	Seminar Human Resource Management (Master)	2 SWS	Seminar (S)	Nieken, Mitarbeiter
SS 2019	2500007	Seminar Human Resources and Organizations (Master)	2 SWS	Seminar (S)	Nieken, Mitarbeiter
SS 2019	2530372	Automated Financial Advisory	2 SWS	Seminar (S)	Ulrich
SS 2019	2530374	Applied Risk and Asset Management	2 SWS	Seminar (S)	Ulrich
SS 2019	2530580	Seminar in Finance (Master, Prof. Uhrig-Homburg)	2 SWS	Seminar (S)	Uhrig-Homburg, Hofmann, Reichenbacher, Eska
SS 2019	2540510	Masterseminar Big Data Mining in Finance	2 SWS	Seminar (S)	Geyer-Schulz
SS 2019	2540559	Digital Service Design Seminar	3 SWS	Seminar (S)	Mädche
SS 2019	2550493	Hospital Management	2 SWS	Block (B)	Hansis
SS 2019	2577915	Strategische Unternehmensführung	2 SWS	Seminar (S)	Klopfer
SS 2019	2579904	Seminar Management Accounting	2 SWS	Seminar (S)	Hammann, Disch
SS 2019	2579905	Special Topics in Management Accounting	2 SWS	Seminar (S)	Mickovic, Riar
SS 2019	2581977	Seminar Produktionswirtschaft und Logistik II	2 SWS	Seminar (S)	Schultmann
WS 19/20	2500006	Seminar Human Resource Management (Master)	2 SWS	Seminar (S)	Nieken, Mitarbeiter
WS 19/20	2500007	Seminar Human Resources and Organizations (Master)	2 SWS	Seminar (S)	Nieken, Mitarbeiter
WS 19/20	2500029	Seminar in Data Science for Finance	2 SWS	Seminar (S)	Ulrich
WS 19/20	2530293		2 SWS	Seminar (S)	Ruckes, Hoang, Benz, Strych, Luedecke, Silbereis, Stengel, Schubert
WS 19/20	2540473	Data Science in Service Management	2 SWS	Seminar (S)	Haubner, Frankenhauser, Gröschel
WS 19/20	2540475	Electronic Markets & User behavior	2 SWS	Seminar (S)	Dorner, Knierim, Dann, Jaquart
WS 19/20	2540477	Digital Experience and Participation	2 SWS	Seminar (S)	Straub, Peukert, Hoffmann, Kloker, Pusmaz, Willrich, Kloepper, Fegert, Greif-Winzrieth
WS 19/20	2540478	Smart Grids and Energy Markets	2 SWS	Seminar (S)	Dinther, Staudt, Richter, Huber, vom Scheidt, Golla
WS 19/20	2540510	Masterseminar in Data Science and Machine Learning	2 SWS	Seminar (S)	Geyer-Schulz, Schweigert, Schweizer, Nazemi

WS 19/20	2540557	Literature Review Seminar: Information Systems and Service Design	3 SWS	Seminar (S)	Mädche
WS 19/20	2540559	Digital Service Design Seminar	3 SWS	Seminar (S)	Mädche
WS 19/20	2572181		2 SWS	Seminar (S)	Klarmann
WS 19/20	2573010	Seminar: Human Resources and Organizations (Bachelor)	2 SWS	Seminar (S)	Nieken, Mitarbeiter
WS 19/20	2573011	Seminar: Human Resource Management (Bachelor)	2 SWS	Seminar (S)	Nieken, Mitarbeiter
WS 19/20	2577915	Strategische Unternehmensführung	2 SWS	Seminar (S)	Klopfer
WS 19/20	2581976	Seminar in Production and Operations Management I	2 SWS	Seminar (S)	Glöser-Chahoud, Schultmann
WS 19/20	2581977	Seminar in Production and Operations Management II	2 SWS	Seminar (S)	Volk, Schultmann
WS 19/20	2581978	Seminar in Production and Operations Management III	2 SWS	Seminar (S)	Wiens, Schultmann
WS 19/20	2581980		2 SWS	Seminar (S)	Keles, Fett, Yilmaz
WS 19/20	2581981		2 SWS	Seminar (S)	Ardone, Ruppert, Sandmeier, Slednev
WS 19/20	2581990		2 SWS	Seminar (S)	Schultmann, Schumacher
Exams					
SS 2019	00019	Seminar Digital Service Innovation		Prüfung (PR)	Satzger
SS 2019	7900008	Hospital Management		Prüfung (PR)	Nickel
SS 2019	7900017	Soziale Innovationen unter die Lupe genommen		Prüfung (PR)	Weissenberger-Eibl
SS 2019	7900052	Entrepreneurship Research		Prüfung (PR)	Terzidis
SS 2019	7900055	Roadmapping		Prüfung (PR)	Weissenberger-Eibl
SS 2019	7900093	Seminar in Business Administration A		Prüfung (PR)	Weinhardt
SS 2019	7900126	Seminar Strategic Management		Prüfung (PR)	Lindstädt
SS 2019	7900127	Seminar in Finance (Master)		Prüfung (PR)	Uhrig-Homburg
SS 2019	7900180	Seminar in Business Administration		Prüfung (PR)	Weinhardt
SS 2019	7900214	Seminar Business Data Analytics (Master)		Prüfung (PR)	Weinhardt
SS 2019	7900242	Applied Risk and Asset Management		Prüfung (PR)	Ulrich
SS 2019	7900244	Digital Service Design Seminar		Prüfung (PR)	Mädche
SS 2019	7900256	Seminar Electronic Markets & User Behavior		Prüfung (PR)	Weinhardt
SS 2019	7900261	Information Systems and Design (ISSD) Seminar		Prüfung (PR)	Mädche
SS 2019	7900262	Practical Seminar: Information Systems and Service Design / Seminarpraktikum: Information Systems und Service Design		Prüfung (PR)	Mädche
SS 2019	7900265	Interactive Analytics Seminar		Prüfung (PR)	Mädche
SS 2019	7900284	Digital Transformation and Business Models		Prüfung (PR)	Weissenberger-Eibl
SS 2019	79-2579904-02	Seminar Management Accounting (Master)		Prüfung (PR)	Wouters
SS 2019	79-2579905-02	Seminar Special Topics in Management Accounting (Master)		Prüfung (PR)	Wouters
SS 2019	7981976	Seminar in Production and Operations Management I		Prüfung (PR)	Schultmann
SS 2019	7981978	Seminar in Production and Operations Management III		Prüfung (PR)	Schultmann
SS 2019	7981979	Seminar Energy Economics I		Prüfung (PR)	Fichtner
SS 2019	7981981	Seminar Energy Economics III		Prüfung (PR)	Fichtner
WS 19/20	7900017	Seminar Smart Grid and Energy Markets		Prüfung (PR)	Weinhardt
WS 19/20	7900159	Seminar in Marketing and Sales		Prüfung (PR)	Klarmann

WS 19/20	7900163	Seminar Human Resource Management (Master)	Prüfung (PR)	Nieken
WS 19/20	7900164	Seminar Human Resources and Organizations (Master)	Prüfung (PR)	Nieken
WS 19/20	7900165	Seminar Digital Experience and Participation	Prüfung (PR)	Weinhardt

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:

V **Seminar Human Resource Management (Master)** — **Seminar (S)**
2500006, SS 2019, 2 SWS, Open in study portal

Notes
See Module Handbook

V **Seminar Human Resources and Organizations (Master)** — **Seminar (S)**
2500007, SS 2019, 2 SWS, Open in study portal

Notes
See Module Handbook

V **Automated Financial Advisory** — **Seminar (S)**
2530372, SS 2019, 2 SWS, Language: English, Open in study portal

Learning Content
At the beginning of the semester, a selection of seminar topics will be discussed with each student of the seminar.

Workload
The total workload for this course is approximately 90 hours.

Literature
Literature will be distributed during the first lecture.

V **Seminar in Finance (Master, Prof. Uhrig-Homburg)** — **Seminar (S)**
2530580, SS 2019, 2 SWS, Language: German, Open in study portal

Learning Content
Within this seminar different topics of current concern are treated. These topics have their foundations in the contents of certain lectures.

The topics of the seminar are published on the website of the involved finance chairs at the end of the foregoing semester.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced at the end of the foregoing semester.

V **Masterseminar Big Data Mining in Finance**
2540510, SS 2019, 2 SWS, Language: German/English, Open in study portal
Seminar (S)

Literature
Literature:

- Goodfellow, I., Bengio, Y., & Courville, A. (2017). Deep Learning. MIT Press.
- Jean, N., Burke, M., Xie, M., Davis, W. M., Lobell, D. B., & Ermon, S. (2016). Combining satellite imagery and machine learning to predict poverty. *Science*, *353*(6301), 790-794.
- LeCun, Y., Bengio, Y., & Hinton, G. (2015). Deep learning. N*ature*, *521*(7553), 436-444.
- Leskovec, J., Rajaraman, A., & Ullman, J. D. (2014). Mining of Massive Datasets. Cambridge University Press.
- Lopez De Prado, M. (2018). Advances in Financial Machine Learning. John Wiley & Sons

V **Hospital Management**
2550493, SS 2019, 2 SWS, Language: German, Open in study portal
Block (B)

Description
The seminar 'Hospital Management' presents internal organization structures, work conditions and work environments at the example of hospitals und relates this to common and expected conditions of other service industries.

Covered topics include normative environment, intra-organizational structure, personnel management, quality, external networking and market appearance. The course consists of two full-day sessions.

Learning Content
The seminar 'Hospital Management' presents internal organization structures, work conditions and work environments at the example of hospitals und relates this to common and expected conditions of other service industries.

Covered topics include normative environment, intra-organizational structure, personnel management, quality, external networking and market appearance. The course consists of two full-day sessions.

Annotation
It is planned to offer the course every semester.

Workload
The total workload for this course is approximately 90 hours.

V **Seminar Management Accounting**
2579904, SS 2019, 2 SWS, Language: English, Open in study portal
Seminar (S)

Notes
see Module Handbook

Learning Content
The course will be a mix of lectures, discussions, and student presentations. Students will write a paper in small groups, and present this in the final week. You are to a large extent free to select your own topic. The seminar course is concentrated in four meetings that are spread throughout the semester.

Meeting 1: Introductory lecture. You need to conduct a first literature search and at the end of the first week you should identify (provisionally) the topic for your paper.

Meeting 2 and 3: The purpose of the second week is to define the topics and research questions in much more detail. Different types of papers may be selected: literature review, research paper, descriptive case study, or teaching case. Students will present their ideas and all participants should ask questions, help each other focus, offer ideas, etc.

Meeting 4: In the third week we are going to present and discuss the final papers.

Annotation
Maximum of 24 students.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced in the course.

V	**Special Topics in Management Accounting** 2579905, SS 2019, 2 SWS, Language: English, Open in study portal	**Seminar (S)**

Notes
see Module Handbook

Learning Content
The course will be a mix of lectures, discussions, and student presentations. Students will write a paper in small groups, and present this in the final week. Topics are selectively prediscibed. The seminar course is concentrated in four meetings that are spread throughout the semester.

Meeting 1: Introductory lecture. You need to conduct a first literature search and at the end of the first week you should identify (provisionally) the topic for your paper.

Meeting 2 and 3: The purpose of the second week is to define the topics and research questions in much more detail. Different types of papers may be selected: literature review, research paper, descriptive case study, or teaching case. Students will present their ideas and all participants should ask questions, help each other focus, offer ideas, etc.

Meeting 4: In the third week we are going to present and discuss the final papers.

Annotation
Maximum of 24 students.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced in the course.

V	**Seminar Human Resource Management (Master)** 2500006, WS 19/20, 2 SWS, Open in study portal	**Seminar (S)**

Notes
See Module Handbook

V	**Seminar Human Resources and Organizations (Master)** 2500007, WS 19/20, 2 SWS, Open in study portal	**Seminar (S)**

Notes
See Module Handbook

V	**Seminar in Data Science for Finance** 2500029, WS 19/20, 2 SWS, Language: English, Open in study portal	**Seminar (S)**

Description
The aim of this seminar is to master real-world challenges of computational risk and asset management. The CRAM team offers a wide range of topics across different asset classes and different stages of the investment process.

Learning Content
Students will work on a quantitative problem related to risk and asset management. This seminar is ideally suited for students who want to deepen and apply their statistics / programming skills and knowledge about financial markets. Industry-relevant problems will be solved with financial data and modern statistical tools in close collaboration with a supervisor. Topics which students solved in the past include the option-based pricing of dividends during the Euro crisis, the estimation of risk neutral moments with high-frequent data and the application of a particle filter to estimate stochastic volatility. The current topics will be presented during the first meeting.

V	**Data Science in Service Management** 2540473, WS 19/20, 2 SWS, Language: German/English, Open in study portal	**Seminar (S)**

Notes
wird auf deutsch und englisch gehalten

V	**Masterseminar in Data Science and Machine Learning** 2540510, WS 19/20, 2 SWS, Language: German, Open in study portal	**Seminar (S)**

Workload
The total workload for this course is approximately 90 hours (3 ECTS). Depending on the realization of the work, the times may vary. The main focus is always on working independently.

V	**Digital Service Design Seminar** 2540559, WS 19/20, 3 SWS, Open in study portal	**Seminar (S)**

Description
Contemporary trends of every increasing digitalization in businesses lead to new challenges and fusion of technologies blurring the lines between the digital, physical and biological spheres, thereby calling for a new approaches for corporate management. Recently, physician Michio Kaku put it like the following: “The destiny of computers – like other mass technologies like electricity, paper, and running water- is to become invisible, that is, to disappear into the fabric of our lives, to be everywhere and nowhere, silently and seamlessly carrying out our wishes.” Michio Kaku (2016)

In the Practical Seminar Digital Service Design students address a real-world challenge in businesses and apply digital service design practices and tools. Furthermore, during the time of the seminar the students prototypical implement a running digital service.

Real-world challenges will vary over time. This time, the challenges are from the domain of **Future Corporate Management.** The practical seminar is carried out in close cooperation with SAP SE and leverages state-of-the-art digital platforms for prototyping.

Learning Content

- Foundations
- Digital Service Design Challenges in Future Corporate Management
- Basics of Digital Service Design practices and tools
- Prototyping and development Digital Services
- Delivering digital service prototypes

V	2572181, WS 19/20, 2 SWS, Language: German, Open in study portal	**Seminar (S)**

Learning Content
The seminary teaches students to gain a systematic overview of a field of literature in Marketing - an important prerequisite for a successful master thesis. Central aspects are identification of relevant literature sources, systematization of the field, working out central insights, writing comprehensively, and identification of research gaps.

Annotation
Students interested in master thesis positions at the chair of marketing should participate in the marketing seminar. For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu)

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
will be announced in the seminary.

V **Seminar: Human Resources and Organizations (Bachelor)** — Seminar (S)
2573010, WS 19/20, 2 SWS, Open in study portal

Notes
See Module Handbook

V **Seminar: Human Resource Management (Bachelor)** — Seminar (S)
2573011, WS 19/20, 2 SWS, Open in study portal

Notes
See Module Handbook

T 4.199 Course: Seminar in Economics A (Master) [T-WIWI-103478]

Responsible: Professorenschaft des Fachbereichs Volkswirtschaftslehre
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-102971 - Seminar

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

Events					
SS 2019	2521310	Advanced Topics in Econometrics	2 SWS	Seminar (S)	Schienle, Chen, Görgen
SS 2019	2560282	Wirtschaftspolitisches Seminar	2 SWS	Seminar (S)	Ott, Assistenten
SS 2019	2560552	Topics in Political Economics (Master)	2 SWS	Seminar (S)	Szech, Maus
SS 2019	2560554	Morals and Social Behavior (Master)	2 SWS	Seminar (S)	Szech, Huber
WS 19/20	2560140	Topics on Political Economics (Bachelor)	2 SWS	Seminar (S)	Ehrlich, Huber
WS 19/20	2560141	Morals & Social Behavior (Bachelor & Master)	2 SWS	Seminar (S)	Huber, Ehrlich
WS 19/20	2560142	Topics on Political Economics (Master)	2 SWS	Seminar (S)	Ehrlich, Huber
WS 19/20	2561208	Ausgewählte Aspekte der europäischen Verkehrsplanung und -modellierung	1 SWS	Seminar (S)	Szimba
Exams					
SS 2019	7900051	Seminar in Economic Policy (Master)		Prüfung (PR)	Ott
SS 2019	7900059	Seminar in Economics B (Master)		Prüfung (PR)	Szech
SS 2019	7900060	Seminar in Economics B (Master)		Prüfung (PR)	Szech
SS 2019	7900147	Seminar in Economics (Bachelor)		Prüfung (PR)	Fuchs-Seliger
SS 2019	7900222	Seminar in Economics B (Master)		Prüfung (PR)	Melik-Tangian
SS 2019	7900237	Seminar Strategic Decisions		Prüfung (PR)	Ehrhart
SS 2019	7900266	Seminar in Macroeconomics I		Prüfung (PR)	Scheffel
SS 2019	7900272	Seminar in Macroeconomics II		Prüfung (PR)	Scheffel
SS 2019	7900282	Digital IT-Solutions and Services Transforming the Field of Public Transportation		Prüfung (PR)	Mitusch
SS 2019	791192ee	Topics in Experimental Economics		Prüfung (PR)	Reiß
SS 2019	79sefi2	Seminar Infrastructure and Science Networks A (Master)		Prüfung (PR)	Wigger
WS 19/20	7900103	Data-driven innovation and science communication (Master)		Prüfung (PR)	Ott
WS 19/20	7900132	Seminar in Economics A (Master)		Prüfung (PR)	Fuchs-Seliger
WS 19/20	79sefi2	Seminar in Economics A (Master)		Prüfung (PR)	Wigger

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:

V **Advanced Topics in Econometrics** **Seminar (S)**
2521310, SS 2019, 2 SWS, Language: English, Open in study portal

Annotation
The course will be offered in English.

V **Topics in Political Economics (Master)** **Seminar (S)**
2560552, SS 2019, 2 SWS, Language: English, Open in study portal

Description
In many companies relative reward schemes are used whereby employees earn a bonus if they perform better than their colleagues. Moreover, hierarchical structures mean that in many organizations, employees find themselves in constant competition for promotions. This is meant to provide incentives for higher performance. However, competitive remuneration schemes could also have detrimental effects such that individual workers may view their colleagues as direct competitors generating more selfish and/or less helpful behavior in the workplace. Furthermore, age, gender and culture seem to have impacts on willingness to compete. For example, in western cultures, adult men sometimes enter competition even though their performance level is way too low for success, i.e., they harm themselves by over-competitiveness. In contrast, adult females sometimes compete less than they could do successfully.

Another challenge in contest design, e.g. in sports, is that when competition takes place among workers with mixed abilities it may lead to a discouragement effect, which establishes that lower ability individuals often reduce effort competing against an individual they do not feel up to (e.g. it has been found that average golf players performed significantly worse when competing against a superstar like Tiger Woods). One solution suggested by the economic literature is to level the playing field between advantaged and disadvantaged individuals by favoring weaker individuals through bid-caps, asymmetric tie-breaking rules, or advances. In sports, asymmetric tie-breaking is already common, for instance, in the
Champions League soccer playoffs "away goals" become the decisive factor in determining the winning team in case of a tie.

Contests are not only a well-established mechanism for incentivizing workers but also for encouraging innovation and advancing R&D. Elements of research and innovation contests can be found in the procurement of various goods and services. For instance, the construction of new buildings, proposals in a venture capital firm or TV shows for entertainment companies all flow through a similar innovation process that involves the solicitation of bids from multiple potential suppliers and the preparation of a pilot or a proposal. In other cases, e.g., in lobbying contests, it is often discussed whether investments are beneficial or not. Some authors have argued that investments into lobbying should be capped in order to soften competition among asymmetrically strong interest groups (e.g. the lobbying industry versus consumers' interest groups). Of course, then the question arises whether such caps achieve the respective design goal or not.

In this seminar, we discuss questions like: How can we design workplaces and labor contracts to increase motivation and productivity? How can contests be used to foster innovation? Which role should social preferences play and how could they inspire specific contest designs? How should sport contests be engineered depending on the respective goals? How should we design lobbying contests?

Also related topics are very welcome!

Notes
Participation will be limited to 12 students.

Annotation
For further questions, please contact Patrick Maus (Patrick.Maus@kit.edu).

Workload
About 90 hours

Literature

Charness, G., Kuhn, P. (2011) Lab labor: What can labor economists learn from the lab? Handbook of labor economics, 4, 229-330.

Cassar, A., Friedman, D. (2004) Economics lab: an intensive course in experimental economics. Routledge.

Croson, R., Gneezy, U. (2009). Gender differences in preferences. Journal of Economic literature, 47(2), 448-474.

Dechenaux, Emmanuel, Dan Kovenock, and Roman M. Sheremeta. "A survey of experimental research on contests, all-pay auctions and tournaments." Experimental Economics 18.4 (2015): 609-669.

V **Morals and Social Behavior (Master)** Seminar (S)

2560554, SS 2019, 2 SWS, Language: English, Open in study portal

Description

For a long time, economists studied given markets and mechanisms to predict outcomes, future developments or generally the participants' behavior. In contrast, Market Design uses theory, empirical and experimental work to design markets which incentivize their participants in a way that leads to a "desirable" outcome. In this, the designer can have different objectives, for example: Maximizing efficiency, welfare or minimizing negative externalities.

Prominent applications of Market Design include, quite topical, Germany's auction of 5G mobile licenses and matching markets, where there are two large populations that need to be matched to one another (think of hospitals and interns, students and dorm rooms or kidney donors and receivers). In this seminar, we think about ways to either design new markets or how we could alter existing ones in a socially beneficial way. Alternatively, research ideas could focus on finding failures or shortcomings of ineffectively designed markets.

Notes

Participation will be limited to 12 students.

Annotation

For further questions, please contact David Huber (david.huber@kit.edu).

Workload

About 90 hours.

V **Topics on Political Economics (Bachelor)** Seminar (S)

2560140, WS 19/20, 2 SWS, Language: English, Open in study portal

Workload

About 90 hours.

V **Topics on Political Economics (Master)** Seminar (S)

2560142, WS 19/20, 2 SWS, Language: English, Open in study portal

Workload

About 90 hours.

T 4.200 Course: Seminar in Economics B (Master) [T-WIWI-103477]

Responsible: Professorenschaft des Fachbereichs Volkswirtschaftslehre
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-102972 - Seminar

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

Events					
SS 2019	2521310	Advanced Topics in Econometrics	2 SWS	Seminar (S)	Schienle, Chen, Görgen
SS 2019	2560282	Wirtschaftspolitisches Seminar	2 SWS	Seminar (S)	Ott, Assistenten
SS 2019	2560552	Topics in Political Economics (Master)	2 SWS	Seminar (S)	Szech, Maus
SS 2019	2560554	Morals and Social Behavior (Master)	2 SWS	Seminar (S)	Szech, Huber
WS 19/20	2560140	Topics on Political Economics (Bachelor)	2 SWS	Seminar (S)	Ehrlich, Huber
WS 19/20	2560141	Morals & Social Behavior (Bachelor & Master)	2 SWS	Seminar (S)	Huber, Ehrlich
WS 19/20	2560142	Topics on Political Economics (Master)	2 SWS	Seminar (S)	Ehrlich, Huber
WS 19/20	2561208	Ausgewählte Aspekte der europäischen Verkehrsplanung und -modellierung	1 SWS	Seminar (S)	Szimba
Exams					
SS 2019	7900051	Seminar in Economic Policy (Master)		Prüfung (PR)	Ott
SS 2019	7900059	Seminar in Economics B (Master)		Prüfung (PR)	Szech
SS 2019	7900060	Seminar in Economics B (Master)		Prüfung (PR)	Szech
SS 2019	7900147	Seminar in Economics (Bachelor)		Prüfung (PR)	Fuchs-Seliger
SS 2019	7900222	Seminar in Economics B (Master)		Prüfung (PR)	Melik-Tangian
SS 2019	7900237	Seminar Strategic Decisions		Prüfung (PR)	Ehrhart
SS 2019	7900266	Seminar in Macroeconomics I		Prüfung (PR)	Scheffel
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SS 2019	7900282	Digital IT-Solutions and Services Transforming the Field of Public Transportation		Prüfung (PR)	Mitusch
SS 2019	791192ee	Topics in Experimental Economics		Prüfung (PR)	Reiß
SS 2019	79sefi3	Seminar Infrastructure and Science Networks B (Master)		Prüfung (PR)	Wigger
WS 19/20	7900103	Data-driven innovation and science communication (Master)		Prüfung (PR)	Ott
WS 19/20	7900132	Seminar in Economics A (Master)		Prüfung (PR)	Fuchs-Seliger
WS 19/20	79sefi3	Seminar in Economics B (Master)		Prüfung (PR)	Wigger

Competence Certificate
Alternative exam assessment (§ 4(2), 3 SPO 2015). The following aspects are included:

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Prerequisites
None.

Recommendation
See seminar description in the course catalogue of the KIT (https://campus.kit.edu/)

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

V **Advanced Topics in Econometrics** **Seminar (S)**
2521310, SS 2019, 2 SWS, Language: English, Open in study portal

Annotation
The course will be offered in English.

V **Topics in Political Economics (Master)** **Seminar (S)**
2560552, SS 2019, 2 SWS, Language: English, Open in study portal

Description
In many companies relative reward schemes are used whereby employees earn a bonus if they perform better than their colleagues. Moreover, hierarchical structures mean that in many organizations, employees find themselves in constant competition for promotions. This is meant to provide incentives for higher performance. However, competitive remuneration schemes could also have detrimental effects such that individual workers may view their colleagues as direct competitors generating more selfish and/or less helpful behavior in the workplace. Furthermore, age, gender and culture seem to have impacts on willingness to compete. For example, in western cultures, adult men sometimes enter competition even though their performance level is way too low for success, i.e., they harm themselves by over-competitiveness. In contrast, adult females sometimes compete less than they could do successfully.

Another challenge in contest design, e.g. in sports, is that when competition takes place among workers with mixed abilities it may lead to a discouragement effect, which establishes that lower ability individuals often reduce effort competing against an individual they do not feel up to (e.g. it has been found that average golf players performed significantly worse when competing against a superstar like Tiger Woods). One solution suggested by the economic literature is to level the playing field between advantaged and disadvantaged individuals by favoring weaker individuals through bid-caps, asymmetric tie-breaking rules, or advances. In sports, asymmetric tie-breaking is already common, for instance, in the
Champions League soccer playoffs "away goals" become the decisive factor in determining the winning team in case of a tie.

Contests are not only a well-established mechanism for incentivizing workers but also for encouraging innovation and advancing R&D. Elements of research and innovation contests can be found in the procurement of various goods and services. For instance, the construction of new buildings, proposals in a venture capital firm or TV shows for entertainment companies all flow through a similar innovation process that involves the solicitation of bids from multiple potential suppliers and the preparation of a pilot or a proposal. In other cases, e.g., in lobbying contests, it is often discussed whether investments are beneficial or not. Some authors have argued that investments into lobbying should be capped in order to soften competition among asymmetrically strong interest groups (e.g. the lobbying industry versus consumers' interest groups). Of course, then the question arises whether such caps achieve the respective design goal or not.

In this seminar, we discuss questions like: How can we design workplaces and labor contracts to increase motivation and productivity? How can contests be used to foster innovation? Which role should social preferences play and how could they inspire specific contest designs? How should sport contests be engineered depending on the respective goals? How should we design lobbying contests?

Also related topics are very welcome!

Notes
Participation will be limited to 12 students.

Annotation
For further questions, please contact Patrick Maus (Patrick.Maus@kit.edu).

Workload
About 90 hours

Literature

Charness, G., Kuhn, P. (2011) Lab labor: What can labor economists learn from the lab? Handbook of labor economics, 4, 229-330.

Cassar, A., Friedman, D. (2004) Economics lab: an intensive course in experimental economics. Routledge.

Croson, R., Gneezy, U. (2009). Gender differences in preferences. Journal of Economic literature, 47(2), 448-474.

Dechenaux, Emmanuel, Dan Kovenock, and Roman M. Sheremeta. "A survey of experimental research on contests, all-pay auctions and tournaments." Experimental Economics 18.4 (2015): 609-669.

V Morals and Social Behavior (Master)

Seminar (S)

2560554, SS 2019, 2 SWS, Language: English, Open in study portal

Description

For a long time, economists studied given markets and mechanisms to predict outcomes, future developments or generally the participants' behavior. In contrast, Market Design uses theory, empirical and experimental work to design markets which incentivize their participants in a way that leads to a "desirable" outcome. In this, the designer can have different objectives, for example: Maximizing efficiency, welfare or minimizing negative externalities.

Prominent applications of Market Design include, quite topical, Germany's auction of 5G mobile licenses and matching markets, where there are two large populations that need to be matched to one another (think of hospitals and interns, students and dorm rooms or kidney donors and receivers). In this seminar, we think about ways to either design new markets or how we could alter existing ones in a socially beneficial way. Alternatively, research ideas could focus on finding failures or shortcomings of ineffectively designed markets.

Notes

Participation will be limited to 12 students.

Annotation

For further questions, please contact David Huber (david.huber@kit.edu).

Workload

About 90 hours.

V Topics on Political Economics (Bachelor)

Seminar (S)

2560140, WS 19/20, 2 SWS, Language: English, Open in study portal

Workload

About 90 hours.

V Topics on Political Economics (Master)

Seminar (S)

2560142, WS 19/20, 2 SWS, Language: English, Open in study portal

Workload

About 90 hours.

T 4.201 Course: Seminar in Informatics A (Master) [T-WIWI-103479]

Responsible: Professorenschaft des Fachbereichs Informatik
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-102973 - Seminar

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

Events					
SS 2019	2512300	Knowledge Discovery and Data Mining	3 SWS		Sure-Vetter, Färber, Nguyen, Weller
SS 2019	2513306	Data Science & Real-time Big Data Analytics	2 SWS		Sure-Vetter, Riemer, Zehnder
SS 2019	2513400	Emerging Trends in Critical Information Infrastructures	2 SWS	Seminar (S)	Lins, Sunyaev, Thiebes
SS 2019	2595470	Seminar Service Science, Management & Engineering	2 SWS	Seminar (S)	Weinhardt, Nickel, Fichtner, Satzger, Sure-Vetter, Fromm
WS 19/20	2400125	Security and Privacy Awareness	2 SWS	Seminar (S)	Boehm, Seidel-Saul, Volkamer, Aldag, Gerber, Gottschalk
WS 19/20	2512301	Linked Data and the Semantic Web	3 SWS		Sure-Vetter, Acosta Deibe, Käfer, Heling
WS 19/20	2512311	Real-World Challenges in Data Science and Analytics	3 SWS		Sure-Vetter, Nickel, Weinhardt, Zehnder, Brandt
WS 19/20	2513500	Cognitive Automobiles and Robots	2 SWS	Seminar (S)	Zöllner
WS 19/20	2595470	Seminar Service Science, Management & Engineering	3 SWS	Seminar (S)	Weinhardt, Satzger, Nickel, Fromm, Fichtner, Sure-Vetter

Exams				
SS 2019	7900090	Data Science & Real-time Big Data Analytics	Prüfung (PR)	Sure-Vetter
SS 2019	7900092	Seminar Service Science, Management & Engineering	Prüfung (PR)	Sure-Vetter
SS 2019	7900094	Knowledge Discovery and Data Mining	Prüfung (PR)	Sure-Vetter
SS 2019	7900114	Selected Issues in Critical Information Infrastructures	Prüfung (PR)	Sunyaev
SS 2019	7900187	Emerging Trends in Critical Information Infrastructures	Prüfung (PR)	Sunyaev
WS 19/20	7900038	Linked Data and the Semantic Web	Prüfung (PR)	Sure-Vetter
WS 19/20	7900044	Seminar Service Science, Management & Engineering	Prüfung (PR)	Sure-Vetter
WS 19/20	7900129	Security and Privacy Awareness	Prüfung (PR)	Volkamer
WS 19/20	7900187	Real-World Challenges in Data Science und Analytics	Prüfung (PR)	Sure-Vetter

Competence Certificate
Alternative exam assessment (§ 4(2), 3 SPO 2015). The following aspects are included:

- Regular participation in the seminar dates
- Preparation of a seminar paper on a partial aspect of the seminar topic according to scientific methods
- Lecture on the topic of the seminar paper.

The point scheme for the assessment is determined by the lecturer of the respective course. It will be announced at the beginning of the course.

Prerequisites
None.

Recommendation
See seminar description in the course catalogue of the KIT (https://campus.kit.edu/)

Annotation
Placeholder for seminars offered by the Institute AIFB.

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:

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

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

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

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

- Medicine
- Social Media
- Finance Market

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

- Mitchell, T.; Machine Learning
- McGraw Hill, Cook, D.J. and Holder, L.B. (Editors) Mining Graph Data, ISBN:0-471-73190-0
- Wiley, Manning, C. and Schütze, H.; Foundations of Statistical NLP, MIT Press, 1999.

V **Data Science & Real-time Big Data Analytics**
2513306, SS 2019, 2 SWS, Language: German/English, Open in study portal

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

V **Seminar Service Science, Management & Engineering** **Seminar (S)**
2595470, SS 2019, 2 SWS, Language: German, Open in study portal

Learning Content
Each Semester, the seminar will cover topics from a different selected subfield of Service Science, Management & Engineering. Topics include service innovation, service economics, service computing, transformation and coordination of service value networks as well as collaboration for knowledge intensive services.

See the KSRI website for more information about this seminar: www.ksri.kit.edu

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
The student will receive the necessary literature for his research topic.

V Security and Privacy Awareness

2400125, WS 19/20, 2 SWS, Open in study portal

Seminar (S)

Notes
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.

Dates:

- Kick-Off (with topic placing): 25.10.19, 11:30-13:00 Building 5.20 Room 1C-01
- Final version: 10.03.20
- Presentation: 25.03.20

Topics will be assigned at the Kick-Off.

Further information about the concrete topics will follow shortly.

ATTENTION: The seminar is only for MASTER students!

V Linked Data and the Semantic Web

2512301, WS 19/20, 3 SWS, Language: German/English, Open in study portal

Notes
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.

V Real-World Challenges in Data Science and Analytics

2512311, WS 19/20, 3 SWS, Language: German/English, Open in study portal

Notes
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.

V **Seminar Service Science, Management & Engineering** **Seminar (S)**
2595470, WS 19/20, 3 SWS, Language: German, Open in study portal

Notes
Each Semester, the seminar will cover topics from a different selected subfield of Service Science, Management & Engineering. Topics include service innovation, service economics, service computing, transformation and coordination of service value networks as well as collaboration for knowledge intensive services.

See the KSRI website for more information about this seminar: www.ksri.kit.edu

The assessment of this course is according to §4(2), 3 SPO in form of an examination of the written seminar thesis (15-20 pages), a presentation and active participation in class.

The final mark is based on the examination of the written seminar thesis but can be upgraded or downgraded according to the quality of the presentation.

Learning objectives:

The student

- illustrates and evaluates classic and current research questions in service science, management and engineering,
- applies models and techniques in service science, also with regard to their applicability in practical cases,
- successfully gets in touch with scientific working by an in-depth working on a special scientific topic which makes the student familiar with scientific literature research and argumentation methods,
- acquires good rhetorical and presentation skills.

As a further aspect of scientific work, especially for Master students the emphasis is put on a critical discussion of the seminar topic.

Recommendations:

Lecture *eServices* [2595466] is recommended.

Workload:

The total workload for this course is approximately 90 hours. For further information see German version.

T 4.202 Course: Seminar in Informatics B (Master) [T-WIWI-103480]

Responsible: Professorenschaft des Fachbereichs Informatik
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-102974 - Seminar

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

Events					
SS 2019	2512300	Knowledge Discovery and Data Mining	3 SWS		Sure-Vetter, Färber, Nguyen, Weller
SS 2019	2513306	Data Science & Real-time Big Data Analytics	2 SWS		Sure-Vetter, Riemer, Zehnder
SS 2019	2513400	Emerging Trends in Critical Information Infrastructures	2 SWS	Seminar (S)	Lins, Sunyaev, Thiebes
SS 2019	2595470	Seminar Service Science, Management & Engineering	2 SWS	Seminar (S)	Weinhardt, Nickel, Fichtner, Satzger, Sure-Vetter, Fromm
WS 19/20	2400125	Security and Privacy Awareness	2 SWS	Seminar (S)	Boehm, Seidel-Saul, Volkamer, Aldag, Gerber, Gottschalk
WS 19/20	2512301	Linked Data and the Semantic Web	3 SWS		Sure-Vetter, Acosta Deibe, Käfer, Heling
WS 19/20	2512311	Real-World Challenges in Data Science and Analytics	3 SWS		Sure-Vetter, Nickel, Weinhardt, Zehnder, Brandt
WS 19/20	2513500	Cognitive Automobiles and Robots	2 SWS	Seminar (S)	Zöllner
WS 19/20	2595470	Seminar Service Science, Management & Engineering	3 SWS	Seminar (S)	Weinhardt, Satzger, Nickel, Fromm, Fichtner, Sure-Vetter

Exams				
SS 2019	7900090	Data Science & Real-time Big Data Analytics	Prüfung (PR)	Sure-Vetter
SS 2019	7900092	Seminar Service Science, Management & Engineering	Prüfung (PR)	Sure-Vetter
SS 2019	7900094	Knowledge Discovery and Data Mining	Prüfung (PR)	Sure-Vetter
SS 2019	7900114	Selected Issues in Critical Information Infrastructures	Prüfung (PR)	Sunyaev
SS 2019	7900187	Emerging Trends in Critical Information Infrastructures	Prüfung (PR)	Sunyaev
WS 19/20	7900038	Linked Data and the Semantic Web	Prüfung (PR)	Sure-Vetter
WS 19/20	7900044	Seminar Service Science, Management & Engineering	Prüfung (PR)	Sure-Vetter
WS 19/20	7900129	Security and Privacy Awareness	Prüfung (PR)	Volkamer
WS 19/20	7900187	Real-World Challenges in Data Science und Analytics	Prüfung (PR)	Sure-Vetter

Competence Certificate
Alternative exam assessment (§ 4(2), 3 SPO 2015). The following aspects are included:

- Regular participation in the seminar dates
- Preparation of a seminar paper on a partial aspect of the seminar topic according to scientific methods
- Lecture on the topic of the seminar paper.

The point scheme for the assessment is determined by the lecturer of the respective course. It will be announced at the beginning of the course.

Prerequisites
None.

Recommendation
See seminar description in the course catalogue of the KIT (https://campus.kit.edu/)

Annotation
Placeholder for seminars offered by the Institute AIFB.

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

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

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

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

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

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

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

- Medicine
- Social Media
- Finance Market

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

- Mitchell, T.; Machine Learning
- McGraw Hill, Cook, D.J. and Holder, L.B. (Editors) Mining Graph Data, ISBN:0-471-73190-0
- Wiley, Manning, C. and Schütze, H.; Foundations of Statistical NLP, MIT Press, 1999.

V **Data Science & Real-time Big Data Analytics**
2513306, SS 2019, 2 SWS, Language: German/English, Open in study portal

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

V **Seminar Service Science, Management & Engineering** **Seminar (S)**
2595470, SS 2019, 2 SWS, Language: German, Open in study portal

Learning Content
Each Semester, the seminar will cover topics from a different selected subfield of Service Science, Management & Engineering. Topics include service innovation, service economics, service computing, transformation and coordination of service value networks as well as collaboration for knowledge intensive services.

See the KSRI website for more information about this seminar: www.ksri.kit.edu

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
The student will receive the necessary literature for his research topic.

V **Security and Privacy Awareness** Seminar (S)
2400125, WS 19/20, 2 SWS, Open in study portal

Notes
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.

Dates:

- Kick-Off (with topic placing): 25.10.19, 11:30-13:00 Building 5.20 Room 1C-01
- Final version: 10.03.20
- Presentation: 25.03.20

Topics will be assigned at the Kick-Off.

Further information about the concrete topics will follow shortly.

ATTENTION: The seminar is only for MASTER students!

V **Linked Data and the Semantic Web**
2512301, WS 19/20, 3 SWS, Language: German/English, Open in study portal

Notes
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.

V **Real-World Challenges in Data Science and Analytics**
2512311, WS 19/20, 3 SWS, Language: German/English, Open in study portal

Notes
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.

V **Seminar Service Science, Management & Engineering** **Seminar (S)**
2595470, WS 19/20, 3 SWS, Language: German, Open in study portal

Notes
Each Semester, the seminar will cover topics from a different selected subfield of Service Science, Management & Engineering. Topics include service innovation, service economics, service computing, transformation and coordination of service value networks as well as collaboration for knowledge intensive services.

See the KSRI website for more information about this seminar: www.ksri.kit.edu

The assessment of this course is according to §4(2), 3 SPO in form of an examination of the written seminar thesis (15-20 pages), a presentation and active participation in class.

The final mark is based on the examination of the written seminar thesis but can be upgraded or downgraded according to the quality of the presentation.

Learning objectives:

The student

- illustrates and evaluates classic and current research questions in service science, management and engineering,
- applies models and techniques in service science, also with regard to their applicability in practical cases,
- successfully gets in touch with scientific working by an in-depth working on a special scientific topic which makes the student familiar with scientific literature research and argumentation methods,
- acquires good rhetorical and presentation skills.

As a further aspect of scientific work, especially for Master students the emphasis is put on a critical discussion of the seminar topic.

Recommendations:

Lecture *eServices* [2595466] is recommended.

Workload:

The total workload for this course is approximately 90 hours. For further information see German version.

T 4.203 Course: Seminar in Operations Research A (Master) [T-WIWI-103481]

Responsible: Prof. Dr. Stefan Nickel
Prof. Dr. Steffen Rebennack
Prof. Dr. Oliver Stein

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-102973 - Seminar

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

Events					
SS 2019	2550132	Seminar zur Mathematischen Optimierung (MA)	2 SWS	Seminar (S)	Stein, Mohr, Neumann
SS 2019	2550473	Seminar on Power Systems Optimization (Master)	2 SWS	Seminar (S)	Rebennack, Assistenten
SS 2019	2550491	Seminar zur diskreten Optimierung	SWS	Block (B)	Nickel, Mitarbeiter
WS 19/20	2550473	Seminar on Power Systems Optimization (Master)	2 SWS	Seminar (S)	Rebennack, Sinske
WS 19/20	2550491	Seminar: Modern OR and Innovative Logistics	2 SWS	Seminar (S)	Nickel, Mitarbeiter
Exams					
SS 2019	00025	Seminar in Operations Research A (Master)		Prüfung (PR)	Nickel
SS 2019	7900018_SS2019	Seminar in Operations Research A (Master)		Prüfung (PR)	Stein
SS 2019	7900251	Seminar in Operations Research A (Master)		Prüfung (PR)	Nickel

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:

V Seminar zur diskreten Optimierung

Block (B)

2550491, SS 2019, SWS, Language: German, Open in study portal

Learning Content
The topics of the seminar will be announced at the beginning of the term in a preliminaty meeting. Dates will be announced on the internet.

Annotation
The seminar is offered in each term.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Literature and relevant sources will be announced at the beginning of the seminar.

V **Seminar: Modern OR and Innovative Logistics** **Seminar (S)**
2550491, WS 19/20, 2 SWS, Language: German, Open in study portal

Learning Content
The topics of the seminar will be announced at the beginning of the term in a preliminaty meeting. Dates will be announced on the internet.

Annotation
The seminar is offered in each term.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Literature and relevant sources will be announced at the beginning of the seminar.

T 4.204 Course: Seminar in Operations Research B (Master) [T-WIWI-103482]

Responsible: Prof. Dr. Stefan Nickel
Prof. Dr. Steffen Rebennack
Prof. Dr. Oliver Stein

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-102974 - Seminar

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

Events					
SS 2019	2550132	Seminar zur Mathematischen Optimierung (MA)	2 SWS	Seminar (S)	Stein, Mohr, Neumann
SS 2019	2550473	Seminar on Power Systems Optimization (Master)	2 SWS	Seminar (S)	Rebennack, Assistenten
SS 2019	2550491	Seminar zur diskreten Optimierung	SWS	Block (B)	Nickel, Mitarbeiter
WS 19/20	2550473	Seminar on Power Systems Optimization (Master)	2 SWS	Seminar (S)	Rebennack, Sinske
WS 19/20	2550491	Seminar: Modern OR and Innovative Logistics	2 SWS	Seminar (S)	Nickel, Mitarbeiter
Exams					
SS 2019	00027	Seminar in Operations Research B (Master)		Prüfung (PR)	Nickel
SS 2019	7900018_SS2019	Seminar in Operations Research A (Master)		Prüfung (PR)	Stein
SS 2019	7900252	Seminar in Operations Research B (Master)		Prüfung (PR)	Nickel

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:

V Seminar zur diskreten Optimierung

Block (B)

2550491, SS 2019, SWS, Language: German, Open in study portal

Learning Content
The topics of the seminar will be announced at the beginning of the term in a preliminaty meeting. Dates will be announced on the internet.

Annotation
The seminar is offered in each term.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Literature and relevant sources will be announced at the beginning of the seminar.

V **Seminar: Modern OR and Innovative Logistics** **Seminar (S)**
2550491, WS 19/20, 2 SWS, Language: German, Open in study portal

Learning Content
The topics of the seminar will be announced at the beginning of the term in a preliminaty meeting. Dates will be announced on the internet.

Annotation
The seminar is offered in each term.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Literature and relevant sources will be announced at the beginning of the seminar.

4.205 Course: Seminar in Statistics A (Master) [T-WIWI-103483]

Responsible: Prof. Dr. Oliver Grothe
Prof. Dr. Melanie Schienle

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-102971 - Seminar

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

Events					
SS 2019	2521310	Advanced Topics in Econometrics	2 SWS	Seminar (S)	Schienle, Chen, Görgen
Exams					
SS 2019	7900150	Advanced Topics in Econometrics, Seminar in Statistics A (Master)		Prüfung (PR)	Schienle
SS 2019	7900250	Data Mining and Applications (Projectseminar)		Prüfung (PR)	Nakhaeizadeh

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:

V Advanced Topics in Econometrics

Seminar (S)

2521310, SS 2019, 2 SWS, Language: English, Open in study portal

Annotation
The course will be offered in English.

T 4.206 Course: Seminar in Statistics B (Master) [T-WIWI-103484]

Responsible: Prof. Dr. Oliver Grothe
Prof. Dr. Melanie Schienle

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-102972 - Seminar

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

Events					
SS 2019	2521310	Advanced Topics in Econometrics	2 SWS	Seminar (S)	Schienle, Chen, Görgen
Exams					
SS 2019	7900250	Data Mining and Applications (Projectseminar)		Prüfung (PR)	Nakhaeizadeh

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:

V Advanced Topics in Econometrics

2521310, SS 2019, 2 SWS, Language: English, Open in study portal

Seminar (S)

Annotation
The course will be offered in English.

T 4.207 Course: Seminar Mathematics [T-MATH-105686]

Organisation: KIT Department of Mathematics
Part of: M-MATH-102730 - Seminar

Type	Credits	Version
Completed coursework	3	1

Exams				
SS 2019	7700025	Seminar Mathematics	Prüfung (PR)	Kühnlein

T 4.208 Course: Simulation of Stochastic Systems [T-WIWI-106552]

Responsible: Prof. Dr. Oliver Grothe
Prof. Dr. Steffen Rebennack

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-103289 - Stochastic Optimization

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

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.

T 4.209 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

Type	Credits	Recurrence	Version
Written examination	3	Each winter term	1

Events					
WS 19/20	2581023	(Smart) Energy Infrastructure	2 SWS	Lecture (V)	Ardone, Pustisek, Jochem
Exams					
SS 2019	7981023	Smart Energy Infrastructure		Prüfung (PR)	Fichtner

Competence Certificate
The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

Prerequisites
None.

Annotation
New course starting winter term 2017/2018.

T 4.210 Course: Smart Grid Applications [T-WIWI-107504]

Responsible: Prof. Dr. Christof Weinhardt
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-103720 - eEnergy: Markets, Services and Systems

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2540452	Smart Grid Applications	2 SWS	Lecture (V)	Staudt, van Dinther
WS 19/20	2540453	Übung zu Smart Grid Applications	1 SWS	Lecture (V)	Staudt, Golla

Competence Certificate
The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulations). By successful completion of the exercises (§4 (2), 3 SPO 2007 respectively §4 (3) SPO 2015) a bonus can be obtained. If the grade of the written exam is at least 4.0 and at most 1.3, the bonus will improve it by one grade level (i.e. by 0.3 or 0.4).

Prerequisites
None

Recommendation
None

Annotation
The lecture will be read for the first time in winter term 2018/19.

T 4.211 Course: Sobolev Spaces [T-MATH-105896]

Responsible: Prof. Dr. Andreas Kirsch
Organisation: KIT Department of Mathematics
Part of: M-MATH-102926 - Sobolev Spaces

Type	Credits	Version
Oral examination	5	1

T 4.212 Course: Social Choice Theory [T-WIWI-102859]

Responsible: Prof. Dr. Clemens Puppe
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101500 - Microeconomic Theory
M-WIWI-101504 - Collective Decision Making

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	1

Events					
SS 2019	2520537	Social Choice Theory	2 SWS	Lecture (V)	Puppe, Müller
SS 2019	2520539	Übung zu Social Choice Theory	1 SWS	Practice (Ü)	Puppe, Müller
Exams					
SS 2019	7900239	Social Choice Theory		Prüfung (PR)	Puppe
SS 2019	7900240	Social Choice Theory		Prüfung (PR)	Puppe

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

Prerequisites
None

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

V Social Choice Theory

Lecture (V)

2520537, SS 2019, 2 SWS, Language: English, Open in study portal

Learning Content
The course provides a comprehensive treatment of preference and judgement aggregation, including proofs of general results that have Arrow's famous impossibility theorem and Gibbard's oligarchy theorem as corollaries. The second part of the course is devoted to voting theory. Among other things, we prove the Gibbard-Satterthwaite theorem.

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

Literature
Main texts:

- Hervé Moulin: Axioms of Cooperative Decision Making, Cambridge University Press, 1988
- Christian List and Clemens Puppe: Judgement Aggregation. A survey, in: Handbook of rational & social choice, P.Anand, P.Pattanaik, C.Puppe (Eds.), Oxford University Press 2009.

Secondary texts:

- Amartya Sen: Collective Choice and Social Welfare, Holden-Day, 1970
- Wulf Gaertner: A Primer in Social Choice Theory, revised edition, Oxford University Press, 2009
- Wulf Gaertner: Domain Conditions in Social Choice Theory, Oxford University Press, 2001

T 4.213 Course: Sociotechnical Information Systems Development [T-WIWI-109249]

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

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

Events					
WS 19/20	2512400	Sociotechnical Information Systems Development	3 SWS	Practical course (P)	Sunyaev, Sturm
Exams					
SS 2019	7900016	Sociotechnical Information Systems Development		Prüfung (PR)	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:

V Sociotechnical Information Systems Development

Practical course (P)

2512400, WS 19/20, 3 SWS, Language: German/English, Open in study portal

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

Learning objectives:

- Independent and self-organized realization of a software development project
- Evaluation and selection of suitable development tools and methods
- Application of modern software development methods
- Planning and execution of different development tasks: requirements assessment, system design, implementation, and quality assurance
- Project documentation
- Presentation of project results in an comprehensible and structured form

T 4.214 Course: Software Quality Management [T-WIWI-102895]

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

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	2

Events					
SS 2019	2511208	Software Quality Management	2 SWS	Lecture (V)	Oberweis
SS 2019	2511209	Übungen zu Software-Qualitätsmanagement	1 SWS	Practice (Ü)	Oberweis, N.N.
Exams					
SS 2019	7900031	Software Quality Management		Prüfung (PR)	Oberweis
WS 19/20	7900027	Software Quality Management		Prüfung (PR)	Oberweis

Competence Certificate
The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation in the first week after lecture period.

Prerequisites
None

Annotation
This course was formely named "Software Technology: Quality Management".

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

V Software Quality Management

2511208, SS 2019, 2 SWS, Language: German, Open in study portal

Lecture (V)

Learning Content
This lecture imparts fundamentals of active software quality management (quality planning, quality testing, quality control, quality assurance) and illustrates them with concrete examples, as currently applied in industrial software development. Keywords of the lecture content are: software and software quality, process models, software process quality, ISO 9000-3, CMM(I), BOOTSTRAP, SPICE, software tests.

Annotation
This course was formely named "Software Technology: Quality Management".

Workload
Lecture 30h
Exercise 15h

Preparation of lecture 30h
Preparation of exercises 30h
Exam preparation 44h
Exam 1h

Total: 150h

Literature

- Helmut Balzert: Lehrbuch der Software-Technik. Spektrum-Verlag 2008
- Peter Liggesmeyer: Software-Qualität, Testen, Analysieren und Verifizieren von Software. Spektrum Akademischer Verlag 2002
- Mauro Pezzè, Michal Young: Software testen und analysieren. Oldenbourg Verlag 2009

Further literature is given in lectures.

T 4.215 Course: Spatial Economics [T-WIWI-103107]

Responsible: Prof. Dr. Ingrid Ott
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101496 - Growth and Agglomeration

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2561260	Spatial Economics	2 SWS	Lecture (V)	Ott
WS 19/20	2561261		1 SWS	Practice (Ü)	Ott, Bälz
Exams					
SS 2019	7900103	Spatial Economics		Prüfung (PR)	Ott

Competence Certificate
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

Prerequisites
None

Recommendation
Basic knowledge of micro- and macroeconomics is assumed, as taught in the courses "Economics I" [2600012], and "Economics II" [2600014]. In addition, an interest in quantitative-mathematical modeling is required. The attendance of the course "Introduction to economic policy" [2560280] is recommended.

Annotation
Due to the research semester of Prof. Dr. Ingrid Ott, the course is not offered in the winter term 2018/19.

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

V Spatial Economics

2561260, WS 19/20, 2 SWS, Language: English, Open in study portal

Lecture (V)

Notes
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 Content
Geography, trade and development
Geography and economic theory
Core models of economic geography and empirical evidence
Agglomeration, home market effect, and spatial wages
Applications and extensions

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

Literature
Steven Brakman, Harry Garretsen, Charles van Marrewijk (2009), The New Introduction to Geographical Economics
Further literature recommendations will be announced in the course of the lecture.

T 4.216 Course: Spatial Stochastics [T-MATH-105867]

Responsible: Prof. Dr. Daniel Hug
Prof. Dr. Günter Last

Organisation: KIT Department of Mathematics

Part of: M-MATH-102903 - Spatial Stochastics

Type	Credits	Version
Oral examination	8	1

Events					
WS 19/20	0105600	Spatial Stochastics	4 SWS	Lecture (V)	Hug
WS 19/20	0105610	Tutorial for 0105600 (Spatial Stochastics)	2 SWS	Practice (Ü)	Hug
Exams					
SS 2019	7700068	Spatial Stochastics		Prüfung (PR)	Last

Prerequisites
none

T 4.217 Course: Special Functions and Applications in Potential Theory [T-MATH-102274]

Responsible: Prof. Dr. Andreas Kirsch
Organisation: KIT Department of Mathematics
Part of: M-MATH-101335 - Special Functions and Applications in Potential Theory

Type	Credits	Version
Oral examination	5	1

Prerequisites
None

T 4.218 Course: Special Topics of Numerical Linear Algebra [T-MATH-105891]

Responsible: Prof. Dr. Marlis Hochbruck
Organisation: KIT Department of Mathematics
Part of: M-MATH-102920 - Special Topics of Numerical Linear Algebra

Type	Credits	Version
Oral examination	8	1

Events					
SS 2019	0160400	Topics in Numerical Linear Algebra	4 SWS	Lecture (V)	Neher
Exams					
SS 2019	77T-MATH-105891 - Spezielle Temen der numerischen linearen Algebr	Special Topics of Numerical Linear Algebra		Prüfung (PR)	Neher
WS 19/20	77Spezielle Themen der numerischen linearen Algebr a (Mündliche Prüfung), WS 2019/20	Special Topics of Numerical Linear Algebra		Prüfung (PR)	Neher

Prerequisites
none

T 4.219 Course: Spectral Theory - Exam [T-MATH-103414]

Responsible: PD Dr. Gerd Herzog
Dr. Peer Kunstmann
Dr. Christoph Schmoeger
Prof. Dr. Roland Schnaubelt
Prof. Dr. Lutz Weis

Organisation: KIT Department of Mathematics

Part of: M-MATH-101768 - Spectral Theory

Type	Credits	Version
Oral examination	8	1

Events					
SS 2019	0163700	Spectral Theory	4 SWS	Lecture (V)	Kunstmann
SS 2019	0163710	Tutorial 0163700 (Spectral Theory)	2 SWS	Practice (Ü)	Kunstmann
Exams					
SS 2019	0100035	Spectral Theory - Exam		Prüfung (PR)	Lamm, Kunstmann

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

V Spectral Theory

0163700, SS 2019, 4 SWS, Language: English, Open in study portal

Lecture (V)

Description

The spectrum of a linear operator on a Banach space generalizes the concept of an eigenvalue of a matrix. In Banach spaces spectral theoretic methods play an equally important role as the eigenvalue theory im finite dimensions. These methods are used everywhere in analysis and its applications.

At the beginning we discuss the basic properties of the spectrum. In view of the applications on differential operators this is not only done for bounded operators, but also for a certain class of unbounded linear operators, the so-called closed operators. To treat differential operators on L^p spaces, we introduce weak derivatives in the L^p setting and Sobolev spaces. One can develop a detailed spectral theory for two main classes of operators. We first deal with compact operators, where the spectrum determined by the eigenvalues to a large extent. In this context we also prove the so-called Fredholm alternative, which has important applications e.g. to integral equations. Then we study (possibly only closed) self adjoint operators on Hilbert spaces. For such operators the spectral theorem is a far reaching extension of the diagonalisation of hermitian matrices. Finally, we treat the functional calculi for self adjoint, bounded and sectorial operators.

Literature

On my webpage one can find the PDF file of the manuscript of my lecture Spectral Theory from summer semester 2010. Presumably, an updated version will be delivered during lecture time. A few relevant monographs:

- H.W. Alt: Lineare Funktionalanalysis. Springer.
- H. Brezis: Functional Analysis, Sobolev Spaces and Partial Differential Equations. Springer.
- J.B. Conway: A Course in Functional Analysis. Springer.
- N. Dunford, J.T. Schwartz: Linear Operators. Part I: General Theory. Wiley.
- T Kato: Perturbation Theory of Linear Operators. Springer.
- A.E. Taylor, D.C. Lay: Introduction to Functional Analysis. Wiley.
- D. Werner: Funktionalanalysis. Springer.

T 4.220 Course: Spin Manifolds, Alpha Invariant and Positive Scalar Curvature [T-MATH-105932]

Responsible: Stephan Klaus
Prof. Dr. Wilderich Tuschmann

Organisation: KIT Department of Mathematics

Part of: M-MATH-102958 - Spin Manifolds, Alpha Invariant and Positive Scalar Curvature

Type	Credits	Version
Oral examination	5	1

T 4.221 Course: Statistical Modeling of Generalized Regression Models [T-WIWI-103065]

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

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2521350	Statistische Modellierung von Allgemeinen Regressionsmodellen	2 SWS	Lecture (V)	Heller

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:

V Statistische Modellierung von Allgemeinen Regressionsmodellen

Lecture (V)

2521350, WS 19/20, 2 SWS, Open in study portal

Annotation
Knowledge of the contents covered by the course "Economics III: Introduction in Econometrics" [2520016]

Workload
The total workload for this course is approximately 135 hours (4.5 credits).

regular attendance: 30 hours

self-study: 65 hours

exam preparation: 40 hours

T 4.222 Course: Stein's Method [T-MATH-105914]

Responsible: Dr. Matthias Schulte
Organisation: KIT Department of Mathematics
Part of: M-MATH-102946 - Stein's Method

Type	Credits	Version
Oral examination	5	1

Prerequisites
none

T 4.223 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

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2521331	Stochastic Calculus and Finance	2 SWS	Lecture (V)	Safarian

Competence Certificate
The assessment of this course consists of a written examination (§4(2), 1 SPOs, 180 min.) and of possibble additional assignments during the course (§4 (3) SPO).

Prerequisites
None

Annotation
For more information see http://statistik.econ.kit.edu/

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

V Stochastic Calculus and Finance

Lecture (V)

2521331, WS 19/20, 2 SWS, Language: English, Open in study portal

Description
The course will provide rigorous yet focused training in stochastic calculus and finance. The program will cover modern approaches in stochastic calculus and mathematical finance. Topics to be covered:

1. Stochastic Calculus. Stochastic Processes, Brownian Motion and Martingales, Stopping Times, Local martingales, Doob-Meyer Decomposition, Quadratic Variation, Stochastic Integration, Ito Formula, Girsanov Theorem, Jump-diffusion Processes. Stable and tempered stable processes. Levy processes.
2. Mathematical Finance: Pricing Models. The Black-Scholes Model, State prices and Equivalent Martingale Measure, Complete Markets and Redundant Security Prices, Arbitrage Pricing with Dividends, Term-Structure Models (One Factor Models, Cox-Ingersoll-Ross Model, Affine Models), Term-Structure Derivatives and Hedging, Mortgage-Backed Securities, Derivative Assets (Forward Prices, Future Contracts, American Options, Look-back Options), Option pricing with tempered stable and Levy-Processes and volatility clustering, Optimal Portfolio and Consumption Choice (Stochastic Control and Merton continuous time optimization problem), Equilibrium models, Consumption-Based CAPM, Numerical Methods.

Learning Content
The course will provide rigorous yet focused training in stochastic calculus and finance. The program will cover modern approaches in stochastic calculus and mathematical finance. Topics to be covered:

1. Stochastic Calculus. Stochastic Processes, Brownian Motion and Martingales, Stopping Times, Local martingales, Doob-Meyer Decomposition, Quadratic Variation, Stochastic Integration, Ito Formula, Girsanov Theorem, Jump-diffusion Processes. Stable and tempered stable processes. Levy processes.
2. Mathematical Finance: Pricing Models. The Black-Scholes Model, State prices and Equivalent Martingale Measure, Complete Markets and Redundant Security Prices, Arbitrage Pricing with Dividends, Term-Structure Models (One Factor Models, Cox-Ingersoll-Ross Model, Affine Models), Term-Structure Derivatives and Hedging, Mortgage-Backed Securities, Derivative Assets (Forward Prices, Future Contracts, American Options, Look-back Options), Option pricing with tempered stable and Levy-Processes and volatility clustering, Optimal Portfolio and Consumption Choice (Stochastic Control and Merton continuous time optimization problem), Equilibrium models, Consumption-Based CAPM, Numerical Methods.

Stochastic processes (Poisson-process, Brownian motion, martingales), stochastic Integral (Integral, quadratic und co-variation, Ito-formula), stochastic differential equation for price-processes, trading strategies, option pricing(Feynman-Kac), neutral risk rating(equivalent martingale measure, Girsanov theorem), term structure models

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

Literature
To be announced in lecture.
Elective literature:

- Dynamic Asset Pricing Theory, Third Edition. by Darrell Duffie, Princeton University Press, 1996
- Stochastic Calculus for Finance II: Continuous-Time Models, by Steven E. Shreve , Springer, 2003
- An Introduction to Stochastic Integration (Probability and its Applications) by Kai L. Chung , Ruth J. Williams , Birkhaueser,
- Methods of Mathematical Finance by Ioannis Karatzas , Steven E. Shreve , Springer 1998
- Kim Y.S. ,Rachev S.T. ,Bianchi M-L, Fabozzi F. Financial market models with Levy processes and time-varying volatility, Journal of Banking and Finance, 32/7,1363-1378, 2008.
- Hull, J., Options, Futures, & Other Derivatives, Prentice Hall, Sixth Edition, (2005).

T 4.224 Course: Stochastic Control [T-MATH-105871]

Responsible: Prof. Dr. Nicole Bäuerle
Organisation: KIT Department of Mathematics
Part of: M-MATH-102908 - Stochastic Control

Type	Credits	Version
Oral examination	4	1

Prerequisites
none

T 4.225 Course: Stochastic Differential Equations [T-MATH-105852]

Responsible: Prof. Dr. Roland Schnaubelt
Prof. Dr. Lutz Weis

Organisation: KIT Department of Mathematics

Part of: M-MATH-102881 - Stochastic Differential Equations

Type	Credits	Version
Oral examination	8	1

T 4.226 Course: Stochastic Evolution Equations [T-MATH-105910]

Responsible: Prof. Dr. Lutz Weis
Organisation: KIT Department of Mathematics
Part of: M-MATH-102942 - Stochastic Evolution Equations

Type	Credits	Version
Oral examination	8	1

Prerequisites
none

T 4.227 Course: Stochastic Geometry [T-MATH-105840]

Responsible: Prof. Dr. Daniel Hug
Prof. Dr. Günter Last

Organisation: KIT Department of Mathematics

Part of: M-MATH-102865 - Stochastic Geometry

Type	Credits	Version
Oral examination	8	1

Events					
SS 2019	0152600	Stochastic Geometry	4 SWS	Lecture (V)	Hug
SS 2019	0152610	Übungen zu 0152600 (Stochastische Geometrie)	2 SWS	Practice (Ü)	Hug
Exams					
SS 2019	7700044	Stochastic Geometry		Prüfung (PR)	Hug

T 4.228 Course: Strategic Finance and Technoloy Change [T-WIWI-110511]

Responsible: Prof. Dr. Martin Ruckes
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101480 - Finance 3
M-WIWI-101483 - Finance 2

Type	Credits	Recurrence	Version
Written examination	1,5	Each winter term	1

Events					
WS 19/20	2530214	Strategic Finance and Technology Change	1 SWS	Lecture (V)	N.N.

Competence Certificate
The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation. The exam is offered each semester. If there are only a small number of participants registered for the exam, we reserve the right to hold an oral examination instead of a written one.

Prerequisites
None

Recommendation
Attending the lecture "Financial Management" is strongly recommended.

4.229 Course: Strategic Management of Information Technology [T-WIWI-102669]

Responsible: Thomas Wolf
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	2

Events					
SS 2019	2511602	Strategic Management of Information Technology	2 SWS	Lecture (V)	Wolf
SS 2019	2511603	Übungen zu Strategisches Management der betrieblichen Informationsverarbeitung	1 SWS	Practice (Ü)	Wolf
Exams					
SS 2019	7900034	Strategic Management of Information Technology		Prüfung (PR)	Wolf
WS 19/20	7900030	Strategic Management of Information Technology		Prüfung (PR)	Wolf

Competence Certificate
Please note that the exam for first writers will be offered for the last time in winter semester 2019/2020. A last examination possibility exists in the summer semester 2020 (only for repeaters).

The assessment of this course is a written (60 min.) or (if necessary) oral examination according (30 min.) to §4(2) of the examination regulation.

Prerequisites
None

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

V Strategic Management of Information Technology

Lecture (V)

2511602, SS 2019, 2 SWS, Language: German, Open in study portal

Learning Content
The following topics will be covered: strategic planing of ICT, architecture of ICT, overall planning of ICT, outsourcing, operation and controlling of ICT.

Literature

- Nolan, R., Croson, D.: Creative Destruction: A Six-Stage Process for Transforming the Organization. Harvard Business School Press, Boston Mass. 1995
- Heinrich, L. J., Burgholzer, P.: Informationsmanagement, Planung, Überwachung, Steuerung d. Inform.-Infrastruktur. Oldenbourg, München 1990
- Nolan, R.: Managing the crises in data processing. Harvard Business Review, Vol. 57, Nr. 2 1979
- Österle, H. et al.: Unternehmensführung und Informationssystem. Teubner, Stuttgart 1992
- Thome, R.: Wirtschaftliche Informationsverarbeitung. Verlag Franz Vahlen, München 1990

T 4.230 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

Type	Credits	Recurrence	Version
Examination of another type	3	Irregular	1

Events					
WS 19/20	2577921	Strategy and Management Theory: Developments and "Classics" (Master)	2 SWS	Seminar (S)	Lindstädt

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:

V Strategy and Management Theory: Developments and "Classics" (Master) — Seminar (S)
2577921, WS 19/20, 2 SWS, Language: German, Open in study portal

Notes
This course is admission restricted. If you werealready admitted to another course in the module “Advanced Topics in Strategy and Management” the participation at this course will be guaranteed.

Learning Content
In this lecture, students discuss and evaluate models in the field of strategic management with a focus on applicability and theory based limitations. Critical examination of current research results will be a substantial part of this course.

Workload
The total workload for this course is approximately 90 hours.

Lecture: 15 hours

Preparation of lecture: 75 hours

Exam preparation: n/a

T 4.231 Course: Supplement Enterprise Information Systems [T-WIWI-110346]

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

Type	Credits	Recurrence	Version
Written examination	4,5	Each term	1

Competence Certificate
The assessment of this course is a written examination (60 min.) or (if necessary) oral examination (30 min.) according to §4(2) of the examination regulation.

Prerequisites
None

T 4.232 Course: Supplement Software- and Systemsengineering [T-WIWI-110372]

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

Type	Credits	Recurrence	Version
Written examination	4,5	Each term	1

Competence Certificate
The assessment consists of an 1h written exam in the first week after lecture period.

Prerequisites
None

Annotation
This course can be used in particular for the acceptance of external courses whose content is in the broader area of software and systems engineering, but cannot assigned to another course of this topic.

T 4.233 Course: Tactical and Operational Supply Chain Management [T-WIWI-102714]

Responsible: Prof. Dr. Stefan Nickel
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101413 - Applications of Operations Research
M-WIWI-102832 - Operations Research in Supply Chain Management

Type	Credits	Recurrence	Version
Written examination	4,5	Each summer term	3

Events					
SS 2019	2550486	Taktisches und operatives SCM	2 SWS	Lecture (V)	Nickel
SS 2019	2550487	Übungen zu Taktisches und operatives SCM	1 SWS	Practice (Ü)	Pomes
Exams					
SS 2019	00026	Tactical and Operational Supply Chain Management		Prüfung (PR)	Nickel

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

The exam takes place in every the semester.

Prerequisite for admission to examination is the succesful completion of the online assessments.

Prerequisites
Prerequisite for admission to examination is the succesful completion of the online assessments.

Recommendation
None

Annotation
The lecture is held in every summer term. The planned lectures and courses for the next three years are announced online.

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

V Taktisches und operatives SCM

2550486, SS 2019, 2 SWS, Language: German, Open in study portal

Lecture (V)

Description
Since the classical work 'Theory of the Location of Industries' of Weber from 1909, the determination of an optimal location of a new facility with respect to existing customers is strongly connectedto strategical logistics planning. Strategic decisions concerning the location of facilities as production plants, distribution centers or warehouses are of high importance for the rentability of supply chains. Thoroughly carried out, location planning allows an efficient flow of materials and leads to lower costs and increased customer service.
Subject of the course is an introduction to the most important terms and definitions in location planning as well as the presentation of basic quantitative location planning models. Furthermore, specialized location planning models for Supply Chain Management will be addressed as they are part in many commercial SCM tools for strategic planning tasks.

Learning Content
The lecture covers basic quantitative methods in location planning in the context of strategic Supply Chain Planning. Besides the discussion of several criteria for the evaluation of the locations of facilities, the students are acquainted with classical location planning models (planar models, network models and discrete models) and advanced location planning models designed for Supply Chain Management (single-period and multi-period models).The exercisesaccompanying the lecture offer the possibility to apply the considered models to practical problems.

Annotation
The lecture is held in every summer term. The planned lectures and courses for the next three years are announced online.

Literature
Elective Literature

- Daskin: Network and Discrete Location: Models, Algorithms, and Applications, Wiley, 1995
- Domschke, Drexl: Logistik: Standorte, 4. Auflage, Oldenbourg, 1996
- Francis, McGinnis, White: Facility Layout and Location: An Analytical Approach, 2nd Edition, Prentice Hall, 1992
- Love, Morris, Wesolowsky: Facilities Location: Models and Methods, North Holland, 1988
- Thonemann: Operations Management - Konzepte, Methoden und Anwendungen, Pearson Studium, 2005

T 4.234 Course: The Riemann Zeta Function [T-MATH-105934]

Responsible: Dr. Fabian Januszewski
Organisation: KIT Department of Mathematics
Part of: M-MATH-102960 - The Riemann Zeta Function

Type	Credits	Version
Oral examination	4	1

T 4.235 Course: Theory of Endogenous Growth [T-WIWI-102785]

Responsible: Prof. Dr. Ingrid Ott
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101478 - Innovation and Growth
M-WIWI-101496 - Growth and Agglomeration

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2561503	Theory of endogenous growth	2 SWS	Lecture (V)	Ott
WS 19/20	2561504		1 SWS	Practice (Ü)	Ott, Eraydin
Exams					
SS 2019	7900105	Theory of Endogenous Growth		Prüfung (PR)	Ott

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

Students will be given the opportunity of writing and presenting a short paper during the lecture time to achieve a bonus on the exam grade. If the mandatory credit point exam is passed, the awarded bonus points will be added to the regular exam points. A deterioration is not possible by definition, and a grade does not necessarily improve, but is very likely to (not every additional point improves the total number of points, since a grade can not become better than 1). The voluntary elaboration of such a paper can not countervail a fail in the exam.

Prerequisites
None

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

Annotation
Due to the research semester of Prof. Dr. Ingrid Ott, the course is not offered in the winter term 2018/19.

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

V Theory of endogenous growth

Lecture (V)

2561503, WS 19/20, 2 SWS, Language: German, Open in study portal

Learning Content

- Basic models of endogenous growth
- Human capital and economic growth
- Modelling of technological progress
- Diversity Models
- Schumpeterian growth
- Directional technological progress
- Diffusion of technologies

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

Literature
Excerpt:

- Acemoglu, D. (2008): Introduction to modern economic growth. Princeton University Press, New Jersey.
- Aghion, P., Howitt, P. (2009): Economics of growth, MIT-Press, Cambridge/MA.
- Barro, R.J., Sala-I-Martin, X. (2003): Economic Growth. MIT-Press, Cambridge/MA.
- Sydsaeter, K., Hammond, P. (2008): Essential mathematics for economic analysis. Prentice Hall International, Harlow.
- Sydsæter, K., Hammond, P., Seierstad, A., Strom, A., (2008): Further Mathematics for Economic Analysis, Second Edition, Pearson Education Limited, Essex.

T 4.236 Course: Time Series Analysis [T-MATH-105874]

Responsible: Prof. Dr. Norbert Henze
Dr. Bernhard Klar

Organisation: KIT Department of Mathematics

Part of: M-MATH-102911 - Time Series Analysis

Type	Credits	Version
Oral examination	4	2

Events					
SS 2019	0161100	Time Series Analysis	2 SWS	Lecture (V)	Klar
SS 2019	0161110	Tutorial for 0161100	1 SWS	Practice (Ü)	Klar
Exams					
SS 2019	7700017	Time Series Analysis		Prüfung (PR)	Klar

T 4.237 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

Type	Credits	Recurrence	Version
Written examination	4,5	Irregular	1

Exams				
SS 2019	791192ee	Topics in Experimental Economics	Prüfung (PR)	Reiß

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.

T 4.238 Course: Traveling Waves [T-MATH-105897]

Responsible: Prof. Dr. Jens Rottmann-Matthes
Organisation: KIT Department of Mathematics
Part of: M-MATH-102927 - Traveling Waves

Type	Credits	Version
Oral examination	6	1

T 4.239 Course: Uncertainty Quantification [T-MATH-108399]

Responsible: Prof. Dr. Martin Frank
Organisation: KIT Department of Mathematics
Part of: M-MATH-104054 - Uncertainty Quantification

Type	Credits	Recurrence	Version
Oral examination	4	Irregular	1

Events					
SS 2019	0164400	Uncertainty Quantification	2 SWS	Lecture (V)	Frank
SS 2019	0164410	Tutorial for 0164400	1 SWS	Practice (Ü)	Frank
Exams					
SS 2019	7700045	Uncertainty Quantification		Prüfung (PR)	Frank

Prerequisites
none

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

V Uncertainty Quantification

0164400, SS 2019, 2 SWS, Language: English, Open in study portal

Lecture (V)

Description
"There are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – there are things we do not know we don't know." (Donald Rumsfeld)

In this class, we learn to deal with the "known unknowns", a field called Uncertainty Quantification (UQ). More specifically, we focus on methods to propagate uncertain input parameters through differential equation models. Given uncertain input, how uncertain is the output? The first part of the course ("how to do it") gives an overview on techniques that are used. Among these are:

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

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

Notes
The course will start on May 2 with a lecture at 08:00 and another lecture at 15:45 (instead of the tutorial).

Learning Content
In the first part, we learn about the techniques used in UQ. In hands-on programming exercises, students apply these techniques to either a problem of their own choice or one of several given examples. In the second part, we study the theoretical foundations of these methods.

Literature

- R.C. Smith: Uncertainty Quantification: Theory, Implementation, and Applications, SIAM, 2014.
- T.J. Sullivan: Introduction to Uncertainty Quantification, Springer-Verlag, 2015.
- D. Xiu: Numerical Methods for Stochastic Computations, Princeton University Press, 2010.
- O.P. Le Maître, O.M. Knio: Spectral Methods for Uncertainty Quantification, Springer-Verlag, 2010.
- R. Ghanem, D. Higdon, H. Owhadi:Handbook of Uncertainty Quantification, Springer-Verlag, 2017.

T 4.240 Course: Valuation [T-WIWI-102621]

Responsible: Prof. Dr. Martin Ruckes
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101480 - Finance 3
M-WIWI-101482 - Finance 1
M-WIWI-101483 - Finance 2

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	1

Events					
WS 19/20	2530212	Valuation	2 SWS	Lecture (V)	Ruckes
WS 19/20	2530213	Übungen zu Valuation	1 SWS	Practice (Ü)	Ruckes, Stengel
Exams					
SS 2019	7900072	Valuation		Prüfung (PR)	Ruckes

Competence Certificate
See German version.

Prerequisites
None

Recommendation
None

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

V Valuation

2530212, WS 19/20, 2 SWS, Language: English, Open in study portal

Lecture (V)

Description
Firms prosper when they create value for their shareholders and stakeholders. This is achieved by investing in projects that yield higher returns than their according cost of capital. Students are told the basic tools for firm and project valuation as well as ways to implement these tools in order to enhance a firm's value and improve its investment decisions. Among other things, the course will deal with the valuation of firms and individual projects using discounted cash flow and relative valuation approaches and the valuation of flexibility deploying real options.

Learning Content
Topics:

- Projections of cash flows
- Estimation of the cost of capital
- Valuation of the firm
- Mergers and acquisitions
- Real options

Literature
Elective Literature

Titman/Martin (2013): *Valuation - The Art and Science of Corporate Investment Decisions*, 2nd. ed. Pearson International.

4.241 Course: Variational Methods [T-MATH-110302]

Responsible: Prof. Dr. Wolfgang Reichel
Organisation: KIT Department of Mathematics
Part of: M-MATH-105093 - Variational Methods

Type	Credits	Version
Oral examination	8	1

T 4.242 Course: Wavelets [T-MATH-105838]

Responsible: Prof. Dr. Andreas Rieder
Organisation: KIT Department of Mathematics
Part of: M-MATH-102895 - Wavelets

Type	Credits	Recurrence	Version
Oral examination	8	Irregular	1

Competence Certificate
Mündliche Prüfung im Umfang von ca. 30 Minuten.

Prerequisites
none

T 4.243 Course: Web Science [T-WIWI-103112]

Responsible: Prof. Dr. York Sure-Vetter
Organisation: KIT Department of Economics and Management
Part of: M-WIWI-101472 - Informatics

Type	Credits	Recurrence	Version
Written examination	4,5	Each winter term	2

Events					
WS 19/20	2511312	Web Science	2 SWS	Lecture (V)	Sure-Vetter
WS 19/20	2511313	Exercises to Web Science	1 SWS	Practice (Ü)	Sure-Vetter, Heling
Exams					
SS 2019	7900032	Web Science		Prüfung (PR)	Sure-Vetter
WS 19/20	7900031	Web Science		Prüfung (PR)	Sure-Vetter

Competence Certificate
The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation or an oral exam (20 min) following §4, Abs. 2, 2 of the examination regulation.

The exam takes place every semester and can be repeated at every regular examination date.

Prerequisites
None

Annotation
New course starting winter term 2015/2016.

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

V Web Science
2511312, WS 19/20, 2 SWS, Language: English, Open in study portal

Lecture (V)

Notes
The lecture provides insights into the analysis of social networks and the used metrics. Thereby, in particular, web phenomena and the available technologies are considered.

Web Science is the emergent study of the people and technologies, applications, processes and practices that shape and are shaped by the World Wide Web. Web Science aims to draw together theories, methods and findings from across academic disciplines, and to collaborate with industry, business, government and civil society, to develop our knowledge and understanding of the Web: the largest socio-technical infrastructure in human history.

The lecture provides an introduction to basic concepts of Web Science. Essential theoretical foundations, phenomena and approaches are presented and explained.

This course aims to provide students with a basic knowledge and understanding about the structure and analysis of selected web phenomena and technologies. Topics include the small world problem, network theory, social network analysis, graph search and technologies/standards/architectures.

Learning objectives:

The students

- look critically into current research topics in the field of Web Science and learns in particular about the topics small-world-problem, network theory, social network analysis, bibliometrics, as well as link analysis and search.
- apply interdisciplinary thinking.
- train the application of technological approaches to social science problems.

Workload:

- The total workload for this course is approximately 135 hours
- Time of presentness: 45 hours
- Time of preperation and postprocessing: 60 hours
- Exam and exam preperation: 30 hours

V **Exercises to Web Science**
2511313, WS 19/20, 1 SWS, Language: English, Open in study portal
Practice (Ü)

Notes
The exercises are related to the lecture Web Science.

Multiple exercises are held that capture the topics, held in the lecture Web Scienceand discuss them in detail. Thereby, practical examples are given to the students in order to transfer theoretical aspects into practical implementation.

This course aims to provide students with a basic knowledge and understanding about the structure and analysis of selected web phenomena and technologies. Topics include the small world problem, network theory, social network analysis, graph search and technologies/standards/architectures.

Learning objectives:

The students

- look critically into current research topics in the field of Web Science and learns in particular about the topics small-world-problem, network theory, social network analysis, bibliometrics, as well as link analysis and search.
- apply interdisciplinary thinking.
- train the application of technological approaches to social science problems.

T 4.244 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

Type	Credits	Recurrence	Version
Examination of another type	3	Irregular	1

Events					
SS 2019	2577912	Workshop Business Wargaming - Analyzinig Strategic Interactions	2 SWS	Seminar (S)	Lindstädt
WS 19/20	2577922	Workshop Business Wargaming - Analyse strategischer Interaktionen (Master)	2 SWS	Seminar (S)	Lindstädt
Exams					
SS 2019	7900071	Workshop Business Wargaming – Analyzing Strategic Interactions		Prüfung (PR)	Lindstädt

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:

V Workshop Business Wargaming - Analyzinig Strategic Interactions

Seminar (S)

2577912, SS 2019, 2 SWS, Language: German, Open in study portal

Notes
This course is admission restricted. If you werealready admitted to another course in the module “Advanced Topics in Strategy and Management” the participation at this course will be guaranteed.

Learning Content
In this course, students simulate and analyze real-life conflict situations using Business Wargaming methods. The students will be able to understand the underlying structure and dynamics of various conflicts, this includes making own conclusions as well as deriving strategic recommendations.

Workload
The total workload for this course is approximately 90 hours.

Lecture: 15 hours

Preparation of lecture: 75 hours

Exam preparation: n/a

V **Workshop Business Wargaming - Analyse strategischer Interaktionen (Master)** **Seminar (S)**
2577922, WS 19/20, 2 SWS, Language: German, Open in study portal

Learning Content
In this lecture, current economic trends will be discussed from a perspective of competition analysis and corporate strategies. Using appropriate frameworks, the students will be able to analyze collectively selected case studies and derive business strategies.

Annotation
This course is admission restricted. If you werealready admitted to another course in the module “Advanced Topics in Strategy and Management” the participation at this course will be guaranteed.

Workload
The total workload for this course is approximately 90 hours.

Lecture: 15 hours

Preparation of lecture: 75 hours

Exam preparation: n/a

T 4.245 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

Type	Credits	Recurrence	Version
Examination of another type	3	Irregular	1

Events					
SS 2019	2577923	Workshop aktuelle Themen Strategie und Management (Master)	2 SWS	Seminar (S)	Lindstädt
Exams					
SS 2019	7900122	Workshop Current Topics in Strategy and Management		Prüfung (PR)	Lindstädt

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:

V Workshop aktuelle Themen Strategie und Management (Master) — Seminar (S)

2577923, SS 2019, 2 SWS, Language: German, Open in study portal

Notes
This course is admission restricted. If you werealready admitted to another course in the module “Advanced Topics in Strategy and Management” the participation at this course will be guaranteed.

Learning Content
In this lecture, students discuss and evaluate models in the field of strategic management with a focus on applicability and theory based limitations. Critical examination of current research results will be a substantial part of this course.

Workload
The total workload for this course is approximately 90 hours.

Lecture: 15 hours

Preparation of lecture: 75 hours

Exam preparation: n/a