Module Handbook
Information Engineering and Management (M.Sc.)
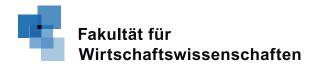
Winter Term 2015/2016
SPO 2015
04.08.2015

Department of Economics and Management
Department of Informatics

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Table of Contents

1   Structure of the Master program in Information Engineering and Management

The Master program in *Information Engineering and Management* has 4 terms. The terms 1 to 3 of the program are method–oriented and provide the students with state-of-the-art knowledge in informatics, business administration, operations research, economics, statistics and law. The interdisciplinary approach is especially emphasized in the interdisciplinary seminar.

It is recommended to study the courses in the following sequence:

- The (mandatory) modules in business administration and operations research should be studied in the first two terms of the program.

- The interdisciplinary seminar module should be taken until the end of the third term of the program.

- The (elective) modules from business administration, economics, operations research, and statistics, from informatics, and from law should be studied in the first three terms of the program.

- The 4-th term is reserved for the Master Thesis in which the student proves his ability for independent scientific research in informatics, the economic sciences, and law.

Figure 1 shows a summary of this recommendation with the structure of the disciplines and with credit points allocated to the modules of the program.

Figure 1: Structure of the Master program in Information Engineering and Management SPO2015 (Recommendation)

2   Module Handbook - a helpful guide throughout the studies

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

- the structure of the modules

- the extent (in CP),

- the dependencies of the modules,

- the learning outcomes,

- the assessment and examinations.

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

Begin and completion of a module

Every module and every course is allowed to be credited only once. The decision whether the course is assigned to one module or the other (e.g. if a course is selectable in two or more modules) is made by the student at the time of signing in for the corresponding exam. The module is **succeeded**, if the general exam of the module and/or if all of its relevant partial exams have been passed (grade min 4.0). In order to that the minimum requirement of credits of this module have been met.

General exams and partial exams

The module exam can be taken in a general exam or several partial exams. If the module exam is offered as a general exam, the entire content of the module will be reviewed in a single exam. If the module exam exists of partial exams, the content of each course will be reviewed in corresponding partial exams. The registration for the examinations takes place online via the self-service function for students. The following functions can be accessed on
https://studium.kit.edu/meinsemester/Seiten/pruefungsanmeldung.aspx:

- Sign in and sign off exams

- Retrieve examination results

- Print transcript of records

For further and more detailed information also see https://studium.kit.edu/Seiten/FAQ.aspx.

Types of exams

The exams are split into written exams, oral exams and alternative exam assessments. Exams are always graded. Non exam assessments can be repeated several times and are not graded.

Repeating exams

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

Additional accomplishments

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

Further information

More detailed information about the legal and general conditions of the program can be found in the examination regulation of the program `http://www.sle.kit.edu/amtlicheBekanntmachungen.php`).

Used abbreviations

LP/CP	Credit Points/ECTS	Leistungspunkte/ECTS
LV	course	Lehrveranstaltung
RÜ	computing lab	Rechnerübung
S	summer term	Sommersemester
Sem.	semester/term	Semester
ER/SPO	examination regulations	Studien- und Prüfungsordnung
KS/SQ	key skills	Schlüsselqualifikationen
SWS	contact hour	Semesterwochenstunde
Ü	excercise course	Übung
V	lecture	Vorlesung
W	winter term	Wintersemester

3   Actual Changes

Important changes are pointed out in this section in order to provide a better orientation. Although this process was done with great care, other/minor changes may exist. Please also check our updates on `http://www.wiwi.kit.edu/lehreMHB.php#mhb_aktuell`

IW4BWLISM3 - Market Engineering (S. 29)

Anmerkungen

The course "Computational Economics" [2590458] will not be offered any more in this module from winter term 2015/2016 on. The examination will be offered latest until summer term 2016 (repeaters only).

IW4BWLUO4 - Strategic Decision Making and Organization (S. 39)

Anmerkungen

The course "Organization Theory" will not be offered any more from summer term 2015 on. The examination will be offered latest until winter term 2015/2016 (repeaters only).

IW4BWLIIP2 - Industrial Production II (S. 40)

Anmerkungen

The course "Material Flow Analysis and Life Cycle Assessment [2581995]" will not be offered any more from winter term 2015/16. The examination had been offered latest on July 2015 (repeaters only).
The course "Life Cycle Assessment" will be offered from winter term 2015/16 and replace the course "Material Flow Analysis and Life Cycle Assessment [2581995]".
Apart from the core course the courses offered are recommendations and can be replaced by courses from the Module Industrial Production III.

IW4BWLIIP6 - Industrial Production III (S. 41)

Anmerkungen

The course "The Management of R&D Projects with Case Studies [2581963]" will not be offered any more from summer term 2015. The examination will be offered latest until winter term 2015/16 (repeaters only).
The course "Project Management" will be offered from winter term 2015/16 and replace the course "The Management of R&D Projects with Case Studies [2581963]".
Apart from the core course the courses offered are recommendations and can be replaced by courses from the Module Industrial Production II.

IW4BWLIIP4 - Energy Economics and Energy Markets (S. 42)

Anmerkungen

The course "Basics of Liberalised Energy Markets" [2581998] will be reduced to 3 credits in winter term 2015/2016.

IW4BWLMAR5 - Marketing Management (S. 46)

Bedingungen

Only one of the following courses can be counted towards the final grade of the module:
Marketing Strategy Business Game, Business Plan Workshop, Open Innovation – Concepts, Methods and Best Practices or Strategic Brand Management.
Exception: In summer term 2016 exceptionally two of the courses can be chosen or, in case one course has already been chosen previously, a second course can be chosen.

IW4BWLMAR6 - Sales Management (S. 48)

Bedingungen

The course „Sales Management and Retailing" [2572156] is compulsory and must be passed. This rule only applies to students who take the first examination within the module "Sales Management" after 01.12.2015.

IW4BWLMAR8 - Evidence-based Marketing (S. 50)

Anmerkungen

New module starting winter term 2015/2016.

IW4BWLMAR9 - Services Marketing (S. 51)

Anmerkungen

new module starting winter term 2015/2016

IW4VWL2 - Applied Strategic Decisions (S. 53)

Anmerkungen

The course *Predictive Mechanism and Market Design* is not offered each year.
The course "Decision Theory" [2520365] will not be offered any more from summer term 2015 on. The examination will be offered latest until winter term 2015/2016 (repeaters only).

IW4STAT1 - Mathematical and Empirical Finance (S. 63)

Anmerkungen

This module will not be offered any more from winter term 2015/2016 on.

IW4STAT2 - Statistical Methods in Risk Management (S. 64)

Anmerkungen

This module will not be offered any more from winter term 2015/2016 on.

IW4STAT4 - Analytics and Statistics (S. 65)

Anmerkungen

New module starting winter term 2015/2016.
The planned lectures and courses for the next three years are announced online.

IW4STAT5 - Econometrics and Statistics I (S. 66)

Anmerkungen

New module starting winter term 2015/2016. It replaces the module "Mathematical and Empirical Finance" [WW4STAT1].

IW4STAT6 - Econometrics and Statistics II (S. 67)

Anmerkungen

New module starting winter term 2015/2016. It replaces the module "*Statistical Methods in Risk Management*" [WW4STAT2]

IW4INAIFB11 - Development of Business Information Systems (S. 104)

Bedingungen

The course *Datenbanksysteme und XML* [2511202] or the course *Software Quality Management* [2511208] must be examined.

2540510 - Master Seminar in Information Engineering and Management (S. 273)

Inhalt

The seminar servers on one hand to improve the scientific working skills. On the other hand, the student should work intensively on a given topic and develop a scientific work, that is based on a profound literature research.
The seminar can also be a implementation of software for a scientific problem (e.g. Business Games/dynamic systems) according to the individual focus in the current semester. The software has to be well documented. The written elaboration covers a description and explanation of the software as well as a discussion about limits and extensibility. Furthermore the software must be deployable und shall be presented on the infrastructure stack of the chair. An implementation of a software has to examine the scientific state of the art in a critical way, too.
A concrete description of the current topics is announced in time for the begin of the application stage.

2540450 - Principles of Information Engineering and Management (S. 223)

Erfolgskontrolle

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation).

2577904 - Organization Theory (S. 312)

Anmerkungen

The course "Organization Theory" will not be offered any more from summer term 2015 on. The examination will be offered latest until winter term 2015/2016 (repeaters only).

24880 - Practical Course Web Engineering (S. 330)

Anmerkungen

The course is lectured for the last time in the summer term 2014. Examination is possible until summer term 2015.

2520317 - Multivariate Statistical Methods (S. 291)

Anmerkungen

The credits for the course "Multivariate Statistical Methods" have been changed from 5 to 4,5 from winter term 2015/2016 on.

2581998 - Basics of Liberalised Energy Markets (S. 147)

Anmerkungen

The course "Basics of Liberalised Energy Markets" [2581998] will be reduced to 3 credits in winter term 2015/2016 and the tutorial [2581999] is no longer offered.

2550493 - Hospital Management (S. 248)

Anmerkungen

The credits have been changed from 3 to 4,5.
The lecture is held in every semester.
The planned lectures and courses for the next three years are announced online.

2550495 - Operations Research in Health Care Management (S. 305)

Anmerkungen

The lecture is planned to be held in the summer term 2016. The planned lectures and courses for the next three years are announced online.

SemFBV1 - Seminar Risk and Insurance Management (S. 397)

Erfolgskontrolle

At least one oral presentation and one term paper have to be deliverd, either as individual work or as team work. Active participation in class and working groups is expected (according to §4(2), 3 SPO).
The grading consists of the weighted performance of the tasks delivered.

2550491 - Seminar in Discrete Optimization (S. 403)

Erfolgskontrolle

The assessment consists of a written seminar thesis of 20-25 pages and a presentation of 35-40 minutes (according to §4(2), 3 of the examination regulation).
The final mark for the seminar consists of the seminar thesis, the seminar presentation, the handout, and if applicable further material such as programming code.
The seminar can be attended both by Bachelor and Master students. A differentiation will be achieved by different valuation standards for the seminar thesis and presentation.

2572156 - Sales Management and Retailing (S. 369)

Bedingungen

This course is compulsory within the module "Sales Management" and must be passed. This rule only applies to students who take the first examination within the module "Sales Management" after 01.12.2015.

SemPÖ1 - Seminar on Morals and Social Behavior (S. 393)

Erfolgskontrolle

Students write a seminar paper on an assigned topic (10 pages), present it in class and discuss results during seminar sessions. These three elements are graded individually. The seminar grade is the weighted average of these individual grades where the weighting is announced on the course syllabus.

2571199 - Open Innovation – Concepts, Methods and Best Practices (S. 304)

Anmerkungen

For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).
Please note that only one of the following courses can be chosen in the Marketing Management Module: Marketing Strategy Business Game, Strategic Brand Management, Open Innovation – Concepts, Methods and Best Practices or Business Plan Workshop.
Exception: In summer term 2016 exceptionally two courses can be chosen or, in case one course has already been chosen previously, a second course can be chosen.
Please note: The number of participants for this course is limited. The Marketing & 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.

2540440 - Marketing Communication (S. 268)

Anmerkungen

New course starting summer term 2015.
The credits for the course have been changed from 3 to 4,5 from summer term 2016 on.

2520357 - Portfolio and Asset Liability Management (S. 321)

Anmerkungen

The credits for the course have been changed from 5 to 4,5 from winter term 2015/2016 on.

2511312 - Web Science (S. 485)

Anmerkungen

New course starting winter term 2015/2016.

n.n. - Project Management (S. 347)

Anmerkungen

The course will be offered from winter term 2015/16 and replace the course "The Management of R&D Projects with Case Studies [2581963]".

n.n. - Life Cycle Assessment (S. 302)

Anmerkungen

The course will be offered from winter term 2015/16 and replace the course "Material Flow Analysis and Life Cycle Assessment [2581995]".

2572202 - Services Marketing (S. 417)

Anmerkungen

new course starting summer term 2016

2572200 - Marketing Communication (S. 303)

Anmerkungen

new course starting winter term 2015/2016

2540494 - Regulatory Management and Grid Management - Economic Efficiency of Network Operation (S. 360)

Anmerkungen

New course starting winter term 2015/2016

2550552 - Advanced Statistics (S. 444)

Anmerkungen

New course starting winter term 2015/2016

4 Mandatory Modules

4.1 All Subjects

Module: Information Engineering and Management [IW4WWIW]

Coordination: C. Weinhardt, A. Geyer-Schulz
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
10	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540450	Principles of Information Engineering and Management (p. 223)	2/1	W	5	C. Weinhardt, T. Teubner
2540500	Business Administration in Information Engineering and Management (p. 158)	2/1	S	5	A. Geyer-Schulz

Learning Control / Examinations
The assessment is carried out as partial exams (according to Section 4 (2), 1-3 SPO) of each course of this module, whose sum of credits 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.

Conditions
None.

Qualification Goals
The student

- understands and analyzes the central role of information as an economic good, a production factor, and a competitive factor,
- identifies, evaluates, prices, and markets information goods,
- evaluates informations flows and the value of information in an interdisciplinary context,
- works out solutions in teams,
- transfers models from Business Administration to situations in business whose basic conditions are changed due to the implementation of information and communication technology,
- applies methods from Business Administration (Decision theory, game theory, operations research, etc.) to questions of Information Engineering and Management,
- analyzes the potential to automize the decision making process in businesses by data bases,
- describes the process to extract relevant data for decision making from operational accounting systems.

Content
The module *Information Engineering and Management* comprises the lectures *Principles of Information Engineering and Management* [2540450] and *Business Administration in Information Engineering and Management* [2540500].
In the lecture *Principles of Information Engineering and Management*, a clear distinction of information as a production, competitive, and economic good is introduced. The central role of information is explained through the concept of the "information lifecycle". The single phases from extraction/generation through storage transformation and evaluation until the marketing and usage of information are analyzed from the business administration perspective and the microeconomic perspective. The state of the art of economic theory is presented throughout the different phases of the information lifecycle. The lecture is complemented by accompanying exercise courses.
In the lecture *Business Administration in Information Engineering and Management*, classical Business Administration is applied to businesses in an information- and communicationtechnological environment. The process to extract relevant data for decision making from operational accounting systems receives special attention. In order to do so, topics such as activity-based costing and transaction costs models are addressed. The automization of the decision making process in businesses by data bases is another focus of the module. To solve such issues within a company, relevant methods such as decision theory and game theory

are lectured. Finally, complex business relevant questions in a dynamically changing environment are adressed by presenting models and methods from system dynamics.

Module: Stochastic Models in Information Engineering and Management [IW4WWOR]

Coordination: K. Waldmann
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
5	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2550679	Markov Decision Models I (p. 449)	2/1/2	W	5	K. Waldmann

Learning Control / **Examinations**
The assessment of the module is in a written examination according to §4(2), 1 of the examination regulation. In each term (usually in March and July), one examination is held for both courses. The grade of the module corresponds to the grade of this examination.

Conditions
None.

Qualification Goals
The lecture provides students with knowledge of modern techniques of stochastic modelling. Students are able to properly describe and analyze basic stochastic systems.

Content
Markov chains are no longer a nice theory but an important tool in order to model, analyse, and optimize a stochastic system as it evolves over time.
Topics overview: Markov chains, Poisson Processes.

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

Module: Interdisciplinary Seminar Module [IW4IWSEM]

Coordination: Studiendekan (Fak. f. Wirtschaftswissenschaften), Studiendekan/in (Fak. f. Informatik)
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
6	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540510	Master Seminar in Information Engineering and Management (p. 273)	2	W	3	A. Geyer-Schulz
SemIW	Seminar Information Engineering and Management (p. 390)	2	W/S	3	C. Weinhardt
SemIIP2	Seminar in Industrial Production (p. 389)	2	W/S	3	F. Schultmann, M. Fröhling
SemEW	Seminar Energy Economics (p. 383)	2	W/S	3	W. Fichtner, P. Jochem, D. Keles, R. McKenna, V. Bertsch
2572197	Seminar in strategic and behavioral marketing (p. 402)	2	W	3	B. Neibecker
2577915	Seminar: Management and Organization (p. 409)	2	W/S	3	H. Lindstädt
2579904	Seminar Management Accounting (p. 391)	2	W/S	3	M. Wouters
2579905	Special Topics in Management Accounting (p. 430)	2		3	M. Wouters, F. Stadtherr
SemTuE1	Entrepreneurship Seminar (p. 384)			3	O. Terzidis
SemTuE2	Seminar Innovation management (p. 385)			3	M. Weissenberger-Eibl
2530280	Seminar in Finance (p. 387)	2	W/S	3	M. Uhrig-Homburg, M. Ruckes
2595477	Practical Seminar Service Innovation (p. 410)	3		4,5	G. Satzger
2595470	Seminar Service Science, Management & Engineering (p. 398)	2	W/S	4	C. Weinhardt, R. Studer, S. Nickel, H. Fromm, W. Fichtner, G. Satzger
2595475	Seminar Mobility Services (p. 392)	2	W	3	G. Satzger, C. Stryja
SemFBV1	Seminar Risk and Insurance Management (p. 397)	2	W/S	3	U. Werner
2530353	Seminar Financial Economics and Risk Management (p. 388)	2	W/S	3	M. Ulrich
SemWIOR1	Seminar Stochastic Models (p. 400)	2	W/S	3	K. Waldmann
SemWIOR2	Seminar Economic Theory (p. 488)	2	W/S	3	C. Puppe
SemWIOR3	Seminar in Experimental Economics (p. 404)	2	W/S	3	N. N.
n.n.	Seminar in Behavioral and Experimental Economics (p. 386)	2	W/S	3	P. Reiss
n.n.	Seminar on Topics in Experimental Economics (p. 394)	2	S	3	P. Reiss
SemPÖ1	Seminar on Morals and Social Behavior (p. 393)	2	W/S	3	N. Szech
SemPÖ2	Seminar on Topics in Political Economics (p. 395)	2	W/S	3	N. Szech
2550131	Seminar in Continous Optimization (p. 405)	2	W/S	3	O. Stein
2550491	Seminar in Discrete Optimization (p. 403)	2	W/S	3	S. Nickel
SemSTAT	Seminar Statistics (p. 399)	2		3	N.N.
SemAIFB1	Seminar in Enterprise Information Systems (p. 378)	2	W/S	3	R. Studer, A. Oberweis, T. Wolf, R. Kneuper
SemAIFB2	Seminar Efficient Algorithms (p. 382)	2	W/S	3	H. Schmeck

SemAIFB4	Seminar Knowledge Management (p. 401)	2	W	3	R. Studer
rechtsem	Seminar in Law (p. 376)	2	W/S	3	T. Dreier
RIO	(p. 356)	2	S	3	G. Sydow
2540445	Seminar Pricing (p. 396)	2	S	3	J. Kim
2520024	Topics in Econometrics (p. 468)	2	S	3	M. Schienle
2521388	Seminar Data Mining I (p. 380)	2	W	3	G. Nakhaeizadeh
2520375	Seminar Data Mining II (p. 381)	2	S	3	G. Nakhaeizadeh
2521391	(p. 441)	2	W	3	M. Höchstötter

Learning Control / Examinations

The assessment in this module is regulated by § 4 (2) 3, of the examination regulation for the Master Information Engineering and Management. Further details will be defined for each seminar separately.

Conditions

Students should have experience with literature search in informatics, economics, business administration, and law. They should know the methods of scientific work, presentation techniques for scientific presentations, as well as the form requirements of scientific publications (guide line for authors) and review processes for scientific publications.

For further details see German version.

Qualification Goals

- 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.

Content

The Students will be coached by a group of tutors which consists in each case of an tutor of informatics, economics and law.

Module: Master Thesis [IW4IWMATHESIS]

Coordination: Studiendekan (Fak. f. Wirtschaftswissenschaften), Vorsitzender des Prüfungsausschusses
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits 30	Cycle	Duration

Learning Control / Examinations
Examination by two examiners from the two faculties. For details refer to examination regulation. The examiner has to be involved in the degree programme. Involved in the degree programme are the persons that coordinate a module or a lecture of the degree programme.

Conditions
Regulated in §11 of the examination regulation.
The requirements for the examiner are described in §14 (2) of the examination regulation.

Qualification Goals
The student can independently handle a complex and unfamiliar subject based on scientific criteria and the current state of research.
He/she is in a position to critically analyze and structure the researched information as well as derive principles and regularities. He/she knows how to apply the thereby achieved results to solve the task at hand. Taking into account this knowledge and his/her interdisciplinary knowledge, he/she can draw own conclusions, derive improvement potentials, propose and implement science-based decisions.
This is basically also done under consideration of social and/or ethical aspects.
He/she can interpret, evaluate and if required, graphically present the obtained results.
He/she is in a position to sensibly structure a research paper, document results and clearly communicate the results in scientific form.

Content

- The master thesis shows that the candidate can autonomously investigate a problem from his discipline with scientific methods according to the state-of-the-art of the discipline within a specified time period.
- The master thesis can be written in German or English.
- The topic of a master thesis can be accepted or chosen by each of the examiners according to examination regulation. The examiner accepting a topic for a master thesis acts as the first supervisor of this thesis.
- Writing a master thesis with a supervisor who is not a member of the two faculties participating in the degree programme (Departement of Informatics, Department of Economics and Management) requires acceptance by the examination board of the degree programme. The candidate must have an opportunity to make suggestions for the topic of the master thesis.
- Candidates can write a master thesis in teams. However, this requires that the contribution and performance of each candidate to the thesis is identifiable according to objective criteria which allow a unique delineation of each candidate's contribution. The contribution of each candidate regarded in isolation must fulfill the requirements a individual master thesis.
- In exceptional cases and upon request of the candidate, the chairman of the examination board chooses a supervisor and requests that this supervisor provides the candidate with a topic for the master thesis within 4 weeks after the request. In this case, the candidate is informed by the chairman of the examination board about the topic selected.
- Topic, specification of research tasks and the volume of the master thesis should be limited by the supervisor, so that the master thesis can be written with the assigned workload of 30 credits (750-900h).
- The master thesis must contain the following declaration of the candidate: "I truthfully assure that I have autonomously written this master thesis. I have quoted all sources used precisely and completely. I have labelled everything which has been taken from the work of others with or without change." A master thesis without this declaration will not be accepted.
- The date of the assignment of the topic to a candidate as well as the date of delivery of the master thesis should be registered at the examination board. The candidate can return a topic for the master thesis only one time and only within a period of two month after he has received the topic. Upon a request of the candidate with reasons supporting an extension, the examination board may extend the deadline for the delivery of the master thesis by a maximum of three months. A master thesis not delivered within time is graded as "fail" except when the candidate is not responsible for this delay (e.g. protection of motherhood).
- The master thesis is reviewed and graded by the supervisor and the additional examiner. The team of supervisor and examiner must represent both faculties participating in the degree programme (Department of Informatics, Department of Economics and Management). At least one of the two must be professor or junior professor. If the grades of the supervisor and the examiner differ, the examination board sets the mark within this limit.
- Reviewing and grading should be done within 8 weeks after delivery of the master thesis.

5   Elective Modules

5.1   Business Administration

Module: Advanced CRM [IW4BWLISM1]

Coordination: A. Geyer-Schulz
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540508	Customer Relationship Management (p. 165)	2/1	W	4,5	A. Geyer-Schulz
2540506	Recommender Systems (p. 357)	2/1	S	4,5	A. Geyer-Schulz, A. Sonnenbichler
2540533	Personalization and Services (p. 319)	2/1	S	4,5	A. Sonnenbichler
2540518	Social Network Analysis in CRM (p. 428)	2/1	S	4,5	A. Geyer-Schulz
2540531	Business Dynamics (p. 156)	2/1	W	4,5	A. Geyer-Schulz, P. Glenn
2595501	Service Analytics (p. 411)	2/1	S	4,5	T. Setzer, H. Fromm

Learning Control / Examinations
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.

Conditions
None.

Qualification Goals
The student

- understand service competition as a sustainable competitive strategy and understand the effects of service competition on the design of markets, products, processes and services,
- models, analyzes and optimizes the structure and dynamics of complex business applications,
- develops and realizes personalized services, especially in the field of recommendation services,
- analyzes social networks and knows their application field in CRM,
- works in teams.

Content
Besides the foundations of modern customer oriented and service oriented management, developments of CRM systems are lectured together with tools for analysis and optimization of such systems.
An overview of general aspects and concepts of personalization and their importance for service provider and customers is given. Then, different categories of recommendation systems are presented: Ranging from explizit recommendation services like reviews to implicit services like the calcuation of recommendations based on the historic data about products and/or customers.
There exist a trend towards viewing economic systems and social systems as networks. This approach allows for the application of different methods from mathematics, economic sciences, sociology and physics. In CRM, net work analyses may provide benefits calculating customer network values.
CRM processes and marketing campaigns are just two examples of dynamic systems that are characterized by feedback loops between different process steps. By means of the tools of business dynamics such processes can be modelled. Simulations of complex systems allow the analysis and optimization of business processes, marketing campaigns, and organizations.

Remarks
The course Social Network Analysis in CRM [2540518] is currently not offered.

The courses *Recommendersystems* and *Personalization and Services* will take place in an alternating way from summer term 14. Details on the cycle and on the exams can be found on http://www.em.uni-karlsruhe.de/studies/.

Module: Electronic Markets [IW4BWLISM2]

Coordination: A. Geyer-Schulz
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540502	Markets and Organizations: Principles (p. 257)	2/1	W	4,5	A. Geyer-Schulz
2540460	Market Engineering: Information in Institutions (p. 265)	2/1	S	4,5	C. Weinhardt
2561232	Telecommunication and Internet Economics (p. 463)	2/1	W	4,5	K. Mitusch
2540531	Business Dynamics (p. 156)	2/1	W	4,5	A. Geyer-Schulz, P. Glenn
2540500	Business Administration in Information Engineering and Management (p. 158)	2/1	S	5	A. Geyer-Schulz

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

Conditions
None.

Qualification Goals
The student

- knows coordination and motivation methods and analyzes them regarding their efficiency,

- classifies markets and describes the roles of the participants in a formal way,

- knows the conditions for market failure and knows and develops countermeasures,

- knows institutions and market mechanisms, their fundamental theories and empirical research results,

- knows the design criteria of market mechanisms and a systematical approach for creating new markets,

- models, analyzes and optimizes the structure and dynamics of complex business applications.

Content
What are the conditions that make electronic markets develop and how can one analyse and optimize such markets?
In this module, the selection of the type of organization as an optimization of transaction costs is treated. Afterwards, the efficiency of electronic markets (price, information and allocation efficiency) as well as reasons for market failure are described. Finally, motivational issues llike bounded rationality and information assymetries (private information and moral hazard), as well as the development of incentive schemes, are presented. Regarding the market design, especially the interdependencies of market organization, market mechanisms, institutions and products are described and theoretical foundations are lectured.
Electronic markets are dynamic systems that are characterized by feedback loops between many different variables. By means of the tools of business dynamics such markets can be modelled. Simulations of complex systems allow the analysis and optimization of markets, business processes, policies, and organizations.
Topics include:

- classification, analysis, and design of markets

- simulation of markets

- auction methods and auction theory

- automated negotiations

- nonlinear pricing

- continuous double auctions
- market-maker, regulation, control

Remarks
The course *Electronic Marktes: Principles* is not offered at the moment.

Module: Market Engineering [IW4BWLISM3]

Coordination: C. Weinhardt
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540460	Market Engineering: Information in Institutions (p. 265)	2/1	S	4,5	C. Weinhardt
2520408	Auction Theory (p. 143)	2/1	W	5	K. Ehrhart
2540454	eFinance: Information Engineering and Management for Securities Trading (p. 186)	2/1	W	4,5	C. Weinhardt
2540489	Experimental Economics (p. 204)	2/1	W	4,5	C. Weinhardt, T. Teubner
2540464	eEnergy: Markets, Services, Systems (p. 184)	2/1	S	4,5	C. Weinhardt
2540494	Regulatory Management and Grid Management - Economic Efficiency of Network Operation (p. 360)	2/1	W	4,5	S. Rogat

Learning Control / Examinations
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.

Conditions
The course *Market Engineering: Information in Institutions* [2540460] is compulsory and must be examined.

Qualification Goals
The students

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

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

Remarks
The course "Computational Economics" [2590458] will not be offered any more in this module from winter term 2015/2016 on. The examination will be offered latest until summer term 2016 (repeaters only).

Module: Business & Service Engineering [IW4BWLISM4]

Coordination: C. Weinhardt
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540456	Business Models in the Internet: Planning and Implementation (p. 215)	2/1	S	4,5	T. Teubner, R. Knapper
2540498	Special Topics in Information Engineering & Management (p. 431)	3	W/S	4,5	C. Weinhardt
2540506	Recommender Systems (p. 357)	2/1	S	4,5	A. Geyer-Schulz, A. Sonnenbichler
2540533	Personalization and Services (p. 319)	2/1	S	4,5	A. Sonnenbichler
2595468	Service Innovation (p. 415)	2/1	S	4,5	G. Satzger, M. Kohler, N. Feldmann
2595477	Practical Seminar Service Innovation (p. 410)	3		4,5	G. Satzger

Learning Control / Examinations

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.

Conditions

None.

Qualification Goals

The student should

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

Content

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

Remarks

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

The courses *Recommendersystems* and *Personalization and Services* will take place in an alternating way from summer term 14. Details on the cycle and on the exams can be found on http://www.em.uni-karlsruhe.de/studies/.

Module: Service Management [IW4BWLISM6]

Coordination: C. Weinhardt, G. Satzger
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2595484	Business and IT Service Management (p. 155)	2/1	W	4,5	G. Satzger
2595468	Service Innovation (p. 415)	2/1	S	4,5	G. Satzger, M. Kohler, N. Feldmann
2595501	Service Analytics (p. 411)	2/1	S	4,5	T. Setzer, H. Fromm
2595505	Industrial Services (p. 226)	2/1	W	4,5	H. Fromm
2540470	Modeling and Analyzing Consumer Behaviour with R (p. 281)	2/1	S	4,5	V. Dorner, C. Weinhardt

Learning Control / Examinations
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.

Conditions
The course *Business and IT Service Management* [2590484] is compulsory and must be examined

Qualification Goals
The students

- understand the basics of developing and managing IT-based services,
- understand and apply OR methods in service management,
- systematically use vast amounts of available data for planning, operation, personalization and improvement of complex service offerings, and
- understand and analyze innovation processes in corporations.

Content
The module service management addresses the basics of developing and managing IT-based services. The lectures contained in this module teach the basics of developing and managing IT-based services and the application of OR methods in the field of service management. Moreover, students learn to systematically analyze vast amounts of data for planning, operation and improvement for complex service offerings. These tools enhance operational and strategic decision support and help to analyze and understand the overall innovation processes in corporations. Current examples from research and industry demonstrate the relevance of the topics discussed in this module.

Module: Service Analytics [IW4BWLKSR1]

Coordination: H. Fromm, C. Weinhardt
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2595501	Service Analytics (p. 411)	2/1	S	4,5	T. Setzer, H. Fromm
2595505	Industrial Services (p. 226)	2/1	W	4,5	H. Fromm
2540498	Special Topics in Information Engineering & Management (p. 431)	3	W/S	4,5	C. Weinhardt
2540470	Modeling and Analyzing Consumer Behaviour with R (p. 281)	2/1	S	4,5	V. Dorner, C. Weinhardt
2540498	Service Analytics II – Enterprise Data Reduction and Prediction (p. 413)	2/1	S	4,5	T. Setzer, C. Weinhardt

Learning Control / Examinations
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.

Conditions
The course Service Analytics [2595501] is compulsory and must be examined.

Recommendations
Basic knowledge of Operations Research, Descriptive Statistics, and Inferential Statistics is assumed.

Qualification Goals
The student should learn to

- Understand different scenarios where analytics is applied in a service context

- Distinguish different analytics methods and concepts and learn when to apply them

- Apply analytics tools in a service context

- Analyze and solve real-world business problems through leveraging analytics

Content
Modern economies have turned into "servitized" economies – with almost 70% of the gross value added being derived from the tertiary sector and with an increasing number of industrial companies proceeding to engage in service-type offerings. The adoption of analytics applied to services for leveraging the full potential of big data is still in its infancy - some areas like web analytics are more advanced, some other areas are just starting. This module strives to provide an overview on analytics methods applied in a service context and introduces different scenarios where analytics is applied to improve different kinds of services. The module offers the opportunity to apply and deepen this knowledge in hands-on tutorials and seminars.

Remarks
Starting summer term 2015, the lecture "Service Analytics II – Enterprise Data Reduction and Prediction" [2540498] can be chosen in the module.

Module: Service Design Thinking [IW4BWLKSR2]

Coordination: C. Weinhardt, G. Satzger
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2595600	Service Design Thinking (p. 414)	6	W/S	9	C. Weinhardt

Learning Control / Examinations
The assessment is carried out as a general exam (according to Section 4(2), 3 of the examination regulation). The overall grade of the module is the grade of the examination (according to Section 4(2), 3 of the examination regulation).

Conditions
The course Service Design Thinking is compulsory and must be examined.

Recommendations
This course is held in English – proficiency in writing and communication is required.

Qualification Goals

- Deep knowledge of the innovation method "Design Thinking", as introduced and promoted by Stanford University
- Development of new, creative solutions through extensive observation of oneself and one's environment, in particular with regard to the relevant service users
- Know how to use prototyping and experimentation to visualize one's ideas, to test and iteratively develop them, and to converge on a solution
- Communicate, work and present in an interdisciplinary and international project setting

Content

- Paper Bike: Learning about the basic method elements by building a paper bike that has to fulfill a given set of challenges.
- Design Space Exploration: Exploring the problem space through customer and user observation.
- Critical Function Prototype: Identification of critical features from the customer's perspective that can contribute to the solution of the overarching problem. Building and testing prototypes that integrate these functionalities.
- Dark Horse Prototype: Inverting earlier assumptions and experiences, which leads to the inclusion of new features and solutions.
- Funky Prototype: Integration of the individually tested and successful functions to a complete solution, which is further tested and developed.
- Functional Prototype: Further selection and convergence of existing ideas. Building a higher resolution prototype that can be tested by customers.
- Final Prototype: Preparing and presenting the final solution to the customer.

Remarks
Due to the project nature of the course, the number of participants is limited. For further information see the course description.

Module: Finance 1 [IW4BWLFBV1]

Coordination: M. Uhrig-Homburg, M. Ruckes
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2530550	Derivatives (p. 178)	2/1	S	4,5	M. Uhrig-Homburg
2530212	Valuation (p. 475)	2/1	W	4,5	M. Ruckes
2530555	Asset Pricing (p. 141)	2/1	S	4,5	M. Uhrig-Homburg, M. Ruckes

Learning Control / Examinations
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.

Conditions
None.

Qualification Goals
The student

- has core skills in economics and methodology in the field of finance

- assesses corporate investment projects from a financial perspective

- is able to make appropriate investment decisions on financial markets

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

Module: Finance 2 [IW4BWLFBV2]

Coordination: M. Uhrig-Homburg, M. Ruckes
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2530260	Fixed Income Securities (p. 206)	2/1	W	4,5	M. Uhrig-Homburg
2530214	Corporate Financial Policy (p. 163)	2/1	S	4,5	M. Ruckes
2530240	Market Microstructure (p. 270)	2/0	W	3	T. Lüdecke
2530565	Credit Risk (p. 249)	2/1	W	4,5	M. Uhrig-Homburg
2530210	Cost and Management Accounting (p. 237)	2/1	S	4,5	T. Lüdecke
2530555	Asset Pricing (p. 141)	2/1	S	4,5	M. Uhrig-Homburg, M. Ruckes
2530212	Valuation (p. 475)	2/1	W	4,5	M. Ruckes
2530550	Derivatives (p. 178)	2/1	S	4,5	M. Uhrig-Homburg
2530570	International Finance (p. 236)	2	S	3	M. Uhrig-Homburg, Dr. Walter
2530299	Business Strategies of Banks (p. 217)	2	W	3	W. Müller
2530296	Exchanges (p. 153)	1	S	1,5	J. Franke
2530232	Financial Intermediation (p. 209)	3	W	4,5	M. Ruckes
2540454	eFinance: Information Engineering and Management for Securities Trading (p. 186)	2/1	W	4,5	C. Weinhardt
2530205	Financial Analysis (p. 207)	2/1	S	4,5	T. Lüdecke

Learning Control / Examinations
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.

Conditions
It is only possible to choose this module in combination with the module *F1 (Finance)* [IW4BWLFBV1]. The module is passed only after the final partial exam of *F1 (Finance)* is additionally passed.

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

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

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

Module: Insurance Management I [IW4BWLFBV6]

Coordination: U. Werner
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2550055	Principles of Insurance Management (p. 341)	3/0	S	4,5	U. Werner
2530323	Insurance Marketing (p. 231)	3/0	S	4,5	E. Schwake
2530324	Insurance Production (p. 232)	3/0	W/S	4,5	U. Werner
2530050	Private and Social Insurance (p. 342)	2/0	W	2,5	W. Heilmann, K. Besserer
2530350	Current Issues in the Insurance Industry (p. 164)	2/0	S	2	W. Heilmann
2530335	Insurance Risk Management (p. 233)	2/0	S	2,5	H. Maser
INSGAME	P&C Insurance Simulation Game (p. 313)	3	W	3	U. Werner
2530395	Risk Communication (p. 363)	3/0	W/S	4,5	U. Werner
2530355	Modelling, Measuring and Managing of Extreme Risks (p. 286)	2	S	2,5	U. Werner, S. Hochrainer

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

Conditions
None.

Qualification Goals
See German version.

Content
See German version.

Module: Insurance Management II [IW4BWLFBV7]

Coordination: U. Werner
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2530323	Insurance Marketing (p. 231)	3/0	S	4,5	E. Schwake
2530324	Insurance Production (p. 232)	3/0	W/S	4,5	U. Werner
2530050	Private and Social Insurance (p. 342)	2/0	W	2,5	W. Heilmann, K. Besserer
2530350	Current Issues in the Insurance Indus-try (p. 164)	2/0	S	2	W. Heilmann
2530335	Insurance Risk Management (p. 233)	2/0	S	2,5	H. Maser
2530395	Risk Communication (p. 363)	3/0	W/S	4,5	U. Werner
INSGAME	P&C Insurance Simulation Game (p. 313)	3	W	3	U. Werner
2550055	Principles of Insurance Management (p. 341)	3/0	S	4,5	U. Werner
2530355	Modelling, Measuring and Managing of Extreme Risks (p. 286)	2	S	2,5	U. Werner, S. Hochrainer

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

Conditions
It is only possible to choose this module in combination with the module *Insurance Management I*. The module is passed only after the final partial exam of *Insurance Management I* has been passed.

Recommendations
The courses chosen from the modules Insurance Management I or Insurance Management II are supposed to complement each other. Advice and information is available from the person responsible for the examination process at the Insurance Department of FBV.

Qualification Goals
See German version.

Content
See German version.

Remarks
See German version.

Module: Strategic Corporate Management and Organization [IW4BWLUO1]

Coordination: H. Lindstädt
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2577904	Organization Theory (p. 312)	2	W	4,5	H. Lindstädt
2577902	Managing Organizations (p. 311)	2/0	W	3.5	H. Lindstädt
2577908	Modeling Strategic Decision Making (p. 283)	2	S	4,5	H. Lindstädt
2577900	Management and Strategy (p. 472)	2/0	S	3.5	H. Lindstädt
2577910	Problem solving, communication and leadership (p. 344)	1/0	S	2	H. Lindstädt

Learning Control / Examinations

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.

Conditions

None.

Qualification Goals

See German version.

Content

The module emphasizes the following aspects: The students learn models and frameworks which are used in strategic management and managing organizations. In addition, the module provides knowledge about management concepts and their practical application.

The module addresses three focal points: First, the students will learn models, frameworks and theoretical findings of the economic organization theory. Further, questions of a value-based concern leadership are discussed. Finally, the limitations of the basic models of economic decision theory are identified and advanced concepts are developed.

Remarks

The module will not be offered any more from summer term 2015. Students who are already assigned on the module can still finish it until summer term 2016.

The course "Organization Theory" will not be offered any more from summer term 2015 on. The examination will be offered latest until winter term 2015/2016 (repeaters only).

The credits for the courses "Managing Organizations" and "Management and Strategy" have been changed from 4 to 3,5 from summer term 2015 on.

Module: Strategic Decision Making and Organization [IW4BWLUO4]

Coordination: H. Lindstädt
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2577904	Organization Theory (p. 312)	2	W	4,5	H. Lindstädt
2577908	Modeling Strategic Decision Making (p. 283)	2	S	4,5	H. Lindstädt
2561127	Public Management (p. 350)	2	W	4,5	B. Wigger, Assistenten
2572157	Pricing (p. 340)	2/1	W	4,5	J. Kim

Learning Control / Examinations
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.

Conditions
None.

Qualification Goals
See German version.

Content

Remarks
The course "Organization Theory" will not be offered any more from summer term 2015 on. The examination will be offered latest until winter term 2015/2016 (repeaters only).

Module: Industrial Production II [IW4BWLIIP2]

Coordination: F. Schultmann
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2581952	Planning and Management of Industrial Plants (p. 136)	2/2	W	5,5	F. Schultmann
2581962	Emissions into the Environment (p. 190)	2/0	W	3,5	U. Karl
2581956	International Management in Engineering and Production (p. 235)	2/0	W	3,5	H. Sasse
n.n.	Life Cycle Assessment (p. 302)	2	W	3,5	H. Keller

Learning Control / Examinations
The assessment is carried out as partial exams (according to section 4 (2), 1 SPO) of the core course *Planning and Managing of Industrial Plants* [2581952] and one further single course of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately.
The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

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

Qualification Goals

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

Content

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

Remarks
The course "Material Flow Analysis and Life Cycle Assessment [2581995]" will not be offered any more from winter term 2015/16. The examination had been offered latest on July 2015 (repeaters only).
The course "Life Cycle Assessment" will be offered from winter term 2015/16 and replace the course "Material Flow Analysis and Life Cycle Assessment [2581995]".
Apart from the core course the courses offered are recommendations and can be replaced by courses from the Module Industrial Production III.

Module: Industrial Production III [IW4BWLIIP6]

Coordination: F. Schultmann
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2581954	Production and Logistics Management (p. 346)	2/2	S	5,5	M. Fröhling
2581961	Supply Chain Management with Advanced Planning Systems (p. 457)	2	S	3,5	M. Göbelt, C. Sürie
2581992	Risk Management in Industrial Supply Networks (p. 364)	2/0	W	3,5	M. Wiens
2581957	Supply Chain Management in the automotive industry (p. 455)	2/0	W	3,5	T. Heupel, H. Lang
n.n.	Project Management (p. 347)	2/1	W	3,5	F. Schultmann

Learning Control / Examinations
The assessment is carried out as partial exams (according to section 4 (2), 1 SPO) of the core course *Production and Logistics Management* [2581954] and further single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately.
The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

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

Qualification Goals

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

Content

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

Remarks
The course "The Management of R&D Projects with Case Studies [2581963]" will not be offered any more from summer term 2015. The examination will be offered latest until winter term 2015/16 (repeaters only).
The course "Project Management" will be offered from winter term 2015/16 and replace the course "The Management of R&D Projects with Case Studies [2581963]".
Apart from the core course the courses offered are recommendations and can be replaced by courses from the Module Industrial Production II.

Module: Energy Economics and Energy Markets [IW4BWLIIP4]

Coordination: W. Fichtner
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2581998	Basics of Liberalised Energy Markets (p. 147)	2/1	W	3	W. Fichtner
2581020	Energy Trade and Risk Management (p. 194)	3	S	4	W. Fichtner, D. Keles, C. Cremer
2581959	Energy Policy (p. 195)	2/0	S	3,5	M. Wietschel
2581022	Gas-Markets (p. 200)	2/0	W	3	A. Pustisek
2581025	Simulation Game in Energy Economics (p. 320)	2/0	S	3	W. Fichtner
2560234	Regulation Theory and Practice (p. 361)	2/1	S	4,5	K. Mitusch
2540464	eEnergy: Markets, Services, Systems (p. 184)	2/1	S	4,5	C. Weinhardt
2581007	Quantitative Methods in Energy Economics (p. 353)	2/1	W	4	D. Keles, P. Plötz

Learning Control / Examinations
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. Additional courses might be accredited upon request.

Conditions
The lecture *Basics of Liberalised Energy Markets* [2581998] has to be examined.

Recommendations
The courses are conceived in a way that they can be attended independently from each other. Therefore, it is possible to start the module in winter and summer term.

Qualification Goals
The student

- gains detailed knowledge about the new requirements of liberalised energy markets,

- describes the planning tasks on the different energy markets,

- knows solution approaches to respective planning tasks.

Content
Basics of Liberalised Energy Markets: The European liberalisation process, energy markets, pricing, market failure, investment incentives, market power
Energy Trade and Risk Management: trade centres, trade products, market mechanisms, position and risk management
Gas-Markets: producing countries, provision structures, market places, pricing
Energy Policy: Management of energy flows, energy-political targets and instruments (emission trading etc.)
Simulation Game in Energy Economics: Simulation of the German electricity system

Remarks
The course "Basics of Liberalised Energy Markets" [2581998] will be reduced to 3 credits in winter term 2015/2016.

Module: Energy Economics and Technology [IW4BWLIIP5]

Coordination: W. Fichtner
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2581003	Energy and Environment (p. 193)	2/1	S	4,5	U. Karl, n.n.
2581958	Strategical Aspects of Energy Economy (p. 452)	2/0	W	3,5	A. Ardone
2581000	Technological Change in Energy Economics (p. 462)	2/0	W	3	M. Wietschel
2581001	Heat Economy (p. 483)	2/0	S	3	W. Fichtner
2581002	Energy Systems Analysis (p. 196)	2/0	W	3	V. Bertsch
2581006	Efficient Energy Systems and Electric Mobility (p. 185)	2/0	S	3,5	R. McKenna, P. Jochem

Learning Control / Examinations
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. Additional courses might be accredited upon request.

Conditions
None.

Recommendations
The courses are conceived in a way that they can be attended independently from each other. Therefore, it is possible to start the module in winter and summer term.

Qualification Goals
The student

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

Content
Strategical Aspects of Energy Economy: Long-term planning methods, generation technologies
Technological Change in Energy Economics: Future energy technologies, learning curves, energy demand
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

Module: Entrepreneurship (EnTechnon) [IW4BWLENT1]

Coordination: O. Terzidis
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2545001	Entrepreneurship (p. 198)	2	W/S	3	O. Terzidis
2545010	Design Thinking (p. 179)	2	W/S	3	O. Terzidis, Dr. Kneisel, Dr. H. Haller, P. Nitschke
2545005	Business Planning (p. 216)	2	W/S	3	O. Terzidis, Mitarbeiter des Lehrstuhls
2545012	Entrepreneurial Leadership & Innovation Management (p. 197)	2	W	3	O. Terzidis, C. Linz
2545003	Managing New Technologies (p. 261)	2/1	S	5	T. Reiß
2572184	Business Plan Workshop (p. 157)	1	S	3	M. Klarmann, O. Terzidis
2545015	Innovation Management: Concepts, Strategies and Methods (p. 230)	2	S	3	M. Weissenberger-Eibl
2540456	Business Models in the Internet: Planning and Implementation (p. 215)	2/1	S	4,5	T. Teubner, R. Knapper
2513305	Developing Business Models for the Semantic Web (p. 181)	2	W	3	R. Studer, M. Maleshkova, F. Keppmann
2545019	Case studies seminar: Innovation management (p. 205)	2	W	3	M. Weissenberger-Eibl
2545016	Roadmapping (p. 365)	2	S	3	D. Koch
2545002	Entrepreneurship Research (p. 199)	2	S	3	O. Terzidis, Mitarbeiter

Learning Control / Examinations
See German version.

Conditions
None.

Qualification Goals
See German version.

Content

Module: Innovation Management [IW4BWLENT2]

Coordination: M. Weissenberger-Eibl
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2545015	Innovation Management: Concepts, Strategies and Methods (p. 230)	2	S	3	M. Weissenberger-Eibl
2545016	Roadmapping (p. 365)	2	S	3	D. Koch
2545017	Technology Assessment (p. 460)	2	S	3	D. Koch
2545018	Technologies for Innovation Management (p. 461)	2	W	3	D. Koch
2545019	Case studies seminar: Innovation management (p. 205)	2	W	3	M. Weissenberger-Eibl
2545018	Current issues in Innovation Management (p. 121)	2	W/S	3	M. Weissenberger-Eibl
2545001	Entrepreneurship (p. 198)	2	W/S	3	O. Terzidis
2545010	Design Thinking (p. 179)	2	W/S	3	O. Terzidis, Dr. Kneisel, Dr. H. Haller, P. Nitschke
2545012	Entrepreneurial Leadership & Innovation Management (p. 197)	2	W	3	O. Terzidis, C. Linz

Learning Control / Examinations
See German version.

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

Recommendations
None.

Qualification Goals
Students develop a comprehensive understanding of the innovation process and its conditionality. There is an additional focus on the concepts and processes which are of particular relevance with regard to shaping the entire process. Various strategies and methods are then taught based on this.
After completing the module, students should have developed a systemic understanding of the innovation process and be able to shape this by developing and applying suitable methods.

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

Module: Marketing Management [IW4BWLMAR5]

Coordination: M. Klarmann
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2571154	Product and Innovation Marketing (p. 345)	2/0	S	3	M. Klarmann
2571150	Market Research (p. 269)	2/1	S	4,5	M. Klarmann
2572167	Behavioral Approaches in Marketing (p. 477)	2/1	W	4,5	B. Neibecker
2571165	Strategic and Innovative Decision Making in Marketing (p. 453)	2/1	S	4,5	B. Neibecker
2572184	Business Plan Workshop (p. 157)	1	S	3	M. Klarmann, O. Terzidis
2571176	Marketing Strategy Business Game (p. 267)	1	S	1,5	M. Klarmann, Mitarbeiter
2571185	Strategic Brand Management (p. 451)	1/0	S	1,5	M. Klarmann, J. Blickhäuser
2571199	Open Innovation – Concepts, Methods and Best Practices (p. 304)	1/0	S	1,5	A. Hahn
2540440	Marketing Communication (p. 268)	2/1	S	4,5	J. Kim

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

Conditions
Only one of the following courses can be counted towards the final grade of the module:
Marketing Strategy Business Game, Business Plan Workshop, Open Innovation – Concepts, Methods and Best Practices or Strategic Brand Management.
Exception: In summer term 2016 exceptionally two of the courses can be chosen or, in case one course has already been chosen previously, a second course can be chosen.

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

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

- "Product and Innovation Marketing"

- "Market Research" – this course has to be completed successfully by students interested in seminar or master thesis positions at the chair of marketing

- "Strategic and Behavioral Marketing"

- "Strategic and Innovative Decision Making in Marketing"

- "Business Plan Workshop"

- "Marketing and Strategy Business Game"

Remarks
The course "Open Innovation – Concepts, Methods and Best Practices" [2571199] has been added summer 2015.
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

Module: Sales Management [IW4BWLMAR6]

Coordination: M. Klarmann
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2572156	Sales Management and Retailing (p. 369)	2	W	3	M. Klarmann
2572157	Pricing (p. 340)	2/1	W	4,5	J. Kim
2571150	Market Research (p. 269)	2/1	S	4,5	M. Klarmann
2572182	Case Studies in Pricing (p. 160)	1	W	1,5	M. Klarmann, Mitarbeiter
2572198	Price Negotiation and Sales Presentations (p. 339)	1	W	1,5	M. Klarmann, M. Schröder

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

Conditions
The course „Sales Management and Retailing" [2572156] is compulsory and must be passed. This rule only applies to students who take the first examination within the module "Sales Management" after 01.12.2015.

Qualification Goals
Students
- have an advanced knowledge about sales management (design and structure of sales systems, relationship with sales partners and important customers)
- have a fundamental understanding of price management (in particular consumer behavior of pricing, pricing strategy, price determination)
- are able to handle particularities and challenges in sales management
- know several qualitative and quantitative approaches to prepare decisions in Marketing
- are able to implement their extensive sales and pricing knowledge in a practical context
- have the theoretical knowledge to write a master thesis in Marketing
- have the theoretical knowledge to work in/together with the sales department

Content
The aim of the module is to deepen the sales management knowledge of the students. Theoretical approaches often have a combined view on marketing and sales, whereas in practical surroundings the sales department is completely separated from the marketing tasks. Given this fact, we concentrate on pure sales management topics and address different facets of the sales management. Students can choose between the following courses:

- "Sales Management and Retailing"

- "Pricing"

- "Market Research" - this course has to be completed successfully by students interested in seminar or master thesis positions at the chair of marketing

- "Case Studies in Pricing"

- "Sales Strategy and Control"

Remarks
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

Module: Strategy, Communication, and Data Analysis [IW4BWLMAR7]

Coordination: B. Neibecker
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2572167	Behavioral Approaches in Marketing (p. 477)	2/1	W	4,5	B. Neibecker
2571165	Strategic and Innovative Decision Making in Marketing (p. 453)	2/1	S	4,5	B. Neibecker
2571162	Information Technology and Business Information (p. 228)	2/1	S	4,5	B. Neibecker
2572157	Pricing (p. 340)	2/1	W	4,5	J. Kim

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

Conditions
None.

Qualification Goals
Students

- are familiar with general procedures and characteristics to develop new products and services under conditions of market orientation,
- can analyse customer needs, learn to realize competitive advantages and to work out interdisciplinary solutions,
- improve their statistic skills to cope with applied Marketing issues.

Content
The core product is everything a customer or business consumer receives. Marketers must understand what it takes to develop a new product successfully. It is important to understand that innovations differ in their degree of newness (up to radical innovations). This helps to determine how quickly the products will be adopted by a target market. Market orientation is on the front side of the medal, the reverse side includes meeting the needs of diverse stakeholders. To find out the critical drivers of success a deep understanding of analytical and statistical methods is essential. As a result, the developing of an effective marketing strategy is discussed as an empirical, scientific process. In addition, consumer behavior approaches in marketing are discussed as an important research area with a strong interdisciplinary and empirical orientation.

Remarks
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

Module: Evidence-based Marketing [IW4BWLMAR8]

Coordination: M. Klarmann
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2571150	Market Research (p. 269)	2/1	S	4,5	M. Klarmann
2572170	Marketing Analytics (p. 266)	2/1	W	4,5	M. Klarmann

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

Conditions
In order to attend Marketing Analytics [2572170], students are required to have passed the course Market Research [2571150].

Qualification Goals
Students

- possess advanced knowledge of relevant market research contents

- know many different qualitative and quantitative methods for measuring customer behavior, preparation of strategic decisions, making causal deductions, usage of social media data and sales forecasting

- possess the statistical skills required for working in marketing research

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

- The course "**Market Research**" provides contents of practical relevance for measuring customer attitudes and customer behavior. The participants learn using statistical methods for strategic decision-making in marketing. Students who are interested in writing their master thesis at the Marketing & Sales Research Group are required to take this course.

- The course „**Marketing Analytics**" is based on „Market Research" and teaches advanced statistical methods for analyzing relevant marketing and market research questions.

Remarks
New module starting winter term 2015/2016.

Module: Services Marketing [IW4BWLMAR9]

Coordination: J. Kim
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2572202	Services Marketing (p. 417)	2	S	3	J. Kim
2572200	Marketing Communication (p. 303)	2/1	W	4,5	J. Kim
2540440	Marketing Communication (p. 268)	2/1	S	4,5	J. Kim
2572157	Pricing (p. 340)	2/1	W	4,5	J. Kim
2572182	Case Studies in Pricing (p. 160)	1	W	1,5	M. Klarmann, Mitarbeiter

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

Conditions
None.

Qualification Goals
Students

- gain knowledge about basic content and strategies of services marketing
- know about current topics (research and practice) in online marketing and learn how the transparency of the internet provides new opportunities to measure the success of marketing instruments
- get to know marketing communications objectives and strategies
- have a fundamental understanding of price management (in particular consumer behavior of pricing, pricing strategy, price determination)
- are able to implement their extensive sales and pricing knowledge in a practical context
- are able to implement their extensive marketing knowledge in a practical context
- have the knowledge to write a master thesis in Services Marketing

Content
understanding of services marketing. Besides the classical offline services, the module also focuses on online services. The course "Services Marketing" starts with an overview of basic content and strategies in services marketing.
Within the course "Online Marketing" students learn about current topics (research and practice) in online marketing and learn how the transparency of the internet provides new opportunities to measure the success of marketing instruments.
In "Marketingkommunikation" students learn about marketing communication objectives and strategies.
The course "Pricing" builds a fundamental understanding of price management.
In the course "Case Studies in Sales and Pricing" students work with case studies helping them to understand the bridge between theoretical and practical knowledge.

Remarks
new module starting winter term 2015/2016

Module: Management Accounting [IW4BWLIBU1]

Coordination: M. Wouters
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2579900	Management Accounting 1 (p. 259)	2/2	S	4,5	M. Wouters
2579902	Management Accounting 2 (p. 260)	2/2	W	4,5	M. Wouters

Learning Control / Examinations
The assessment is carried out as partial exams (according to Section 4 (2), 13 SPO) of the courses of this module. The assessment procedures are described for each course of the module separately.
The overall grade of the module is the average of the grades for each course weighted by the credits
and truncated after the first decimal.

Conditions
None.

Qualification Goals
Students
• are familiar with various management accounting methods,
• can apply these methods for cost estimation, profitability analysis, and product costing,
• are able to analyze short-term and long-decisions with these methods,
• have the capacity to devise instruments for organizational control.

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

Remarks
Students who like this module are probably also interested in the courses

- 2530216 Financial Management
- 2530210 Management Accounting

5.2   Economics

Module: Applied Strategic Decisions [IW4VWL2]

Coordination: P. Reiss
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2521533	Advanced Game Theory (p. 119)	2/1	W	4,5	P. Reiss, C. Puppe, K. Ehrhart
2520408	Auction Theory (p. 143)	2/1	W	5	K. Ehrhart
2540460	Market Engineering: Information in Institutions (p. 265)	2/1	S	4,5	C. Weinhardt
2540489	Experimental Economics (p. 204)	2/1	W	4,5	C. Weinhardt, T. Teubner
2520402	Predictive Mechanism and Market Design (p. 338)	2/1	W	4,5	P. Reiss
2530214	Corporate Financial Policy (p. 163)	2/1	S	4,5	M. Ruckes
2530232	Financial Intermediation (p. 209)	3	W	4,5	M. Ruckes

Learning Control / Examinations

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.

Conditions

The course *Advanced Game Theory* is obligatory. Exception: The course *Introduction to Game Theory* [2520525] was completed.

Recommendations

Basic knowledge in game theory is assumed.

Qualification Goals

Students

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

Content

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

Remarks

The course *Predictive Mechanism and Market Design* is not offered each year.
The course "Decision Theory" [2520365] will not be offered any more from summer term 2015 on. The examination will be offered latest until winter term 2015/2016 (repeaters only).

Module: Macroeconomic Theory [IW4VWL8]

Coordination: M. Hillebrand
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520543	Theory of Economic Growth (p. 467)	2/1	S	4,5	M. Hillebrand
25549	Theory of Business Cycles (p. 466)	2/1	W	4,5	M. Hillebrand
2561503	Theory of endogenous growth (p. 192)	2/1	W	4,5	I. Ott

Learning Control / Examinations
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.

Conditions
None.

Recommendations
Grundlegende mikro- und makroökonomische Kenntnisse, wie sie beispielsweise in den Veranstaltungen *Volkswirtschaftslehre I (Mikroökonomie)* [2600012] und *Volkswirtschaftslehre II (Makroökonomie)* [2600014] vermittelt werden, werden vorausgesetzt. Aufgrund der inhaltlichen Ausrichtung der Veranstaltung wird ein Interesse an quantitativ-mathematischer Modellierung vorausgesetzt.

Qualification Goals
See German version.

Content

Module: Economic Theory and its Application in Finance [IW4VWL14]

Coordination: K. Mitusch
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520527	Advanced Topics in Economic Theory (p. 120)	2/1	S	4,5	M. Hillebrand, K. Mitusch
2530214	Corporate Financial Policy (p. 163)	2/1	S	4,5	M. Ruckes
2530232	Financial Intermediation (p. 209)	3	W	4,5	M. Ruckes
2530555	Asset Pricing (p. 141)	2/1	S	4,5	M. Uhrig-Homburg, M. Ruckes

Learning Control / Examinations
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.

Conditions
The course „Advanced Topics in Economic Theory" is compulsory and must be examined.

Recommendations
None.

Qualification Goals
The students

- have learnt the methods of formal economic modeling, particularly of General Equilibrium Theory and contract theory

- will be able to apply these methods to the topics in Finance, specifically the areas of financial markets and institutions and corporate finance

- have gained many useful insights into the relationship between firms and investors and the functioning of financial markets

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

Module: Microeconomic Theory [IW4VWL15]

Coordination: C. Puppe
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2521533	Advanced Game Theory (p. 119)	2/1	W	4,5	P. Reiss, C. Puppe, K. Ehrhart
2520527	Advanced Topics in Economic Theory (p. 120)	2/1	S	4,5	M. Hillebrand, K. Mitusch
2520537	Social Choice Theory (p. 423)	2/1	S	4,5	C. Puppe
2520408	Auction Theory (p. 143)	2/1	W	5	K. Ehrhart

Learning Control / Examinations
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.

Conditions
None.

Recommendations
None.

Qualification Goals
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?

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).

Remarks
Starting summer term 2015, the lecture "Auction Theory" [2520408] can be chosen in the module.

Module: Collective Decision Making [IW4VWL16]

Coordination: C. Puppe
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2525537	Mathematical Theory of Democracy (p. 274)	2/1	W	4,5	A. Melik-Tangyan
2520537	Social Choice Theory (p. 423)	2/1	S	4,5	C. Puppe
2561127	Public Management (p. 350)	2	W	4,5	B. Wigger, Assistenten

Learning Control / Examinations
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.

Conditions
None.

Recommendations
None.

Qualification Goals
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.

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

Module: Experimental Economics [IW4VWL17]

Coordination: P. Reiss
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540489	Experimental Economics (p. 204)	2/1	W	4,5	C. Weinhardt, T. Teubner
2520402	Predictive Mechanism and Market Design (p. 338)	2/1	W	4,5	P. Reiss
2520400	Topics in Experimental Economics (p. 469)	2/1	S	4,5	P. Reiss

Learning Control / Examinations
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.

Conditions
The course *Experimental Economics* [2540489] is compulsory and must be examined.

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

Qualification Goals
Students

- are acquainted with the methods of Experimental Economics along with its strengths and weaknesses;

- understand how theory-guided research in Experimental Economics interacts with the development of theory;

- are provided with foundations in data analysis;

- design an economic experiment and analyze its outcome.

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

Remarks

- The course *Advanced Game Theory* is not offered before Winter 2014/15.

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

5.3   Operations Research

Module: Operations Research in Supply Chain Management and Health Care Management [IW4OR4]

Coordination: S. Nickel
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2550486	Facility Location and Strategic Supply Chain Management (p. 440)	2/1	W	4,5	S. Nickel
2550488	Tactical and Operational Supply Chain Management (p. 459)	2/1	S	4,5	S. Nickel
2550480	Operations Research in Supply Chain Management (p. 306)	2/1	W/S	4,5	S. Nickel
2550495	Operations Research in Health Care Management (p. 305)	2/1	W/S	4,5	S. Nickel
2550493	Hospital Management (p. 248)	3/0	W/S	4,5	S. Nickel, Hansis
2550498	Practical seminar: Health Care Management (with Case Studies) (p. 337)	2/1/2	W/S	7	S. Nickel
2550497	Software Laboratory: OR Models II (p. 425)	2/1	S	4,5	S. Nickel
2550488	Discrete-event Simulation in Production and Logistics (p. 202)	2/1	S	4,5	S. Nickel, S. Spieckermann
2550494	Supply Chain Management in the Process Industry (p. 456)	2/1	W	4,5	S. Nickel
2550484	Graph Theory and Advanced Location Models (p. 221)	2/1	W/S	4,5	S. Nickel
2550494	Challenges in Supply Chain Management (p. 161)	3	S	4,5	R. Blackburn

Learning Control / Examinations
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.

Conditions
See German version.

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

Qualification Goals
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 familiar with general procedures and characteristics of Health Care Management and the possibilities for adapting mathematical models for non-profit organizations,

- is able to model practical problems mathematically and estimate their complexity as well as choose and adapt appropriate solution methods.

Content

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

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

Health Care Management addresses specific Supply Chain Management problems in the health sector. Important applications arise in scheduling and internal logistics of hospitals.

Remarks

Some lectures and courses are offered irregularly.

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

Module: Mathematical Programming [IW4OR6]

Coordination: O. Stein
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

	ECTS Credits	Cycle	Duration
	9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2550138	Mixed Integer Programming I (p. 211)	2/1	S	4,5	O. Stein
25140	Mixed Integer Programming II (p. 212)	2/1	W	4,5	O. Stein
2550128	Special Topics in Optimization I (p. 435)	2/1	W/S	4,5	O. Stein
2550126	Special Topics in Optimization II (p. 436)	2/1	W/S	4,5	O. Stein
2550484	Graph Theory and Advanced Location Models (p. 221)	2/1	W/S	4,5	S. Nickel
2550111	Nonlinear Optimization I (p. 299)	2/1	S	4,5	O. Stein
2550113	Nonlinear Optimization II (p. 300)	2/1	S	4,5	O. Stein
2550134	Global Optimization I (p. 219)	2/1	W	4,5	O. Stein
2550136	Global Optimization II (p. 220)	2/1	W	4,5	O. Stein
2550120	Convex Analysis (p. 246)	2/1		4,5	O. Stein
2550115	Parametric Optimization (p. 317)	2/1		4,5	O. Stein

Learning Control / Examinations
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.

Conditions
See German version.

Qualification Goals
The student

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

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

Remarks
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.

Module: Stochastic Modelling and Optimization [IW4OR7]

Coordination: K. Waldmann
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2550679	Markov Decision Models I (p. 449)	2/1/2	W	5	K. Waldmann
2550682	Markov Decision Models II (p. 450)	2/1/2	S	4,5	K. Waldmann
2550674	Quality Control I (p. 351)	2/1/2	W/S	4,5	K. Waldmann
2550659	Quality Control II (p. 352)	2/1/2	W/S	4,5	K. Waldmann
25687	Optimization in a Random Environment (p. 307)	2/1/2	W/S	4,5	K. Waldmann
2550662	Simulation I (p. 420)	2/1/2	W/S	4,5	K. Waldmann
2550665	Simulation II (p. 421)	2/1/2	W/S	4,5	K. Waldmann
25688	OR-oriented modeling and analysis of real problems (project) (p. 308)	2/1/2	W/S	4,5	K. Waldmann

Learning Control / Examinations
The assessment is carried out as partial written 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.

Conditions
See German version.

Qualification Goals
The student posses detailed knowledge in modelling, analyzing and optimizing stochastic systems in economy and engineering.

Content
Markov Decision Models I: Markov Chains, Poisson Processes.
Markov Decision Models II: Queuing Systems, Stochastic Decision Processes
Simulation I: Generation of random numbers, Monte Carlo integration, Discrete event simulation, Discrete and continuous random variables, Statistical analysis of simulated data.
Simulation II: Variance reduction techniques, Simulation of stochastic processes, Case studies.
Quality Control I: Statistical Process Control, Acceptance Sampling, Design of experiments
Quality Control II: Reliability of complexe systems with and without repair, Maintenance
OR-orientied modeling and analysis of real problems: project-based modelling and analysis

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

5.4 Statistics

Module: Mathematical and Empirical Finance [IW4STAT1]

Coordination: W. Heller, M. Schienle
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Irregular	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2521331	Stochastic Calculus and Finance (p. 448)	2/1	W	4,5	M. Safarian
2520381	Advanced Econometrics of Financial Markets (p. 118)	2/1	S	5	A. Nazemi
2521353	Statistical Methods in Financial Risk Management (p. 442)	2/1		4,5	A. Nazemi
2520357	Portfolio and Asset Liability Management (p. 321)	2/1	S	4,5	M. Safarian
2520020	Applied Econometrics (p. 135)	2/1	S	4,5	M. Schienle

Learning Control / Examinations
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.

Conditions
None.

Qualification Goals
See German version.

Content

Remarks
This module will not be offered any more from winter term 2015/2016 on.

Module: Statistical Methods in Risk Management [IW4STAT2]

Coordination: W. Heller, M. Schienle
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520375	Data Mining and Applications (p. 167)	2	S	4,5	G. Nakhaeizadeh
2520317	Multivariate Statistical Methods (p. 291)	2/2	S	4,5	O. Grothe
2521353	Statistical Methods in Financial Risk Management (p. 442)	2/1		4,5	A. Nazemi
2521325/2521326	Statistics and Econometrics in Business and Economics (p. 443)	2/2	W	4,5	W. Heller
2520357	Portfolio and Asset Liability Management (p. 321)	2/1	S	4,5	M. Safarian
2520020	Applied Econometrics (p. 135)	2/1	S	4,5	M. Schienle

Learning Control / Examinations

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.

Conditions
None.

Qualification Goals
See German version.

Content

Remarks
This module will not be offered any more from winter term 2015/2016 on.

Module: Analytics and Statistics [IW4STAT4]

Coordination: O. Grothe
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520317	Multivariate Statistical Methods (p. 291)	2/2	S	4,5	O. Grothe
2550552	Advanced Statistics (p. 444)	2/2	W	4,5	O. Grothe

Learning Control / Examinations
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.

Conditions
The course "*Advanced Statistics*" is compulsory and must be examined.

Qualification Goals
A Student

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

Content

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

Remarks
New module starting winter term 2015/2016.
The planned lectures and courses for the next three years are announced online.

Module: Econometrics and Statistics I [IW4STAT5]

Coordination: M. Schienle
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520020	Applied Econometrics (p. 135)	2/1	S	4,5	M. Schienle
2520022	Financial Econometrics (p. 208)	2/2	W	4,5	M. Schienle
2521300	Non- and Semiparametrics (p. 298)	2/2	W	4,5	M. Schienle
2520320	(p. 314)	2/2	S	4,5	W. Heller
2521350	Statistical Modeling of generalized regression models (p. 445)	2/2	W	4,5	W. Heller
2520375	Data Mining and Applications (p. 167)	2	S	4,5	G. Nakhaeizadeh

Learning Control / Examinations
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.

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

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

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

Remarks
New module starting winter term 2015/2016. It replaces the module "Mathematical and Empirical Finance" [IW4STAT1].

Module: Econometrics and Statistics II [IW4STAT6]

Coordination: M. Schienle
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520375	Data Mining and Applications (p. 167)	2	S	4,5	G. Nakhaeizadeh
2520317	Multivariate Statistical Methods (p. 291)	2/2	S	4,5	O. Grothe
2520357	Portfolio and Asset Liability Management (p. 321)	2/1	S	4,5	M. Safarian
2521331	Stochastic Calculus and Finance (p. 448)	2/1	W	4,5	M. Safarian
2520020	Applied Econometrics (p. 135)	2/1	S	4,5	M. Schienle
2520022	Financial Econometrics (p. 208)	2/2	W	4,5	M. Schienle
2520320	(p. 314)	2/2	S	4,5	W. Heller
2521350	Statistical Modeling of generalized regression models (p. 445)	2/2	W	4,5	W. Heller
2521300	Non- and Semiparametrics (p. 298)	2/2	W	4,5	M. Schienle

Learning Control / Examinations

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.

Conditions

This module can only be passed if the module *"Econometrics and Statistics I"* [IW4STAT5] has been finished successfully before.

Qualification Goals

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

Content

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

Remarks

New module starting winter term 2015/2016. It replaces the module "*Statistical Methods in Risk Management*" [IW4STAT2]

5.5   Informatics

Module: Computer Security [IW4INSICH]

Coordination: J. Müller-Quade
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24941	Security (p. 418)	3/1	S	6	J. Müller-Quade
SemSich	Seminar in Security (p. 377)	2	W/S	3	J. Müller-Quade
24137	Signals and Codes (p. 419)	2	W	3	J. Müller-Quade
24629	Symmetric Encryption (p. 458)	2	S	3	J. Müller-Quade
24691	Cryptographic Voting Schemes (p. 250)	2	S	3	J. Müller-Quade

Learning Control / Examinations

Conditions
None.

Qualification Goals
The student

- knows and understands the basic commonly used algorithms, their design, correctness and efficiency analysis, implementation, documentation and application,

- an handle new algorithmic problems, using this understanding,

- can apply the mathematical approaches learned in the basic computer science and mathematics courses to solve problems. Main topics are here formal correctness arguments and a mathematical analysis of efficiency.

- deals with a restricted problem in the field of computer security within the seminar,

- analyzes and discusses the problems associated to a distinct discipline in the lectures and in the final seminar paper,

- discusses, presents and defends subject-specific arguments within a given task,

- organizes the preparation of the final papers largely independent.

Content
Theoretical and practical aspects of computer security

- Development of safety goals and classification of threats

- Presentation and comparison of different formal access control models

- Formal description of authentication systems, presentation and comparison of different authentication methods (passwords, biometrics, challenge-response protocols)

- Analysis of typical vulnerabilities in programs and web applications and development of appropriate protective methods / avoidance strategies

- Overview of opportunities for side channel attacks

- Introduction to key management and Public Key Infrastructure

- Presentation and comparison of current safety certifications

- Block ciphers, hash functions, digital signature, public key encryption and digital signatures (RSA, ElGamal), and various methods of key exchange (eg, Diffie-Hellman)

- Presentation of combinations of cryptographic modules using currently used protocols such as Secure Shell (SSH) and Transport Layer Security (TLS)

Module: Advanced Topics in Cryptography [IW4INFKRYP]

Coordination: J. Müller-Quade
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24623	Selected topics in Cryptography (p. 144)	2	S	3	J. Müller-Quade
WSUW	How Statistics Begins to Understand the Difference Between Cause and Effect (p. 487)	2	W	3	D. Janzing
24137	Signals and Codes (p. 419)	2	W	3	J. Müller-Quade
24629	Symmetric Encryption (p. 458)	2	S	3	J. Müller-Quade
24166	Provable Security in Cryptography (p. 148)	2	W	3	D. Hofheinz
24115	Asymmetric Encryption Schemes (p. 142)	2	W	3	J. Müller-Quade
24691	Cryptographic Voting Schemes (p. 250)	2	S	3	J. Müller-Quade
2400057	Digital signatures (p. 182)	2	W	3	D. Hofheinz
24165	Side-Channel Attacks in Cryptography (p. 370)	2/0	W	3	J. Müller-Quade, Antonio Almeida

Learning Control / **Examinations**
Lectures will be assessed in an oral overall exam on all taken lectures according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The grade of the module is the average of the single grades weighted by the related credit points and cut off after the first decimal place.

Conditions
None.

Qualification Goals
The student

- will be familiar with the theoretical foundations and the basic mechanisms of computer security and cryptography.
- can understand and explain the methods of computer security and cryptography,
- will be able to read and understand the latest scientific papers,
- will be able to critically assess appropriate security solutions, and identify weaknesses / threats,
- can design an own security solution to a given problem, (eg. later in the a master's thesis).

Content
The module is intended to provide depth theoretical and practical aspects of IT security and cryptography.

- Development of safety goals and classification of threats.
- Formal description of authentication systems.
- Analysis of typical vulnerabilities in programs and web applications and development of appropriate protective methods / avoidance strategies
- Overview of opportunities for side channel attacks
- Introduction to key management and Public Key Infrastructure
- Presentation and comparison of current safety certifications.
- The current research issues from some of the following areas are covered:

    – Block ciphers, hash functions,

- – Public-key encryption, digital signature, key exchange.
- – Basic security protocols such as fair coin toss over the phone, Byzantine Agreement, Dutch Flower Auctions, Zero Knowledge.
- – Threat models and security definitions.
- – Modular design and protocol composition.
- – Security definitions of simulatability.
- – Universal Composability.
- – Deniability as an additional safety feature.
- – Electronic Voting.

Module: Introduction to Algorithmics [IW4INEAT]

Coordination: D. Wagner
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
10	Every 2nd term, Winter Term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24079	Algorithms II (p. 126)	3/1	W	6	D. Wagner, P. Sanders
2400047	Algorithm Design Seminar (p. 372)	2	W/S	4	D. Wagner

Learning Control / Examinations

Conditions
None.

Qualification Goals
The student

- gains basic insights into the most important areas of algorithmics,

- identifies algorithmic problems from different areas of application and can formulate these in a formal manner,

- comprehends and determines the running times of algorithms,

- knows basic algorithms and data structures and can transfer this knowledge to new problems.

Content
This module conveys knowledge of basic theoretical and practical aspects of algorithmics. It covers common methods for the design and analysis of basic algorithmic problems as well as the fundamentals of common algorithmic methods such as approximations algorithms, linear programming, randomized algorithms, parallel algorithms and parameterized algorithms.

Module: Advanced Algorithms: Design and Analysis [IW4INAADA]

Coordination: D. Wagner
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24171	Randomized Algorithms (p. 354)	2/1	W	5	T. Worsch
2400053	Parallel Algorithms (p. 315)	2/1	W	5	P. Sanders
2400051	Algorithm Engineering (p. 122)	2/1	S	5	P. Sanders, D. Wagner
24622	Algorithms in Cellular Automata (p. 127)	2/1	S	5	T. Worsch
2400047	Algorithm Design Seminar (p. 372)	2	W/S	4	D. Wagner
24118	Algorithms for Visualization of Graphs (p. 128)	2/1		5	D. Wagner
ALGTprak	Practical Course in Algorithm Design (p. 322)	4		6	P. Sanders, D. Wagner
24638	Algorithms for Routing (p. 124)	2/1	S	5	D. Wagner
AAS	Algorithms for Ad-Hoc and Sensor Networks (p. 123)	2/1		5	D. Wagner
ALGG	Computational Geometry (p. 129)	3	S	5	M. Nöllenburg, D. Wagner
2511106	Nature-inspired Optimisation Methods (p. 294)	2/1	S	5	P. Shukla
2400034	(p. 130)	2/1		5	M. Nöllenburg, D. Wagner

Learning Control / Examinations

Conditions
None.

Qualification Goals
The student

- knows advanced methodical approaches with respect to the design and analysis of algorithms,

- can comment on theoretical aspects of algorithmics in a qualified and well-structured manner,

- identifies algorithmic problems from different areas and can formulate these formally,

- can analyze and judge the computational complexity of algorithmic problems from different areas,

- can recognize and design suitable algorithmic techniques to solve algorithmic problems.

Content
This module conveys profound knowledge concerning theoretical aspects of algorithmics. Its focus is on the design and analysis of advanced algorithms, particularly, on algorithms for graphs, randomized algorithms, parallel algorithms and algorithms for NP-hard problems.

Module: Advanced Algorithms: Engineering and Applications [IW4INAALGOB]

Coordination: D. Wagner
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
ALGTprak	Practical Course in Algorithm Design (p. 322)	4		6	P. Sanders, D. Wagner
2400051	Algorithm Engineering (p. 122)	2/1	S	5	P. Sanders, D. Wagner
2511104	Organic Computing (p. 309)	2/1	S	5	H. Schmeck
2511106	Nature-inspired Optimisation Methods (p. 294)	2/1	S	5	P. Shukla
24638	Algorithms for Routing (p. 124)	2/1	S	5	D. Wagner
2400053	Parallel Algorithms (p. 315)	2/1	W	5	P. Sanders
24118	Algorithms for Visualization of Graphs (p. 128)	2/1		5	D. Wagner
2400047	Algorithm Design Seminar (p. 372)	2	W/S	4	D. Wagner
24622	Algorithms in Cellular Automata (p. 127)	2/1	S	5	T. Worsch
24171	Randomized Algorithms (p. 354)	2/1	W	5	T. Worsch
AAS	Algorithms for Ad-Hoc and Sensor Networks (p. 123)	2/1		5	D. Wagner
2400034	(p. 130)	2/1		5	M. Nöllenburg, D. Wagner

Learning Control / Examinations

Conditions
None.

Qualification Goals
The Student

- knows advanced methodical approaches concerning the design of algorithms and their applications,

- can comment on the practical aspects of algorithmics in a qualified and well-structured manner,

- identifies algorithmic problems from different areas of application and can formulate these formally,

- can judge the computational complexity of algorithmic problems,

- recognizes suitable algorithmic techniques for solving these problems and can transfer and apply knowledge of these techniques to new problems,

- can implement solutions based on algorithmic techniques for practical problems and can evaluate these

Content
This module conveys profound knowledge concerning practical aspects of algorithmics and covers applications of algorithms for practical problems. Its focus is on the design, the practical implementation and the evaluation of algorithms, particularly, algorithms for graphs, parallel algorithms, algorithms for NP-hard problems, optimization algorithms inspired by nature, as well as algorithms from various areas of application.

Module: Language Technology and Compiler [IW4INCOMP1]

Coordination: G. Snelting
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
8	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24661	Language Technology and Compiler (p. 438)	4/2	S	8	G. Snelting

Learning Control / Examinations
The assessment consists of an oral exam (approx. 30 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The grade of the module corresponds to the grade of the oral exam.

Conditions
None.

Qualification Goals
The student

- knows the importance of language and compiler technologies in other areas of computer science

- learns the theoretical foundations and practical methods which form the foundation for the compiler passes: lexical analysis, syntactic analysis, semantic analysis, code generation and code optimization

- has received an overview over the state of the art in compiler construction

- is able to apply his knowledge in practice when constructing a compiler (e.g. In the compiler lab)

Content

- Structure of a compiler

- Lexical analysis

- Syntactic analysis

- Semantic analysis

- Code generation

- Code optimization

- Specific technologies: LL-Parser, LR/LALR-Parser, attributed grammars, instruction selection, register allocation, runtime mechanisms, memory management, static single assignment form and its usage in optimization

Module: Software Systems [IW4INSWS]

Coordination: R. Reussner
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24667	Component Based Software Architecture (p. 243)	2	S	3	R. Reussner, Andreas Rentschler
24660	Software Development for Modern, Parallel Platforms (p. 427)	2	S	3	W. Tichy
24112	Multicore Computers and Computer Clusters (p. 288)	2	W	3	W. Tichy
24673	Reading Group (p. 256)	1	W/S	1	R. Reussner
SpezVer	Specification and Verification of Software (p. 437)	3	W	5	B. Beckert
24293	Multicore Programming in Practice: Tools, Models, Languages (p. 334)	4	W	6	W. Tichy, T. Karcher, L. Rodríguez
24164	Software-Evolution (p. 424)	2	W	3	K. Krogmann, K. Krogmann
24187	Natural Language Processing and Software Engineering (p. 439)	2	W	3	W. Tichy
24657	(p. 284)	2	W	3	R. Reussner, Lucia Kapova
2400093	Applying Formal Verification (p. 138)	3	S	5	B. Beckert
APS	Automatic Software Parallelization (p. 145)	2/1	S	4	F. Padberg
2400050	Requirements Engineering (p. 362)		S	3	A. Koziolek

Learning Control / Examinations

The assessment consists of an oral exam on the contents of each taken lecture and practical courses (approx. 25 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.

Lesegruppe Softwaretechnik: ungraded assessment according to sec. 4 subsec. 2 no. 3 study and examination regulations.

The lecture *Multicore Programming in Practice: Tools, Models, Languages* [24293] will have a graded assessment according to sec. 4 subsec. 2 no. 3 study and examination regulations. The assessment is explained in the course description.

The lecture *Multicore Computers and Computer Clusters* will have an asessment consists of a written exam according to section 4 subsection 2 no. 1 study and examination regulations.

The grade of the module is the average of the single grades weighted by the related credit points.

Conditions

The lecture *Multicore Programming in Practice* [24293] can **not** be taken in the study course Information Engineering and Management.

Qualification Goals

In the courses that comprise this module, students learn different approaches and techniques for systematic and high-quality development of software systems, e.g. requirements engineering, implementing components and services, use of parallelism and multi-core platforms, as well as the verification of created software systems.

Content

The content will be explained in the course descriptions.

Remarks

The lecture *Multikernpraktikum* is no longer offered.
The lecture *Praktikum Performance von Anwendungen auf Cloud-Großrechner IBM z10* is no longer offered.
The lecture *Security Engineering* is not offered any longer.

Module: Software Methods [IW4INSWM]

Coordination: R. Reussner
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24667	Component Based Software Architecture (p. 243)	2	S	3	R. Reussner, Andreas Rentschler
24156	Empirical Software Engineering (p. 191)	2	W	3	W. Tichy
24634	Modern Development Environments using the example of .NET (p. 287)	2	S	3	W. Tichy, Gelhausen, Ladani
24673	Reading Group (p. 256)	1	W/S	1	R. Reussner
24164	Software-Evolution (p. 424)	2	W	3	K. Krogmann, K. Krogmann
24187	Natural Language Processing and Software Engineering (p. 439)	2	W	3	W. Tichy
24657	(p. 284)	2	W	3	R. Reussner, Lucia Kapova
APS	Automatic Software Parallelization (p. 145)	2/1	S	4	F. Padberg
2400050	Requirements Engineering (p. 362)		S	3	A. Koziolek

Learning Control / Examinations
The assessment consists of an oral exam on the taken lectures and practical courses (approx. 45 minutes) according to section 4 subsection 2 no. 2 study and examination regulations.
The grade of the module corresponds to the grade of the oral exam.

Conditions
None.

Qualification Goals
The students learn the foundations and advanced methods for systematic planning, design, implementation, evaluation and enhancement of software systems. By acquiring knowledge and capabilities to critically evaluate modern technologies, the students are enabled to use these technologies purposefully and effectively. Apart from functional viewpoints and software properties, extra-functional properties such as security and performance are taught. Additionally, an overview of current research topics and challenges are offered.

Content
The content is explained in the course descriptions.

Module: Applied Web Engineering [IW4INPWE]

Coordination: H. Hartenstein
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24124	Web Engineering (p. 484)	2/0	W	4	H. Hartenstein, M. Nußbaumer
24880	Practical Course Web Engineering (p. 330)	4	W/S	5	H. Hartenstein, M. Nußbaumer, M. Keller

Learning Control / Examinations
The assessment consists of an oral exam (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The assessment is based on practical work and presentations according to § 4(2), 3 study and examination regulations.
The grade of the module is the average of the single grades weighted by the related credit points.

Conditions
None.

Recommendations
Knowledge of HTML is required, basic programming knowledge (e.g. Java, C++/C or C#, etc.) is expected.

Qualification Goals

- Students know the fundamentals as well as current methodologies and techniques in the field of Web Engineering and can apply them in practice. They have gained insights and first experiences in managing Web projects as well as in analyzing, structuring and describing problems in the field of Web Engineering.

- Students have acquired knowledge about state-of-the-art Web-based concepts, technologies and frameworks. They have developed a fundamental understanding of server- and client-side technologies and their interaction.

- Students have the ability to design Web-based systems autonomously with regard to the aspects data, interaction, navigation, presentation, communication and processing.

- Students are able to understand and interpret scientific papers and standard specifications and are confident in using the domain-specific language.

Content
The module is designed as an introduction to the discipline of Web Engineering, covering both theory and practice. The focus is on approaches and methods fostering a systematic construction of Web-based applications and systems. The different phases and aspects of the Web application lifecycle are examined as well. It helps students to look at the Web phenomenon from different perspectives - e.g. as a Web designer, analyst, architect, component engineer, program manager, product manager or CIO. Methods for dealing with requirements, design, architecture, implementation and management are discussed and applied in a project.

The module will convey practical knowledge of the Web's fundamental languages and technologies, like (X)HTML/CSS and XML/XSL. Furthermore component-based Web engineering approaches and frameworks are applied in the software project. Another thematic focus of the course is on Web services as a fundamental building block for constructing service-oriented applications. By realizing a software project, the structured and disciplined application of the learnt technologies is emphasized.

Module: Wireless Networking [IW4INWN]

Coordination: M. Zitterbart
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
8	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24104	Internet of Everything (p. 238)	2/0	W	4	M. Zitterbart
24669	Modeling and Simulation of Networks and Distributed Systems (p. 285)	2/0	S	4	H. Hartenstein
24643	Mobile Communication (p. 280)	2/0	W	4	O. Waldhorst, M. Zitterbart
24146	Ubiquitous Computing (p. 470)	2/1	W	5	M. Beigl
24601	Network Security: Architectures and Protocols (p. 296)	2/0	S	4	M. Zitterbart
24128	Telematics (p. 465)	3	W	6	M. Zitterbart

Learning Control / Examinations
The assessments for the individual courses consist of oral exams (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The grade of the module is the average of the single grades weighted by the related credit points.
It is recommended to take the exams at the same time as part of an overall exam.

Conditions
The lecture *Telematics* [24128] must be taken if it has not been passed yet. If the lecture *Telematics* [24128] has not been passed yet, it has to be the first exam or examined simultaneously with the second chosen lecture.

Recommendations
Knowledge of the lecture *Introduction in Computer Networks* [24519] or *Networked IT-Infrastructures* [24074] is recommended as a basis for this module.

Qualification Goals
Each student should be able

- to learn and use the concepts and principals of wireless network design

- to identify the flaws and benefits of wireless communication systems

- to judge the performance of protocols, wireless networks and architectures

- master advanced protocols, architectures and algorithms of wireless communication systems

Content
This module details selected aspects of wireless communication systems. This includes beside the requirements of secure and multimedia-based communication also the realization and controllability of large communication systems and networks. An important aspect is benchmarking and mastering the used algorithms, protocols and architectures. Also actual developments and applications are in the focus of this module.

Module: Networking Labs [IW4INNL]

Coordination: H. Hartenstein
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24669	Modeling and Simulation of Networks and Distributed Systems (p. 285)	2/0	S	4	H. Hartenstein
24878	Practical Course Modeling and Simulation of Networks and Distributed Systems (p. 326)	0/2	S	5	H. Hartenstein
24149	IT-Security Management for Networked Systems (p. 240)	2/1	W	5	H. Hartenstein
24601	Network Security: Architectures and Protocols (p. 296)	2/0	S	4	M. Zitterbart

Learning Control / **Examinations**

The assessments for the individual lectures consist of oral exams (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The assessments for practical courses will be assessments according to sec. 4 subsec. 2 no. 3 study and examination regulations.
The grade of the module is the average of the single grades weighted by the related credit points.

Conditions

- Knowledge of the lectures *Introducted in Computer Networks* [24519] or *Networked IT-Infrastructures* [24074] is recommended as a basis for this module.
- The lecture *Telematics* [24128] is presumed to be known.

One of the following combinations can be taken:

- Modeling and Simulation of Networks and Distributed Systems (24669) and Practical Course Modeling and Simulation of Networks and Distributed Systems (24878)
- Modeling and Simulation of Networks and Distributed Systems (24669) and IT-Security Management for Networked Systems (24149)
- IT-Security Management for Networked Systems (24149) and Network Security: Architectures and Protocols (24601)

Qualification Goals

Each student should be able

- to learn and apply the concepts and principals of wireless network design
- to identify the flaws and benefits of wireless communication systems
- to judge the performance of protocols, wireless networks and architectures
- master advanced protocols, architectures and algorithms of wireless communication systems

Content

This module details and applies selected aspects of communication systems. This includes beside the requirements of secure and multimedia-based communication also the realization and controllability of large communication systems and networks. An important aspect is benchmarking and mastering the used algorithms, protocols and architectures. Also actual developments and applications are in the focus of this module.

Remarks

If the lecture *Telematics* [24128] has not been taken yet, it has to be the first exam or examined simultaneously with the second chosen lecture.

Module: Future Networking [IW4INFN]

Coordination: M. Zitterbart
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

	ECTS Credits	Cycle	Duration
	8	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24674	Next Generation Internet (p. 297)	2/0	S	4	R. Bless, M. Zitterbart
24132	Multimedia Communications (p. 290)	2/0	W	4	R. Bless, M. Zitterbart
24643	Mobile Communication (p. 280)	2/0	W	4	O. Waldhorst, M. Zitterbart
24104	Internet of Everything (p. 238)	2/0	W	4	M. Zitterbart
24128	Telematics (p. 465)	3	W	6	M. Zitterbart

Learning Control / Examinations
The assessments for the individual courses consist of oral exams (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The grade of the module is the average of the single grades weighted by the related credit points.
It is recommended to take the exams at the same time as part of an overall exam.

Conditions
The lecture *Telematics* [24128] must be taken if it has not been passed yet. If the lecture *Telematics* [24128] has not been passed yet, it has to be the first exam or examined simultaneously with the second chosen lecture.

Recommendations
Knowledge of the lecture *Introduction in Computer Networks* [24519] or *Networked IT-Infrastructures* [24074] is recommended as a basis for this module.

Qualification Goals
Each student should be able

- to learn and use the concepts and principals of future network design

- to identify the flaws and benefits of future communication systems

- to judge the performance of protocols, future networks and architectures

- master advanced protocols, architectures and algorithms of future communication systems

Content
This module details selected aspects of future communication systems. This includes beside the requirements of secure and multimedia-based communication also the realization and controllability of large communication systems and networks. An important aspect is benchmarking and mastering the used algorithms, protocols and architectures. Also actual developments and applications are in the focus of this module.

Module: Networking [IW4INNW]

Coordination: M. Zitterbart
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
8	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24128	Telematics (p. 465)	3	W	6	M. Zitterbart
24674	Next Generation Internet (p. 297)	2/0	S	4	R. Bless, M. Zitterbart
24669	Modeling and Simulation of Networks and Distributed Systems (p. 285)	2/0	S	4	H. Hartenstein
24132	Multimedia Communications (p. 290)	2/0	W	4	R. Bless, M. Zitterbart
24601	Network Security: Architectures and Protocols (p. 296)	2/0	S	4	M. Zitterbart
PEprak	Lab Protocol Engineering (p. 327)	4	W	4	M. Zitterbart

Learning Control / Examinations

The assessments for the individual courses consist of oral exams (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The grade of the module is the average of the single grades weighted by the related credit points.
It is recommended to take the exams at the same time as part of an overall exam.

Conditions

None.

Recommendations

Knowledge of the lecture *Introduction in Computer Networks* [24519] or *Networked IT-Infrastructures* [24074] is recommended as a basis for this module.

Qualification Goals

Each student should be able

- to learn and use the concepts and principals of wired network design

- to identify the flaws and benefits of wired communication systems

- to judge the performance of protocols, wired networks and architectures

- master advanced protocols, architectures and algorithms of wired communication systems

Content

This module details selected aspects of wired communication systems. This includes beside the requirements of secure and multimedia-based communication also the realization and controllability of large communication systems and networks. An important aspect is benchmarking and mastering the used algorithms, protocols and architectures. Also actual developments and applications are in the focus of this module.

Module: Networking Security - Theory and Praxis [IW4INNTP]

Coordination: M. Zitterbart
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24601	Network Security: Architectures and Protocols (p. 296)	2/0	S	4	M. Zitterbart
24149	IT-Security Management for Networked Systems (p. 240)	2/1	W	5	H. Hartenstein
24629	Symmetric Encryption (p. 458)	2	S	3	J. Müller-Quade
24941	Security (p. 418)	3/1	S	6	J. Müller-Quade
SemiKryp3	Seminar in Cryptography (p. 374)	2	W/S	3	J. Müller-Quade

Learning Control / **Examinations**

The assessments for the individual courses consist of oral exams (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations. The assessment of the seminar consists of a graded assessment according to sec. 4 subsec. 2 no. 3 study and examination regulations.

The assessment of the course *Seminar in Cryptography* [SemiKryp3] consists of a written seminar thesis and a presentation thereof according to sec. 4 subsec. 2 no. 3 study and examination regulations. The grade is the average of the weighted single grades (generally 50% seminar thesis, 50% presentation). The seminar can be taken in this module with 2 credit points. This has to be approved by the examiner.

The assessment of the lecture *Security* consists of a written exam (approx. 60 minutes) according to sec. 4 subsec. 2 no. 1 study and examination regulations.

The grade of the module is the average of the single grades weighted by the related credit points.

It is recommended to take the exams at the same time as part of an overall exam.

Conditions

- At least one of the following lectures has to be taken: *Network Security: Architectures and Protocols* [24601] or *IT-Security Management for Networked Systems* [24149].

- Furthermore the following lectures can be chosen from: *Symmetric encryption* [24629] or *Seminar in Cryptography* [SemiKryp2] or *Security* [24941]

Recommendations

The lecture *Security* is a basis for this module.

Qualification Goals

Each student should be able

- to recall the basic security mechanisms and theoretical foundations of networking security and cryptography

- to read and understand actual academic papers

- to judge the security level of actual security solutions

- to identify possible attacks on security solutions

Content

This module details selected aspects of networking security and cryptography in theory and praxis.

Module: Communication and Database Systems [IW4INKD]

Coordination: K. Böhm, M. Zitterbart
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
8	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24516	Database Systems (p. 173)	2/1	S	4	K. Böhm
24519	Introduction in Computer Networks (p. 189)	2/1	S	4	M. Zitterbart

Learning Control / Examinations
The assessment of the lecture *Introduction in Computer Networks* consists of a written exam according to section 4 subsection 2 no. 1 study and examination regulations.
The assessment of the lecture *Database Systems* consists of a written exam according to section 4 subsection 2 no. 1 study and examination regulations.
The grade of the module is the average of the single grades weighted with the related credit points and cut off after the first decimal place.

Conditions
None.

Qualification Goals
The students will

- have learned fundamentals of data communication as well as the design of communication systems,
- be familiar with the composition of the different protocols and their mechanisms and be able to design simple protocols on their own,
- have understood the relationships between the different communication layers,
- be able to explain the benefits of database technology at the end of the course,
- have understood the development of database applications and be able to set up and access simple databases,
- be familiar with the terminology and the underlying database theory.

Content
Distributed information systems are worldwide information repositories which are accessible by everybody at any place of the world at any time. The physical distance is bridged by telecommunication systems, while database management technology manages and coordinates data for arbitrary periods of time. In order to understand globally running processes, one has to understand both data transmission techniques and database technology. Besides the telecommunication and database technologies on their own, an understanding of their cooperation is required, too.

Module: Innovative Concepts of Data and Information Management [IW4INIKDI]

Coordination: K. Böhm
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
8	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24114	Big Data Analytics (p. 132)	2/1	W	5	K. Böhm, E. Müller
db_impl	Database Implementation and Tuning (p. 171)	2/1	S	5	K. Böhm
2400020	Deployment of Database Systems (p. 170)	2/1	W	5	K. Böhm
24109	Datamanagement in the Cloud (p. 175)	2/1	W	5	K. Böhm
24141	Information integration and mobile Web applications (p. 227)	2	W	3	J. Mülle, A. Rashid
24605	Data Privacy Protection in Interconnected Information Systems (p. 176)	2	S	3	K. Böhm
PLV	Selling IT-Solutions Professionally (p. 336)	2	W/S	1,5	K. Böhm, Hellriegel
PUB	Consulting in Practice (p. 335)	2	W/S	1,5	K. Böhm, Stefan M. Lang
2400005	Project Management in Practice (p. 348)	2	W/S	1,5	K. Böhm, W. Schnober
24522	(p. 486)	0/1	S	1	K. Böhm
24111	Mechanisms and Applications of Workflow Systems (p. 247)	3	W	5	J. Mülle, Silvia von Stackelberg
2400015	Indexing Structures for Efficient Query Processing on Large Databases (p. 225)	2	S	3	K. Böhm, E. Müller
24647	Data Mining Paradigms and Methods for Complex Databases (p. 169)	2/1	S	5	K. Böhm, E. Müller

Learning Control / Examinations
The assessment consists of partial examinations on the selected courses that satisfy the minimum requirement of credit points. The assessments are explained in the course descriptions.
The grade of the module is the average of the single grades weighted by the related credit points.

Conditions
None.

Recommendations
It is recommended to take the module *Communication and Database Systems* in advance.

Qualification Goals
The students

- know the research area of information systems in its various facets and are able to do scientific work in this area,

- are able to develop complex information systems on their own,

- are able to structure and manage complex projects in the field of information systems with unpredictable difficulties,

- are able to explain and to discuss complex aspects of the topics covered by this module with both experts and informed outsiders.

Content
This module aims at exposing students to modern information management, both, in 'breadth´ and 'depth´. We achieve 'breadth´ by means of a close inspection and comparison of different systems and their respective aims. We achieve 'depth´ by means of an extensive examination of the underlying concepts and design alternatives, their assessment as well as by discussing applications.

Remarks
The courses of this module are offered irregularly. Nonetheless, it is guaranteed that the module can be passed anytime.

Module: Theory and Practice of Data Warehousing and Mining [IW4INDWMTP]

Coordination: K. Böhm
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24874	Analyzing Big Data - Laboratory Course (p. 331)	2	S	4	K. Böhm
24114	Big Data Analytics (p. 132)	2/1	W	5	K. Böhm, E. Müller
2400020	Deployment of Database Systems (p. 170)	2/1	W	5	K. Böhm
db_impl	Database Implementation and Tuning (p. 171)	2/1	S	5	K. Böhm
24109	Datamanagement in the Cloud (p. 175)	2/1	W	5	K. Böhm
2400015	Indexing Structures for Efficient Query Processing on Large Databases (p. 225)	2	S	3	K. Böhm, E. Müller
24647	Data Mining Paradigms and Methods for Complex Databases (p. 169)	2/1	S	5	K. Böhm, E. Müller

Learning Control / Examinations
The assessment consists of an oral exam on the contents of the selected lecture (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The practical course requires an additional certificate following sec. 4 subsec. 2 no. 3 study and examination regulations.
The grade of the module is the grade of the oral exam.

Conditions
At least one practical course has to be taken.

Recommendations
It is recommended to take the lecture *Data Warehousing and Mining* [24118] if it has not been taken yet.

Qualification Goals
The students

- know the research area of information systems in its various facets and are able to do scientific work in this area,
- are able to explain and to discuss complex aspects of the topics covered by this module with both experts and informed outsiders,
- know the concepts, algorithms, techniques and selected tools in the areas of data warehousing and data mining,
- are familiar with the practical challenges of data analysis and are able to develop respective solutions on their own.

Content
This module aims at exposing students to modern information management, both, in 'breadth´ and 'depth´. We achieve 'breadth´ by means of a close inspection and comparison of different systems and their respective aims. We achieve 'depth´ by means of an extensive examination of the underlying concepts and design alternatives, their assessment as well as by discussing applications. In particular, we look at data warehousing and mining techniques not only from a theoretical point of view but deploy and realise such technologies in a practical course.

Remarks
The courses of this module are offered irregularly. Nonetheless, it is guaranteed that the module can be passed anytime.

Module: Theory and Practice of Database Technology [IW4INDBTP]

Coordination: K. Böhm
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24286	Practical Course Database Systems (p. 172)	2	W	4	K. Böhm
praktvd	Practical Course Distributed Data Management (p. 329)	2	W	4	K. Böhm
24109	Datamanagement in the Cloud (p. 175)	2/1	W	5	K. Böhm
24114	Big Data Analytics (p. 132)	2/1	W	5	K. Böhm, E. Müller
2400020	Deployment of Database Systems (p. 170)	2/1	W	5	K. Böhm
db_impl	Database Implementation and Tuning (p. 171)	2/1	S	5	K. Böhm
2400015	Indexing Structures for Efficient Query Processing on Large Databases (p. 225)	2	S	3	K. Böhm, E. Müller
24647	Data Mining Paradigms and Methods for Complex Databases (p. 169)	2/1	S	5	K. Böhm, E. Müller

Learning Control / Examinations
The assessment consists of an oral exam on the contents of the selected lecture (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The practical course requires an additional certificate following sec. 4 subsec. 2 no. 3 study and examination regulations.
The grade of the module is the grade of the oral exam.

Conditions
One of the practical courses has to be taken.

Qualification Goals

Content
This module aims at exposing students to modern information management, both, in 'breadth´ and 'depth´. We achieve 'breadth´ by means of a close inspection and comparison of different systems and their respective aims. We achieve 'depth´ by means of an extensive examination of the underlying concepts and design alternatives, their assessment as well as by discussing applications. In particular, we look at the topics of this module not only from a theoretical point of view but deploy and realise the respective technologies in a practical course.

Remarks
The courses of this module are offered irregularly. Nonetheless, it is guaranteed that the module can be passed anytime.

Module: Dynamic IT-Infrastructures [IW4INDITI]

Coordination: H. Hartenstein
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24669	Modeling and Simulation of Networks and Distributed Systems (p. 285)	2/0	S	4	H. Hartenstein
24146	Ubiquitous Computing (p. 470)	2/1	W	5	M. Beigl
24878	Practical Course Modeling and Simulation of Networks and Distributed Systems (p. 326)	0/2	S	5	H. Hartenstein
24149	IT-Security Management for Networked Systems (p. 240)	2/1	W	5	H. Hartenstein
24074	Data and Storage Management (p. 166)	2	W	3	B. Neumair
2400004	Integrated Network and Systems Management (p. 234)	2	S	3	B. Neumair
24617	Parallel computer systems and parallel programming (p. 316)	2/0	S	4	A. Streit
2400050	Distributed Computing (p. 478)	2	W	4	A. Streit

Learning Control / Examinations
The assessments of the lectures consist of oral exams (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The assessments for practical courses and seminars will be graded assessments according to sec. 4 subsec. 2 no. 3 study and examination regulations.
The grade of the module is the average of the single grades weighted equally.

Conditions
The *Practical Course Modeling and Simulation of Networks and Distributed Systems* can only be taken if the lecture *Modeling and Simulation of Networks and Distributed Systems* is taken as well.

Recommendations
Knowledge of the lecture *Introduction in Computer Networks* [24519] is recommended as a basis for this module.

Qualification Goals
The students will get to know established as well as novel concepts for the design, implementation, operation and management of dynamic IT infrastructures (Web, Grid, Cloud, Internet):

- Getting to know established and novel concepts for IT infrastructures

- Application of methods for the evaluation and analysis of dynamic IT infrastructures

- Assessment of tools, protocols and procedures for the operation and management of dynamic IT infrastructures

- Assessment of the strengths and weaknesses of IT infrastructures

- Insight into the practical operation of dynamic IT infrastructures using the example of the operation within the Steinbuch Centre for Computing (SCC)

Content
This module covers various aspects of dynamic IT infrastructures such as layout, design, concept, development, operation and performance evaluation as well as optimization. These topics are considered from a theoretical-analytical approach as well as from the perspective of the practical experiences of day-to-day use. Being a modern IT service provider, the *Steinbuch Centre for Computing (SCC)* serves as object of study, since it combines both aspects in real life.

Module: Biosignal Processing [IW4INBSV]

Coordination: T. Schultz
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24105	Biosignals and User Interfaces (p. 152)	4	W	6	T. Schultz, C. Herff, D. Heger
24600	Multilingual Human-Machine Communication (p. 289)	4	S	6	T. Schultz, F. Putze
24612	Cognitive Modeling (p. 242)	2	S	3	T. Schultz, F. Putze
24103	Design and Evaluation of innovative user interfaces (p. 180)	2	W	3	T. Schultz, F. Putze, M. Georgi
BCI	Brain-Computer Interfaces (p. 154)	2	S	3	T. Schultz, C. Herff, D. Heger

Learning Control / Examinations
The assessment consists of an oral exam on the contents of the taken lectures (approx. 45 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The grade of the module is the average of the single grades weighted by the related credit points.
For appointments please e-mail helga.scherer@kit.edu.
It is recommended to schedule an appointment well in advance.

Conditions
One of the lectures *Biosignals and User Interfaces* or *Multilingual Human-Machine Communication* must be part of the exam.

Qualification Goals

- Introduction to biosignals, especially speech, motion, brain and muscle activity

- Foundations of production and recording of biosignals

- Foundations of automatic recognition and interpretation of biosignals

- Theory of biosignal processing

- Theory of statistical modeling

- Knowledge of the current state of the art in research and development

- Knowledge of many real-world applications

- Assessment of the potential, challenges and limitations of biosignals for human-machine interaction

Content
This module introduces students to the foundations and applications of automatic recording, processing and interpretation of biosignals. The production of biosignals will be explained, followed by methods for recording and preprocessing. Furthermore, the lecture will explain the foundations of statistical modeling as it is used in current systems. Many examples illustrate the practical application for human-machine interaction.

Module: Speech Processing [IW4INSV]

Coordination: T. Schultz
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24145	Principles of Automatic Speech Recognition (p. 222)	4	W	6	A. Waibel, Sebastian Stüker
24600	Multilingual Human-Machine Communication (p. 289)	4	S	6	T. Schultz, F. Putze
24298	Practical Course Automatic Speech Recognition (p. 324)	2	W	3	A. Waibel, Stüker
24103	Design and Evaluation of innovative user interfaces (p. 180)	2	W	3	T. Schultz, F. Putze, M. Georgi
2400080	Seminar: Multilingual Speech Recognition (p. 406)	2	W	3	A. Waibel, S. Stüker, M. Müller
2400078	Seminar: Neural Networks and Artificial Intelligence (p. 407)	2	W	3	A. Waibel, T. Asfour, J. Gehring, S. Stüker
2400007	Natural Language Processing and Dialog Modeling (p. 476)	2	W	3	J. Niehues, M. Schmidt, L. Zhang, A. Waibel

Learning Control / Examinations
The assessment consists of an oral exam on the contents of the taken lectures (approx. 45 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The grade of the module is the average of the single grades weighted by the related credit points.
Practical course *Automatic Speech Recognition:*   In addition the student needs to submit a certificate (not graded) as an assessment according to sec. 4 subsec. 2 no. 3 study and examination regulations.
For appointments please e-mail helga.scherer@kit.edu. It is recommended to schedule an appointment well in advance.

Conditions
None.

Qualification Goals

- Introduction to the processing of natural speech
- Theory of signal processing
- Theory of statistical modeling of speech
- Foundations of machine learning methods for speech processing
- Knowledge of the current state of the art in research and development
- Knowledge of many real-world applications
- Assessment of the potential, challenges and limitations of speech processing for human-machine interaction and human-human communication.

Content
This module introduces students to the foundations and applications of automatic speech recognition and processing. The lecture will explain the foundations of statistical modeling of speech as it is used in current systems. Many examples from state of the art systems illustrate the practical application for human-machine interaction and human-human communication.

Remarks
Lecture slides are available as pdf at http://csl.anthropomatik.kit.edu.
Current literature will be announced in the lectures, seminars and practical courses.

Module: Curves and Surfaces [IW4INKUF]

Coordination: H. Prautzsch
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2400006	Curves and Surfaces in CAD I (p. 251)	2	S	3	H. Prautzsch
CFD2	Curves and Surfaces in CAD II (p. 252)	2	W	3	H. Prautzsch
KFCAD3	Curves and Surfaces in CAD III (p. 253)	2	W/S	3	H. Prautzsch
rsp	Rationale Splines (p. 355)	2 oder 2/1	W	3 oder 5	H. Prautzsch
	Subdivision algorithms (p. 473)	2	W	3	H. Prautzsch
24122	Meshes and point clouds (p. 295)	2	W	3	H. Prautzsch
ADG	Applied Differential Geometry (p. 134)	2	W	3	H. Prautzsch
2400029	Geometric basics for Geometry Processing (p. 213)	2	S	3	H. Prautzsch

Learning Control / Examinations
The assessment consists of an oral exam (approx. 45 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The grade of the module corresponds to the grade of the oral exam.

Conditions
None.

Qualification Goals
Gaining knowledge and deeper understanding in the area of Computer Aided Geometric Design (CAGD) and Geometric Computing.
Further, this module should enable the students to master typical CAGD tasks and to work on a master's thesis, in particular.

Content
Technics and algorithms for generating, representing, reconstructing, modifying, animating and analyzing free form geometries (curves, surfaces and bodies).

Remarks
Some courses are not offered every year, see http://i33www.ira.uka.de/pages/Lehre/VertiefungsgebietComputergraphik.html

Module: Context Sensitive Systems [IN4INKUS]

Coordination: M. Beigl
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

	ECTS Credits	Cycle	Duration
	9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24658	Context Sensitive Systems (p. 245)	2	S	4	M. Beigl, Till Riedel
24895	Practical Course: Context Sensitive ubiquitous Systems (p. 332)	4	S	5	M. Beigl
24844	Seminar: Ubiquitous Systems (p. 408)	2	W/S	4	M. Beigl
24146	Ubiquitous Computing (p. 470)	2/1	W	5	M. Beigl
24696	Reading Group Context Sensitive Systems (p. 254)	1	S	1	M. Beigl, Till Riedel

Learning Control / Examinations

Conditions
None.

Qualification Goals

Content

Module: Human-Machine-Interaction [IW4INMMI]

Coordination: M. Beigl
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

	ECTS Credits	Cycle	Duration
	9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24844	Seminar: Ubiquitous Systems (p. 408)	2	W/S	4	M. Beigl
24875	Practical Course: Sensor-based HCI Systems (p. 333)	4	S	5	M. Beigl
24659	Human-Machine-Interaction (p. 278)	2	S	4	M. Beigl
24146	Ubiquitous Computing (p. 470)	2/1	W	5	M. Beigl
24697	Reading Group Human-Machine-Interaction (p. 255)	1	S	1	M. Beigl
24648	Design Príncipes for Interactive Real-Time Systems" (p. 218)	2	S	3	E. Peinsipp-Byma, O. Sauer

Learning Control / Examinations

Conditions
None.

Qualification Goals

Content

Module: Algorithms in Computer Graphics [IW4INACG]

Coordination: H. Prautzsch
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24122	Meshes and point clouds (p. 295)	2	W	3	H. Prautzsch
24173	Medical Simulation Systems I (p. 276)	2	W	3	R. Dillmann, Speidel
24676	Medical Simulation Systems II (p. 277)	2	S	3	R. Dillmann, Suwelack
2400026	Geometric Optimzation (p. 214)	2	W	3	H. Prautzsch
ALGG	Computational Geometry (p. 129)	3	S	5	M. Nöllenburg, D. Wagner
	Subdivision algorithms (p. 473)	2	W	3	H. Prautzsch
2400007	Practical course: Geometric Modeling (p. 325)	2	S	3	H. Prautzsch, Diziol
2400034	(p. 130)	2/1		5	M. Nöllenburg, D. Wagner

Learning Control / Examinations
The assessment consists of an oral exam on the contents of the taken lectures and practical courses (approx. 40 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The grade of the module corresponds to the grade of the oral exam.

Conditions
None.

Qualification Goals
Fundamental knowledge in the area of geometric modelling and computer graphics with its applications in CAD/CAGD and medical simulation.

Content

Module: Foundations and Application of IT-Security [IW4INGAS]

Coordination: J. Müller-Quade
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
8	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24941	Security (p. 418)	3/1	S	6	J. Müller-Quade
SemiKryp2	Seminar in Cryptography (p. 375)	2	W/S	2	J. Müller-Quade

Learning Control / Examinations

Conditions
None.

Qualification Goals
The student

- knows the theoretic background and the basic mechanisms of computer security and cryptography
- understands the mechanisms of computer security and can explain them,
- can read and understand the current scientific papers,
- can evaluate the safety procedures and can recognize hazards,
- can adapt mechanisms of computer security to new environment.
- deals with a restricted problem in the field of cryptography within the seminar,
- analyzes and discusses the problems associated to a distinct discipline in the lectures and in the final seminar paper,
- discusses, presents and defends subject-specific arguments within a given task,
- organizes the preparation of the final papers largely independent.

Content

- Theoretical and practical aspects of computer security
- Development of safety goals and classification of threats
- Presentation and comparison of different formal access control models
- Formal description of authentication systems, presentation and comparison of different authentication methods (passwords, biometrics, challenge-response protocols)
- Analysis of typical vulnerabilities in programs and web applications and development of appropriate protective protection methods / avoidance strategies
- Introduction to key management and Public Key Infrastructure
- Presentation and comparison of current safety certifications
- Block ciphers, hash functions, digital signature, public key encryption and digital signatures (RSA, ElGamal), and various methods of key exchange (e.g., Diffie-Hellman)
- Furthermore, an introduction to provable security is provided, which presents some of the key security concepts (e.g. IND-CCA).
- Presentation of combinations of cryptographic modules using currently used protocols such as Secure Shell (SSH) and Transport Layer Security (TLS).

Module: Parallel Processing [IW4INPV]

Coordination: W. Karl
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24161	Microprocessors II (p. 279)	2	W	3	W. Karl
24117	Heterogeneous Parallel Computing Systems (p. 224)	2	W	3	W. Karl
24660	Software Development for Modern, Parallel Platforms (p. 427)	2	S	3	W. Tichy
24112	Multicore Computers and Computer Clusters (p. 288)	2	W	3	W. Tichy
24606	Models of Parallel Processing (p. 282)	3	S	5	T. Worsch
24622	Algorithms in Cellular Automata (p. 127)	2/1	S	5	T. Worsch
24293	Multicore Programming in Practice: Tools, Models, Languages (p. 334)	4	W	6	W. Tichy, T. Karcher, L. Rodríguez
2400053	Parallel Algorithms (p. 315)	2/1	W	5	P. Sanders
APS	Automatic Software Parallelization (p. 145)	2/1	S	4	F. Padberg
ASH	Algorithms for Memory Hierarchies (p. 125)	2		5	P. Sanders, N. Sitchinava

Learning Control / Examinations
The assessment consists of oral exams of the taken courses according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The lecture *Multicore Programming in Practice: Tools, Models, Languages* [24293] will have an assessment according to sec. 4 subsec. 2 no. 3 study and examination regulations. The assessment is explained in the course description.
The lecture *Multicore Computers and Computer Clusters* will have an asessment consists of a written exam according to section 4 subsection 2 no. 1 study and examination regulations.
Lecture Parallele Algorithms: The assessment consists of an oral exam according to sec. 4 subsec. 2 no. 2 study and examination regulations and an assessment according to sec. 4 subsec. 2 no. 3 study and examination regulations. Weighted 80 %, 20 %
The grade of the module is the average of the single grades weighted by the related credit points.

Conditions
The lecture *Multicore Programming in Practice* can not be taken in the study course Information Engineering and Management.

Qualification Goals

Content

Module: Web Engineering [IW4INWEBE]

Coordination: H. Hartenstein
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
4	Every 2nd term, Winter Term	1

Learning Control / Examinations
The assessment consists of an oral exam (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The grade of the module corresponds to the grade of the oral exam.

Conditions
None.

Qualification Goals

- Students know fundamentals as well as current methodologies and techniques in the field of Web Engineering

- Students have gained insight into existing Web-oriented application platforms and development frameworks, and have the basic knowledge for system design close to current practices.

- Students can apply methods for analyzing current standards and technologies of the Web. Students are able to understand and interpret scientific papers and standard specifications and are confident in using the domain-specific terminology.

- Students are able to analyze, structure and describe problems in the field of Web Engineering as well as to design Web-based system architectures.

Content
This module will discuss the systematic construction of Web-based applications and systems by focusing on the different phases and aspects of the Web application lifecycle. It helps students to look at the Web phenomenon from different perspectives - e.g. as a Web designer, analyst, architect, component engineer, program manager, product manager or CIO. Students learn how to engineer Web applications and agile systems from requirements engineering, planning, design, development, testing, deployment and up to operation, maintenance and evolution. Many examples are shown and discussed, demonstrating the need for expecting change and staying agile. As this is not a programming course, students will be introduced to the core technology aspects and are encouraged to consolidate the details.

Module: Autonomous Robotics [IN4INAR]

Coordination: R. Dillmann
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	**Cycle**	**Duration**
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24152	Robotics I – Introduction to robotics (p. 366)	2	W	3	R. Dillmann, S. Schmidt-Rohr
24712	Robotics II - Learning and planning robots (p. 367)	2	S	3	R. Dillmann
24635	Robotik III - Sensors in Robotics (p. 368)	2	S	3	R. Dillmann, Meißner, Gonzalez, Aguirre
24619	Biologically Inspired Robot (p. 150)	2	S	3	R. Dillmann, Arne Rönnau
2400077	Mechano-Informatics and Robotics (p. 275)	4	W	4	T. Asfour
24644	Anthropomatics: Humanoid Robotics (p. 137)	2	S	3	T. Asfour

Learning Control / Examinations

Conditions
None.

Qualification Goals

Content

Module: Web Data Management [IW4INAIFB4]

Coordination: R. Studer
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
25070p	Advanced Lab Applied Informatics (p. 323)	2	W/S	4	A. Oberweis, H. Schmeck, R. Studer
2511310	Semantic Web Technologies (p. 371)	2/1	S	5	R. Studer, A. Harth
2511312	Web Science (p. 485)	2/1	W	5	Y. Sure-Vetter

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

Conditions
The lecture *Semantic Web Technologies* [2511310] is obligatory and has to be absolved.

Qualification Goals
Students

   • develop ontologies for semantic web technologies und choose suitable representation languages,

   • are able to provide data and applications via a cloud-based infrastructure

   • transfer the methods and technologies of semantic web technologies and cloud computing to new application sectors,

   • evaluate the potential of semantic web technologies and the cloud computing approaches for new application sectors.

Content
The module Web Data Management covers the basic principles, methods and applications for intelligent systems in the World Wide Web. Cloud Services are essential for the decentralized, scalable provision of data and applications as well as the methods of semantic web based on the description of data and services via metadata in form of so called ontologies.
Formal principles and practical aspects such as knowledge modeling and available representation language tools for ontologies are covered in detail. Methods for the realization of intelligent systems within the World Wide Web are treated and applications as in Web 2.0 or Service Science are discussed and evaluated.
Furthermore the application of modern Cloud technologies for the use of software and hardware as a service via internet is introduced. Cloud technologies allow the efficient implementation of applications on distributed computer clusters and permit a high scalability as well as new business models in the internet.

Module: Intelligent Systems and Services [IW4INAIFB5]

Coordination: R. Studer
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2511302	Knowledge Discovery (p. 241)	2/1	W	5	R. Studer
2511308	Service Oriented Computing 2 (p. 416)	2/1	S	5	R. Studer, S. Agarwal, B. Norton
25860sem	Special Topics of Knowledge Management (p. 434)	2/1	W/S	5	R. Studer
2511102	Algorithms for Internet Applications (p. 131)	2/1	W	5	H. Schmeck
2511202	Database Systems and XML (p. 174)	2/1	W	5	A. Oberweis
25070p	Advanced Lab Applied Informatics (p. 323)	2	W/S	4	A. Oberweis, H. Schmeck, R. Studer

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

Conditions
None.

Qualification Goals
Students

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

Content
In the broader sense learning systems are understood as biological organisms and artificial systems which are able to change their behavior by processing outside influences. Network leaning methods based on symbolic, statistic and neuronal approaches are the focus of Computer Sciences.
In this module the most important network learning methods are introduced and their applicability is discussed with regard to different information sources such as data texts and images considering especially procedures for knowledge acquirement via data and text mining, natural analogue procedures as well as the application of organic learning procedures within the finance sector.

Module: Semantic Technologies [IW4INAIFB6]

Coordination: R. Studer
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
8	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
25070s	Seminar in Applied Informatics (p. 373)	2	W/S	3	A. Oberweis, H. Schmeck, R. Studer
25070p	Advanced Lab Applied Informatics (p. 323)	2	W/S	4	A. Oberweis, H. Schmeck, R. Studer
2511310	Semantic Web Technologies (p. 371)	2/1	S	5	R. Studer, A. Harth
2511312	Web Science (p. 485)	2/1	W	5	Y. Sure-Vetter

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

Conditions
None.

Qualification Goals
The student

- understands the koncepts behind Semantic Web and Linked Data technologies

- develops ontologies to be employed in semantic web-based applications and chooses suitable representation languages,

- is familiar with approaches in the area of knowledge representation and modelling,

- is able to transfer the methods and technologies of semantic web technologies to new application sectors,

- evaluates the potential of semantic web for new application sectors,

- understands the challenges in the areas of Data and system integration on the web is able to develop solutions.

Content

Module: Ubiquitous Computing [IW4INAIFB7]

Coordination: H. Schmeck
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24146	Ubiquitous Computing (p. 470)	2/1	W	5	M. Beigl
2511102	Algorithms for Internet Applications (p. 131)	2/1	W	5	H. Schmeck
2511104	Organic Computing (p. 309)	2/1	S	5	H. Schmeck
24149	IT-Security Management for Networked Systems (p. 240)	2/1	W	5	H. Hartenstein
24146p	Advanced Lab in Ubiquitous Computing (p. 328)	2/0	W/S	4	H. Schmeck
2511108	Smart Energy Distribution (p. 422)	2	S	4	H. Schmeck

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

Conditions
None.

Qualification Goals
The student

- gets comprehensive knowledge about topics in the area of Ubiquitous Computing

- can design and evaluate ubiquitous systems in different application areas

- acquires appropriate knowledge for addressing specialized aspects in the area of ubiquitous computing

Content
Ubiquitous information technology (Ubiquitous Computing) addresses the ubiquitous (or pervasive) availability of information processing. The availability of these systems has the objective to facilitate the operational environment in technical scenarios or in daily life of humans and to enrich it with new capabilities. This module provides fundamentals of ubiquitous computing and further topics like network and Internet technologies, security aspects, the analysis of autonomously operating systems in Organic Computing and also the utilisation of information and communication technologies in highly decentralized energy systems.

Module: Organic Computing [IW4INAIFB8]

Coordination: H. Schmeck
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2511104	Organic Computing (p. 309)	2/1	S	5	H. Schmeck
2511106	Nature-inspired Optimisation Methods (p. 294)	2/1	S	5	P. Shukla
25700sp	Special Topics of Efficient Algorithms (p. 433)	2/1	W/S	5	H. Schmeck
25070p	Advanced Lab Applied Informatics (p. 323)	2	W/S	4	A. Oberweis, H. Schmeck, R. Studer

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

Conditions
None.

Qualification Goals
The student

- obtains detailed knpowledge about the theory and applications of Organic Computing

- utilizes concepts for designing autonomous systems in the context of organic computing and for their systematic evaluation

- knows how to address problem settings based on solution templates from Organic Computing

Content
Organic Computing describes the systematic Analysis and Design of autonomous, information processing sysytems whoich can cooperate in aheterogeneous environment. This modul provides fundamental concepts and solution templates of Organic Computing

Module: Development of Business Information Systems [IW4INAIFB11]

Coordination: A. Oberweis
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2511202	Database Systems and XML (p. 174)	2/1	W	5	A. Oberweis
2511208	Software Quality Management (p. 426)	2/1	S	5	A. Oberweis
2511218	Requirements Analysis and Requirements Management (p. 133)	2/0	W	4	R. Kneuper
2511404	IT Complexity in Practice (p. 263)	2/1	W	5	D. Seese, Kreidler
2511212	Document Management and Groupware Systems (p. 183)	2	S	4	S. Klink
2511602	Strategic Management of Information Technology (p. 454)	2/1	S	5	T. Wolf
2511214	Management of IT-Projects (p. 262)	2/1	S	5	R. Schätzle
SBI	Special Topics of Enterprise Information Systems (p. 432)	2/1	W/S	5	A. Oberweis
25070p	Advanced Lab Applied Informatics (p. 323)	2	W/S	4	A. Oberweis, H. Schmeck, R. Studer

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

Conditions
The course *Datenbanksysteme und XML* [2511202] or the course *Software Quality Management* [2511208] must be examined.

Qualification Goals
Students

- describe the structure and the components of enterprise information systems,

- explain functionality and architecture of the enterprise information system components ,

- choose and apply relevant components to solve given problems in a methodic approach,

- describe roles, activities and products in the field of software engineering management,

- compare process and quality models and choose an appropriate model in a concrete situation,

- write scientific theses in the areas of enterprise information system components and software engineering management and find own solutions for given problems and research questions.

Content
An enterprise information system contains the complete application software to store and process data and information in an organisation including design and management of databases, workflow management and strategic information planning.
Due to global networking and geographical distribution of enterprises as well as the increasing acceptation of eCommerce the application of distributed information systems becomes particular important.
This module teaches concepts and methods for design and application of information systems.

Module: Fundamentals of Robotics [IW4INROB]

Coordination: R. Dillmann
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Learning Control / Examinations
The assessment consists of an oral exam on the contents of the taken lectures (approx. 45-60 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The grade of the module corresponds to the grade of the oral exam.
The exam can be taken every semester during the lecture period.

Conditions
The course *Robotics I – Introduction to robotics* [24152] has to be taken, the remaining lectures can be chosen freely from the offered courses.

Recommendations
Previous attendance in practical courses offered at the institute is recommended to gain practical experiences in different areas of robotics, complementing and deepening the theoretical knowledge from lectures.

Qualification Goals
Students gain knowledge about the essential components of robotic systems and robotic controllers and their interaction. They shall have the ability to identify the different problems in a robotic system and have knowledge on solution approaches and applicable methods. They shall be able to choose appropriate components for simple applications and to choose appropriate designs for these components based on the intended application.

Content
The module provides an overview of the domain of robotics with its different tasks, problems and subproblems. It covers industrial robots in industrial production as well as service robots. The emphases are in the areas of robot control, perception, modeling and programming

Remarks
To sign up please send an e-mail to: *sekrdill@anthropomatik.kit.edu*
It is recommended to schedule an appointment well in advance.

Module: Medical Simulation and Neural Medicine [IW4INMSNM]

Coordination: R. Dillmann
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24173	Medical Simulation Systems I (p. 276)	2	W	3	R. Dillmann, Speidel
24676	Medical Simulation Systems II (p. 277)	2	S	3	R. Dillmann, Suwelack
24139 / 24678	Human brain and central nervous system: anatomy, information transfer, signal processing, neurophysiology and therapy (p. 210)	2	W/S	3	U. Spetzger

Learning Control / Examinations
The assessment consists of an oral exam on the contents of the taken lectures (approx. 30-40 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The grade of the module corresponds to the grade of the oral exam.
The exam can be taken every semester during the lecture period.
To sign up please send an e-mail to: sekretariat.dillmann@ira.uka.de
It is recommended to schedule an appointment well in advance.

Conditions
Attendance of the lab classes and seminars on medical informatics offered by the institute is recommended since they offer the opportunity to extend theoretical and practical skills.

Recommendations
Attendance of the lab classes and seminars on medical informatics offered by the institute is recommended since they offer the opportunity to extend theoretical and practical skills.

Qualification Goals
On completion of this module students will know the essential components of medical simulation systems and their interaction. The objective is a basic methodological understanding regarding the identification of different problems as-well-as imparting knowledge of fundamental solution approaches for the design of medical simulation systems. The lecture aims to impart the competence to conceive dedicated systems and to make important design decisions correctly.
Students will have an understanding of construction and the complex functions of the human brain and the central nerve system. The basic principles of neural physiology are conveyed. Furthermore, diagnostic procedures are presented, with a focus on computer assisted and robot assisted surgical procedures.

Content
The module gives an overview of medical simulation systems and gives insight into applications of computer science to medical problems. Focus is on the fields of imaging and image processing, intra-operative assistance systems, and modeling and simulation of biological systems.
Furthermore, an overview on neural medicine and a basic understanding of physiology regarding senses and nerves is conveyed, which are an important interface to the innovative research area of neural prosthodontics. A close connection to the areas of imaging, image processing and operative support systems is shown. Concrete application examples from medical diagnosis and therapy are presented.

Module: Automated visual inspection [IW4INAS]

Coordination: J. Beyerer
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24169	Automated Visual Inspection and Image Processing (p. 146)	4	W	6	J. Beyerer
24675	Pattern Recognition (p. 292)	2	S	3	J. Beyerer
24172	Introduction to Information Fusion (p. 188)	2	W	3	M. Heizmann
2400035	Seminar Image Analysis and Fusion (p. 379)	2	S	3	J. Beyerer
24150	Machine Learning 1 - Basic Methods (p. 271)	2	W	3	R. Dillmann, J. Zöllner, S. Ulbrich, M. Zofka
2400112	Image Data Compression (p. 149)	2	W	3	A. Pak, J. Beyerer

Learning Control / Examinations

The assessment consists of an oral exam (approx. 45 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations. The grade of the module corresponds to the grade of the oral exam.

Conditions

The course *Automated Visual Inspection and Image Processing* has to be taken.

Qualification Goals

Content

Module: Machine Vision [IW4INMVW]

Coordination: J. Beyerer
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24169	Automated Visual Inspection and Image Processing (p. 146)	4	W	6	J. Beyerer
24675	Pattern Recognition (p. 292)	2	S	3	J. Beyerer
24172	Introduction to Information Fusion (p. 188)	2	W	3	M. Heizmann
24684	Introduction to Video Analysis (p. 187)	2	S	3	J. Beyerer, Arens
24180	Computer Vision for Human-Computer Interaction (p. 162)	4	W	6	R. Stiefelhagen
24628	Content-based Image and Video Retrieval (p. 229)	2	S	3	R. Stiefelhagen
24893	Practical Course Computer Vision for Human-Computer Interaction (p. 349)	2	S	3	R. Stiefelhagen, Manuel Martinez
2400112	Image Data Compression (p. 149)	2	W	3	A. Pak, J. Beyerer
2403011	Biomedric Systems for Person Identification (p. 151)	2	S	3	M. Saquib Sarfraz

Learning Control / Examinations
The assessment consists of an oral exam (approx. 45 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations. The grade of the module corresponds to the grade of the oral exam.

Conditions
At least one course offered by the chair of Beyerer has to be taken.

Qualification Goals

Content

Module: Automated Planning and Decision-making [IW4INAPE]

Coordination: J. Beyerer
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24675	Pattern Recognition (p. 292)	2	S	3	J. Beyerer
2400035	Seminar Image Analysis and Fusion (p. 379)	2	S	3	J. Beyerer
24603	Probabilistic Planning (p. 343)	4	S	6	J. Beyerer, Marco Huber

Learning Control / Examinations
The assessment consists of an oral exam (approx. 45 minutes) according to section 4 subsection 2 no. 2 study and examination regulations.
The grade of the module corresponds to the grade of the oral exam.

Conditions
The course *Probabilistische Planung* has to be taken.

Qualification Goals

Content

Module: Image-based detection and classification [IW4INBDK]

Coordination: J. Beyerer
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24675	Pattern Recognition (p. 292)	2	S	3	J. Beyerer
24169	Automated Visual Inspection and Image Processing (p. 146)	4	W	6	J. Beyerer
24172	Introduction to Information Fusion (p. 188)	2	W	3	M. Heizmann
24684	Introduction to Video Analysis (p. 187)	2	S	3	J. Beyerer, Arens
2400035	Seminar Image Analysis and Fusion (p. 379)	2	S	3	J. Beyerer
24150	Machine Learning 1 - Basic Methods (p. 271)	2	W	3	R. Dillmann, J. Zöllner, S. Ulbrich, M. Zofka
24620	Machine Learning 2 – Advanced methods (p. 272)	2	S	3	J. Zöllner, R. Dillmann, S. Ulbrich, M. Weber
2400112	Image Data Compression (p. 149)	2	W	3	A. Pak, J. Beyerer

Learning Control / Examinations

The assessment consists of an oral exam (approx. 45 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations. The grade of the module corresponds to the grade of the oral exam.

Conditions

The course *Pattern Recognition* has to be taken.

Qualification Goals

Content

Module: Entrepreneurship for Computer Scientists [IW4INUKI]

Coordination: K. Böhm
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24114	Big Data Analytics (p. 132)	2/1	W	5	K. Böhm, E. Müller
db_impl	Database Implementation and Tuning (p. 171)	2/1	S	5	K. Böhm
2400020	Deployment of Database Systems (p. 170)	2/1	W	5	K. Böhm
24109	Datamanagement in the Cloud (p. 175)	2/1	W	5	K. Böhm
24141	Information integration and mobile Web applications (p. 227)	2	W	3	J. Mülle, A. Rashid
24605	Data Privacy Protection in Interconnected Information Systems (p. 176)	2	S	3	K. Böhm
PLV	Selling IT-Solutions Professionally (p. 336)	2	W/S	1,5	K. Böhm, Hellriegel
PUB	Consulting in Practice (p. 335)	2	W/S	1,5	K. Böhm, Stefan M. Lang
2400005	Project Management in Practice (p. 348)	2	W/S	1,5	K. Böhm, W. Schnober
24522	(p. 486)	0/1	S	1	K. Böhm
24111	Mechanisms and Applications of Workflow Systems (p. 247)	3	W	5	J. Mülle, Silvia von Stackelberg
2400015	Indexing Structures for Efficient Query Processing on Large Databases (p. 225)	2	S	3	K. Böhm, E. Müller

Learning Control / Examinations

Conditions
None.

Qualification Goals

Content

Module: Theory and Practice of Big Data Analytics [IW4INADTP]

Coordination: K. Böhm
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24874	Analyzing Big Data - Laboratory Course (p. 331)	2	S	4	K. Böhm
24114	Big Data Analytics (p. 132)	2/1	W	5	K. Böhm, E. Müller
2400020	Deployment of Database Systems (p. 170)	2/1	W	5	K. Böhm
db_impl	Database Implementation and Tuning (p. 171)	2/1	S	5	K. Böhm
24109	Datamanagement in the Cloud (p. 175)	2/1	W	5	K. Böhm
2400015	Indexing Structures for Efficient Query Processing on Large Databases (p. 225)	2	S	3	K. Böhm, E. Müller
24647	Data Mining Paradigms and Methods for Complex Databases (p. 169)	2/1	S	5	K. Böhm, E. Müller

Learning Control / Examinations

The assessment consists of an oral exam on the contents of the selected lecture (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.
The practical course requires an additional certificate following sec. 4 subsec. 2 no. 3 study and examination regulations.
The grade of the module is the grade of the oral exam.

Conditions

At least one practical course has to be taken.

Recommendations

t is recommended to take the lecture   *Theory and Practice of Big Data Analytics* [24118] if it has not been taken yet.

Qualification Goals

Content

Module: [IN4INDPMD]

Coordination: K. Böhm
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
5	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24647	Data Mining Paradigms and Methods for Complex Databases (p. 169)	2/1	S	5	K. Böhm, E. Müller

Learning Control / Examinations

Conditions
None.

Qualification Goals

Content

5.6   Law

Module: Intellectual Property Law [IW4JURA4]

Coordination: T. Dreier
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24354	Internet Law (p. 239)	2/0	W	3	T. Dreier
24121	Copyright (p. 474)	2/0	W	3	T. Dreier
24656	Patent Law (p. 318)	2/0	S	3	P. Bittner
24136 / 24609	Trademark and Unfair Competition Law (p. 264)	2/0	W/S	3	Y. Matz
VGE	Computer Contract Law (p. 482)	2/0	W	3	M. Bartsch

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

Conditions
None.

Qualification Goals
See German version.

Content

Module: Private Business Law [IW4JURA5]

Coordination: Z. (ZAR)
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24650	Civil Law for Advanced (p. 479)	2/0	S	3	Z. (ZAR)
24671	Law of Contracts (p. 481)	2/0	S	3	Z. (ZAR)
24167	Employment Law I (p. 139)	2	W	3	A. Hoff
24668	Employment Law II (p. 140)	2	S	3	A. Hoff
24168	Tax Law I (p. 446)	2/0	W	3	D. Dietrich
24646	Tax Law II (p. 447)	2/0	S	3	D. Dietrich

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

Conditions
None.

Recommendations
For the courses

- *Civil Law for Advanced* [24650]

- *Law of Contracts* [24671],

basic knowledge in civil law as taught in the courses *Civil Law for Beginners* [24012], *Advanced Civil Law* [24504], and *Commercial and Corporate Law* [24011] is required.

Qualification Goals
The student

- has gained in-depth knowledge of German company law, commercial law and civil law;

- is able to analyze, evaluate and solve complex legal and economic relations and problems;

- is well grounded in individual labour law, collective labour law and commercial constitutional law, evaluates and critically assesses clauses in labour contracts;

- recognizes the significance of the parties to collective labour agreements within the economic system and has differentiated knowledge of labour disputes law and the law governing the supply of temporary workers and of social law;

- possesses detailed knowledge of national earnings and corporate tax law and is able to deal with provisions of tax law in a scientific manner and assesses the effect of these provisions on corporate decision-making.

Content
The module provides the student with knowledge in special matters in business law, like employment law, tax law and business law, which are essential for managerial decisions.

Module: Public Business Law [IW4JURA6]

Coordination: G. Sydow
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24632	Telecommunications Law (p. 464)	2/0	S	3	G. Sydow
24082	Public Media Law (p. 301)	2	W	3	C. Kirchberg
24666	European and International Law (p. 203)	2/0	S	3	G. Sydow
24140	Environmental Law (p. 471)	2	W	3	G. Sydow
24018	Data Protection Law (p. 177)	2/0	W	3	G. Sydow

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

Conditions
None.

Qualification Goals
See German version.

Content

Module: Governance, Risk & Compliance [IW4JURGRC]

Coordination: T. Dreier
Degree programme: Informationswirtschaft SPO 2015 (M.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24121	Copyright (p. 474)	2/0	W	3	T. Dreier
24018	Data Protection Law (p. 177)	2/0	W	3	G. Sydow
24168	Tax Law I (p. 446)	2/0	W	3	D. Dietrich
24671	Law of Contracts (p. 481)	2/0	S	3	Z. (ZAR)
2400087	Corporate Complince (p. 359)	2	W	3	T. Dreier, N.N.
2400041	Seminar: Governance, Risk & Compli-ance (p. 480)	2	S	3	T. Dreier, N.N.

Learning Control / Examinations

Conditions
None.

Qualification Goals

Content

6   Courses

6.1   All Courses

Course: Advanced Econometrics of Financial Markets [2520381]

Coordinators: A. Nazemi
Part of the modules: Mathematical and Empirical Finance (p. 63)[IW4STAT1]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	en

Learning Control / Examinations
The assessment of this course consists of a written examination (following §4(2), 1 SPO) and of possible additional assignments during the course (following §4(2), 3 SPO).

Conditions
None.

Learning Outcomes
After successful completion of the course students will have attained both knowledge and competency to comprehend the theories behind portfolio management of major financial institutions. Hence students can adapt this understanding to the more specialised needs of the intermediary.

Content
Advanced Econometrics of Financial Markets covers: Forecasting stock return, market microstructure(non-synchronised trading, spread and modelling transactions), "event studies analysis", capital asset pricing model, multi-factor price models, intertemporal equilibrium models.

Media
transparencies, exercises.

Literature
Campbell, Lo, McKinlay: The Econometrics of Financial Markets. Princeton University Press.

Remarks
See German version.

Course: Advanced Game Theory [2521533]

Coordinators: P. Reiss, C. Puppe, K. Ehrhart
Part of the modules: Applied Strategic Decisions (p. 53)[IW4VWL2], Microeconomic Theory (p. 56)[IW4VWL15]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	en

Learning Control / Examinations
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.

Conditions
None.

Recommendations
Basic knowledge of mathematics and statistics is assumed.

Learning Outcomes
The student
- deepens and broadens his/her basic knowledge of Game Theory,
- develops a rigorous understanding of newer concepts in Game Theory,
- develops the capability to independently model and analyze complex systems of strategic decision-making, and to develop appropriate solutions.

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

Media
Slides, problem sets.

Literature
Compulsory textbook:
Osborne, M. A. Rubinstein, A Course in Game Theory, MIT Press, 1994.
Additional Literature:
Aumann, R./Hart, S. (Hrsgb.), Handbook of Game Theory I-III, Elsevier, 1992/1994/2002.

Course: Advanced Topics in Economic Theory [2520527]

Coordinators: M. Hillebrand, K. Mitusch
Part of the modules: Economic Theory and its Application in Finance (p. 55)[IW4VWL14], Microeconomic Theory (p. 56)[IW4VWL15]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	en

Learning Control / Examinations
The assessment consists of a written exam (60min) (following §4(2), 1 of the examination regulation) at the beginning of the recess period or at the beginning of the following semester.

Conditions
None.

Recommendations
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.

Learning Outcomes
The students

- will understand fundamental questions of General Equilibrium Theory and will be able to solve these questions with appropriate methods,
- will understand fundamental questions of information economics respectively contract theory and will be able to solve these questions with appropriate methods,
- will be able to apply advanced methods of formal economic modelling.

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.

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.

Remarks
The course Advanced Topics in Economic Theory will not take place in summer semester 2015.

Course: Current issues in Innovation Management [2545018]

Coordinators: M. Weissenberger-Eibl
Part of the modules: Innovation Management (p. 45)[IW4BWLENT2]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
Non exam assessment (following §4(3) of the examination regulation).

Conditions
None.

Recommendations
None.

Learning Outcomes
The aim of the course is the thoroughly examination of a current issues in Innovation Management.

Content
The aim of the course is the thoroughly examination of a current issues in Innovation Management.

Course: Algorithm Engineering [2400051]

Coordinators: P. Sanders, D. Wagner
Part of the modules: Advanced Algorithms: Engineering and Applications (p. 73)[IW4INAALGOB], Advanced Algorithms:
                          Design and Analysis (p. 72)[IW4INAADA]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
The students come to know the methodology of algorithm engineering. Moreover, examples of well done algorithm engineering are presented.

Content

- What is algorithm engineering, why is it interesting, ...?
- Realistic models of machines and applications
- Practice-oriented design of algorithms
- Implementation techniques
- Experimental methods
- Analysis of measured data

The above skills are taught using concrete examples. In the past the following topics from the area of fundamental algorithms and data structures have been used for example:

- linked lists without special cases
- Sorting: parallel, external, superscalar,...
- Priority queues (chache efficiency,...)
- Search trees for integer keys
- Full-text indexing
- Graph algorithms: minimum spanning trees (external,...), route planning

The best practical and theoretical techniques known are considered. In most cases, these techniques are very different from the methods taught in a beginner's course.

Media
Slides, Scriptum, scientific papers, source codes

Literature
Elective literature:

- K. Mehlhorn, P. Sanders, Algorithms and Data Structures - The Basic Toolbox, Springer 2008

Course: Algorithms for Ad-Hoc and Sensor Networks [AAS]

Coordinators: D. Wagner
Part of the modules: Advanced Algorithms: Engineering and Applications (p. 73)[IW4INAALGOB], Advanced Algorithms: Design and Analysis (p. 72)[IW4INAADA]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1		de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Basic knowledge of graph theory and algorithm engineering are helpful.

Learning Outcomes
Students aquire a deep and systematic understanding of algorithmic questions in geometric distributed systems and relevant technologies. They learn how to model tasks in communication and self-organization as geometric and graph-theoretic problems. They understand the development and analysis of centralized and distributed algorithms in the field of sensor networks and are able to apply this knowledge to other fields of research in computer science.

Content
Students have a deep and systematic understanding of algorithmic questions in geometric distributed systems and relevant technologies. They know how to model tasks in communication and self-organization as geometric and graph-theoretic problems. They understand the development and analysis of centralized and distributed algorithms in the field of sensor networks and are able to apply this knowledge to other fields of research in computer science

Media
Slides.

Literature
Elective literature:
Wagner, Wattenhofer (Eds.). Algorithms for Sensor and Ad Hoc Networks, Springer, 2008

Course: Algorithms for Routing [24638]

Coordinators: D. Wagner
Part of the modules: Advanced Algorithms: Engineering and Applications (p. 73)[IW4INAALGOB], Advanced Algorithms: Design and Analysis (p. 72)[IW4INAADA]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Basic knowledge of graph theory and algorithm engineering is helpful.

Learning Outcomes
The goal of this course is to give the students a first impression on the problem of route planning and thereby applying knowledge from the fields of graph theory and algorithmics. On one hand, occuring problems are reduced to their algorithmic core and then solved efficiently. On the other hand, several modeling aspects and their interpretations are discussed. Students learn to to apply the presented methods and techniques to related problems autonomously

Content
Finding optimal routes in transportation networks is an everyday problem. While formerly routes used to be planned manually at the kitchen table using maps, automated route planning established in most parts of today's society: the best railway itinerary is obtained from the Internet while routes in road networks are often computed by mobile devices.
An approach to compute best connections emerges from graph theory. The transportation network is modeled as a directed graph wherein the route is computed by a shortest path algorithm. When using travel times as metric in the graph, the resulting route is the provably quickest connection. Dijkstra's algorithm - developed in 1959 - solves the shortest path problem optimally. However, realistic transportation networks are by far too big (the road network of western and central Europe consists of approximately 45 Milllion segments) for Dijkstra's algorithm to be fast enough for practical use. Hence, current research focuses on the development of so-called speed-up techniques for Dijkstra's algorithm. Thereby these methods use a two-phased approach: in a preprocessing step the network is enriched with additional information which is then used to accelerate Dijkstra's algorithm during the computation of shortest paths.

This course gives an overview of state-of-the art algorithms for efficient route planning, from which some are discussed in more detail.

Media
slides

Literature
Elective literature:
Mehlhorn/Sanders: Algorithms and Data Structures, The Basic Toolbox. Springer, 2008

Course: Algorithms for Memory Hierarchies [ASH]

Coordinators: P. Sanders, N. Sitchinava
Part of the modules: Parallel Processing (p. 96)[IW4INPV]

ECTS Credits	Hours per week	Term	Instruction language
5	2		en

Learning Control / Examinations

Conditions
None.

Learning Outcomes
The students will:

- - learn about the models of computation for data too large to fit inlocal memory
- - learn the techniques in I/O-efficient and cache-efficient algorithm design for such massive data.

Content
The course will cover the following models:
- External Memory Model
- Cache-oblivious Model
- Parallel External Memory Model
The course will also cover techniques in designing I/O-efficient,
cache-oblivious and parallel I/O-efficient algorithms in the following topics:
- Fundamental algorithms: sorting, scanning, prefix sums
- Computational geometry
- Graph algorithms
- Data structures

Course: Algorithms II [24079]

Coordinators: D. Wagner, P. Sanders
Part of the modules: Introduction to Algorithmics (p. 71)[IW4INEAT]

ECTS Credits	Hours per week	Term	Instruction language
6	3/1	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam (approx. 120 minutes) according to section 4 subsection 2 no. 1 study and examination regulations.

Conditions
See module description.

Learning Outcomes
The student

- gains profound insight into the most important aspects of algorithmics
- identifies algorithmic problems in different areas of application and can formulate these in a formal manner
- comprehends and determines the running times of algorithms
- knows fundamental algorithms and data structures and can apply this knowledge to new problems.

Content
This course conveys knowledge of basic theoretical and practical aspects of algorithmics. It covers common methods for the design and analysis of basic algorithmic problems as well as the fundamentals of common algorithmic methods such as approximations algorithms, linear programming, randomized algorithms, parallel algorithms and parameterized algorithms.

Course: Algorithms in Cellular Automata [24622]

Coordinators: T. Worsch
Part of the modules: Advanced Algorithms: Engineering and Applications (p. 73)[IW4INAALGOB], Parallel Processing
(p. 96)[IW4INPV], Advanced Algorithms: Design and Analysis (p. 72)[IW4INAADA]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
Students get acquainted with the basic and important approaches to and techniques for fine-grained parallel algorithms.
They are able to develop simple CA algorithms themselves which use these techniques and to asses the quality.

Content
Cellular automata are an important model for fine-grained parallelism, which was developed by John von Neumann using a suggestion by S. Ulam.

In the course important basic algorithms (e.g. for synchronization) and techniques for the design of efficient fine-grained algorithms are introduced. The application of these algorithms in different problem areas shown. Besides self-replication, which was von Neumann's motivation, pattern transformations and problem known from sequential algorithms like sorting, this also includes typical parallel problems like leader election and the modelling of real phenomena.

Contents:

- computational complexity
- pattern recognition
- self-reproduction
- sorting
- syncronization
- leader election
- discretization of continuous systems
- sandpile model

Media
lecture notes and slides in pdf format; computer demonstrations

Literature
Elective literature:

- M. Delorme, J. Mazoyer: Cellular Automata, Kluwer, 1999
- B. Chopard, M. Droz: Cellular Automata Modeling of Physical Systems, Cambridge Univ. Press, 1998
- J. von Neumann: Theory of Self-Reproducing Automata (ed. A. Burks), Univ. of Illinois Press, 1966
- T. Toffoli, N. Margolus: Cellular Automata Machines, MIT Press, 1987
- R. Vollmar: Algorithmen in Zellularautomaten, Teubner, 1979

Course: Algorithms for Visualization of Graphs [24118]

Coordinators: D. Wagner
Part of the modules: Advanced Algorithms: Engineering and Applications (p. 73)[IW4INAALGOB], Advanced Algorithms: Design and Analysis (p. 72)[IW4INAADA]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1		de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Basic knowledge of graph theory and algorithmics is helpful.

Learning Outcomes
The students acquire a systematic understanding of algorithmic problems and solutions in the area of graph visualization, which builds upon existing knowledge in graph theory and algorithmics. The problems at hand are reduced to their algorithmic core and are subsequently solved efficiently – if possible from the complexity point-of-view. The students learn to apply the presented methods and techniques autonomously to related questions. They are enabled to work on current research questions in graph drawing.

Content
Networks are relational data that increasingly occur in various applications. Examples range from physical networks, for example, transport or supply networks, to abstract networks, for example, social networks. Network visualization is a basic tool to explore and understand such networks.

Mathematically, networks are modeled as graphs and the visualization problem reduces to the algorithmic core problem of finding a suitable graph layout, that is, determining the positions of vertices and edges in the plane. Depending on the application and the properties of the graph at hand different constraints and optimization criteria apply. The corresponding research area of graph drawing uses approaches from algorithmics, graph theory, and computational geometry.

In the course of the lecture, a representative selection of visualizationalgorithms is presented.

Media
Blackboard, slides, script.

Literature
Elective literature:

- Di Battista, Eades, Tamassia, Tollis: Graph Drawing, Prentice Hall 1999
- Kaufmann, Wagner: Drawing Graphs, Springer-Verlag, 2001

Course: Computational Geometry [ALGG]

Coordinators: M. Nöllenburg, D. Wagner
Part of the modules: Advanced Algorithms: Design and Analysis (p. 72)[IW4INAADA], Algorithms in Computer Graphics
                           (p. 94)[IW4INACG]

ECTS Credits	Hours per week	Term	Instruction language
5	3	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Basic knowledge of algorithms and data structures (e.g. from the lectures Algorithms I + II) is expected.

Learning Outcomes
After successful participation in this module students shall be able to

- explain concepts, structures and problem definitions that were presented in class

- execute algorithms on example instances, analyze them and explain their properties

- select which algorithms and data structures are suitable for solving a given geometric problem and adapt them appropriately

- analyze new geometric problems and design own solutions based on the concepts and techniques presented in this lecture

Content
Spatial data are processed in various subfields of computer science, e.g. in computer graphics, visualization, geographic information systems, robotics etc. The area of computational geometry deals with the design and analysis of geometric algorithms and data structures. In this module we present common techniques and concepts in computational geometry in the context of selected and applied geometric questions.

Media
blackboard, slides, excercise sheets

Literature
Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars: Computational Geometry Algorithms and Applications, Springer Verlag 2008
Rolf Klein: Algorithmische Geometrie, Springer Verlag 2005

Course: [2400034]

Coordinators: M. Nöllenburg, D. Wagner
Part of the modules: Advanced Algorithms: Engineering and Applications (p. 73)[IW4INAALGOB], Advanced Algorithms:
                      Design and Analysis (p. 72)[IW4INAADA], Algorithms in Computer Graphics (p. 94)[IW4INACG]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1		

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Algorithms for Internet Applications [2511102]

Coordinators: H. Schmeck
Part of the modules: Intelligent   Systems   and   Services   (p.   100)[IW4INAIFB5],   Ubiquitous   Computing
                           (p. 102)[IW4INAIFB7]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter term	en

Learning Control / Examinations
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", 45 min) (according Section 4(2), 3 of the examination regulation).
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).

Conditions
None.

Learning Outcomes
The students will learn to master methods and concepts of essential algorithms within Internet applications and to develop capabilities for innovative improvements. The course aims at teaching advanced concepts for the design and application of algorithms with respect to the requirements in networked systems. Based on a fundamental understanding of taught concepts and methods the students should be able to select appropriate concepts and methods for problem settings in their future professional life, and - if necessary - customize and apply them in an adequate way. The students will be capable to find appropriate arguments for their chosen approach to a problem setting.
In particular, the student will

- know the structure and elementary protocols of the Internet (TCP/IP) and standard routing algorithms (distance vector and link state routing),
- know methods of information retrieval in the WWW, algorithms for searching information and be able to assess the performance of search engines,
- know how to design and use cryptographic methods and protocols to guarantee and check confidentiality, data integrity and authenticity,
- know algorithmic basics of electronic payment systems and of electronic money
- know new developments towards an Internet of Energy

Content
Internet and World Wide Web are changing our world, this core course provides the necessary background and methods for the design of central applications of the Internet. After an introduction into Internet technology the following topics are addressed: information retrieval in the www, structure and functioning of search engines, foundations of secure communication, electronic payment systems and digital money, and new developments and challenges in the Internet of Energy.

Media
Powerpoint slides with annotations on graphics screen, access to Internet resources, recorded lectures

Literature

- Tanenbaum: Computer Networks, 4th edition, Prentice-Hall 2003.
- Baeza-Yates, Ribeiro-Neto: Modern Information Retrieval. Addison-Wesley, 1999.
- Wobst: Abenteuer Kryptologie : Methoden, Risiken und Nutzen der Datenverschlüsselung, 3rd edition. Addison-Wesley, 2001.
- Schneier: Applied Cryptography, John Wiley, 1996.
- Furche, Wrightson: Computer money : Zahlungssysteme im Internet [Übers.: Monika Hartmann]. - 1. Aufl. - Heidelberg : dpunkt, Verl. für Digitale Technologie, 1997.

Elective literature:

- Further references will be given in the course.

Remarks
This course will not be offered after WS 2016/17

Course: Big Data Analytics [24114]

Coordinators: K. Böhm, E. Müller
Part of the modules: Theory and Practice of Big Data Analytics (p. 112)[IW4INADTP], Theory and Practice of
                           Data Warehousing and Mining (p. 86)[IW4INDWMTP], Entrepreneurship for Computer Scientists
                           (p. 111)[IW4INUKI], Theory and Practice of Database Technology (p. 87)[IW4INDBTP], Innovative
                           Concepts of Data and Information Management (p. 84)[IW4INIKDI]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter term	de

Learning Control / Examinations
The assessment consists of an oral exam according to section 4 subsection 2 no. 2 study and examination regulations.

Conditions
This course cannot be combined with the courses *Knowledge Discovery* [2511302] and/or *Data Mining* [2520375].

Recommendations
Knowledge about database systems, e.g. from the lecture *Database Systems*

Learning Outcomes

Content

Media
Slides.

Literature

- Data Mining: Concepts and Techniques (3rd edition):
  Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann Publishers 2011

- Data Mining and Analysis, Fundamental Concepts and Algorithms: Mohammed J. Zaki, Wagner Meira JR., Campridge
  University Press 2014

- Introduction to Data Mining:
  Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Addison-Wesley 2006

- Knowledge Discovery in Databases:
  Martin Ester, Jörg Sander, Springer 2000

Course: Requirements Analysis and Requirements Management [2511218]

Coordinators: R. Kneuper
Part of the modules: Development of Business Information Systems (p. 104)[IW4INAIFB11]

ECTS Credits	Hours per week	Term	Instruction language
4	2/0	Winter term	de

Learning Control / Examinations
The assessment of this course is a written or (if necessary) oral examination according to §4(2) of the examination regulation.

Conditions
None.

Learning Outcomes
The students have a full understanding of the foundations of the analysis and management of requirements as part of the development process of software and systems. They know the main terminology and approaches of this topic, and are able to express requirements themselves using different description methods.

Content
The analysis and management of requirements is a central task in the development of software and systems, addressing the border between the application discipline and computer science. The adequate performance of this task has a decisive influence on the whether or not a development project will be successful. The lecture provides an introduction to this topic, using the syllabus for the "Certified Professional for Requirements Engineering" (CPRE) as a guideline.
Lecture structure:
1. Introduction and overview, motivation
2. Identifying requirements
3. Documenting requirements (in natural language or using a modelling language such as UML)
4. Verification and validation of requirements
5. Management of requirements
6. Tool support

Literature
Literature will be given in the lecture.

Course: Applied Differential Geometry [ADG]

Coordinators: H. Prautzsch
Part of the modules: Curves and Surfaces (p. 91)[IW4INKUF]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
Students are introduced into an active research area and will be acquainted with the important specifics

Content
Elements of differential geometry as curvature, isophothes, geodesics, curvature lines, offset curves and surfaces, minimal surfaces, optimal parametrizations, developable surfaces, unfoldings. These concepts are introduced for smooth surfaces and similar discrete concepts are discussed for triangular meshes.

Media
Blackboard and slides

Literature
Elective literature:
See http://i33www.ira.uka.de/pages/Lehre/Vorlesungen/AngewandteDifferentialgeometrie.html

Course: Applied Econometrics [2520020]

Coordinators: M. Schienle
Part of the modules: Mathematical and Empirical Finance (p. 63)[IW4STAT1], Econometrics and Statistics II (p. 67)[IW4STAT6], Econometrics and Statistics I (p. 66)[IW4STAT5], Statistical Methods in Risk Management (p. 64)[IW4STAT2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
The assessment of this course is a written examination (90 min) according to §4(2), 1 of the examination regulation.

Conditions
None.

Learning Outcomes

Content

- asymptotics in the linear model, maximum likelihood estimation, IV
- theoretical and computer based exercises

Literature
Wooldridge, Greene

Remarks
The credits for the course have been changed from 5 to 4,5 from winter term 2015/2016 on.

Course: Planning and Management of Industrial Plants [2581952]

Coordinators: F. Schultmann
Part of the modules: Industrial Production II (p. 40)[IW4BWLIIP2]

ECTS Credits	Hours per week	Term	Instruction language
5,5	2/2	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam (90 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.

Conditions
None.

Learning Outcomes

- Students shall be able to describe the tasks of plant management.

- Students shall be proficient in using selected methods of investment and cost estimates.

- Students shall be able to consider necessary processing and logistical requirements of designing industrial plants.

- Students shall be able to discuss interdependencies between capacity planning, process design and plant optimization.

- Students shall be proficient in discussing and applying selected methods of quality management, plant maintenance and plant dismantling.

Content
Industrial plant management incorporates a complex set of tasks along the entire life cycle of an industrial plant, starting with the initiation and erection up to operating and dismantling.
During this course students will get to know special characteristics of industrial plant management. Students will learn important methods to plan, realize and supervise the supply, start-up, maintenance, optimisation and shut-down of industrial plants. Alongside, students will have to handle the inherent question of choosing between technologies and evaluating each of them. This course pays special attention to the specific characteristics of plant engineering, commissioning and investment.

Media
Media will be provided on the e-learning platform.

Literature
will be announced in the course

Course: Anthropomatics: Humanoid Robotics [24644]

Coordinators: T. Asfour
Part of the modules: Autonomous Robotics (p. 98)[IN4INAR]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.

Conditions
None.

Learning Outcomes

- Students will be introduced to state-of-the art approaches in the field of human-centered, i.e. anthropomatic systems and in particular humanoid robots.

- Selected topics related to perception, action and cognition will be discussed to extend the theoretical and practical knowledge in the area of humanoid robotics.

Content
In this lecture, current research activities in the area of humanoid robotics are presented that deal with the implementation of complex sensorimotor capabilities in humanoid robots. The following methods and algorithms, including their advantages and disadvantages, as well as the state of the art will be discussed:

- Building humanoid robots
  - Biomechanical models of the human body
  - Mechatronics of humanoid robots

- Active Perception
  - Active vision and active touch
  - Visuo-haptic exploration

- Grasping
  - Grasping in humans
  - Grasp planning for single and dual-hand tasks

- Imitation-learning: Observation, representation and reproduction
  - Acquisition and analysis of human motion
  - Action representations: DMPs, HMMs, Splines
  - Mapping and motion reproduction

- Two-legged locomotion
  - Walking and body balancing in humans
  - Active body balancing in humanoid robots

- From Signals to Symbols
  - From features to objects and from motions to actions
  - Object-Action Complexes: Semantic sensorimotor categories

Media
Slides

Literature
Elective literature:
scientific papers on the subject, will be made available on the lecture homepage.

Course: Applying Formal Verification [2400093]

Coordinators: B. Beckert
Part of the modules: Software Systems (p. 75)[IW4INSWS]

ECTS Credits	Hours per week	Term	Instruction language
5	3	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Employment Law I [24167]

Coordinators: A. Hoff
Part of the modules: Private Business Law (p. 115)[IW4JURA5]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam following §4, Abs. 2, 1 of the SPO.

Conditions
None.

Learning Outcomes
It is the aim of this lecture to provide a solid insight into individual-related labour law. The students will understand the importance of labour law as an integral part of social market economy. They will be able to review contractual provisions in employment contracts and to evaluate labour law conflicts.

Content
Students will be introduced to all labour law regulations concerning the beginning, enforcement and termination of an employment. The lecture provides an introduction into procedural matters. A labour court's trial will be attended.

Literature
tba at the beginning of the course.

Course: Employment Law II [24668]

Coordinators: A. Hoff
Part of the modules: Private Business Law (p. 115)[IW4JURA5]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam following §4, Abs. 2, 1 of the SPO.

Conditions
None.

Learning Outcomes
Based on the knowledge gained in the lecture on Labour Law I, the students are to gain a deeper insight into labour law.

Content
Students will gain insight into the statutory rights of employees and tariff law. They learn about the importance of employers associations and unions for the economy and gain adequate knowledge of laws concerning industrial action, supply of temporary workers and social security law.

Literature
Tba at the beginning of the course.

Course: Asset Pricing [2530555]

Coordinators: M. Uhrig-Homburg, M. Ruckes
Part of the modules: Finance 1 (p. 34)[IW4BWLFBV1], Economic Theory and its Application in Finance (p. 55)[IW4VWL14], Finance 2 (p. 35)[IW4BWLFBV2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations

Conditions
None.

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

Learning Outcomes
Students are familiar with advanced concepts in asset pricing (in particular the stochastic discount factor model). They are able to apply their acquired skills to solve empirical questions related to securities.

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.

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.

Course: Asymmetric Encryption Schemes [24115]

Coordinators: J. Müller-Quade
Part of the modules: Advanced Topics in Cryptography (p. 69)[IW4INFKRYP]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
none

Recommendations
Basic knowledge of algebra is helpful.

Learning Outcomes
The student
• knows, understands and applies the most popular public-key schemes,
• has an overview of the theoretical and practical aspects of public-key cryptography,
• evaluates cryptographic protocols and identifies vulnerabilities/threats,
• combines basic building blocks to small protocols.

Content
This course will show the students the theoretical and practical aspects of Public Key Cryptography.
• The most important primitives of cryptography will be covered, as there are: one-way function, hash function, digital signature, public key encryption and digital signatures (RSA, ElGamal), and various methods of key exchange (e.g. Diffie-Hellman) with their strengths and weaknesses.
• In addition to public-key systems, the lecture provides knowledge about number-theoretic algorithms for solving problems such as primality testing, factoring large numbers and computing discrete logarithms in finite groups. Thus the choice of parameters and the related level of security of a cryptographic system can be estimated.
• Furthermore, an introduction to provable security is provided, which presents some of the key security concepts (e.g. IND-CCA).
• The combination of cryptographic modules will be treated on for currently used protocols such as Secure Shell (SSH), Transport Layer Security (TLS) and anonymous digital money.

Course: Auction Theory [2520408]

Coordinators: K. Ehrhart
Part of the modules: Applied Strategic Decisions (p. 53)[IW4VWL2], Microeconomic Theory (p. 56)[IW4VWL15], Market Engineering (p. 29)[IW4BWLISM3]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter term	de

Learning Control / Examinations
The assessment of this course is a written examination (following §4(2), 1 SPO) of 60 mins.
The exam is offered each semester.

Conditions
None.

Recommendations
We suggest to attend either Game Theory I or Decision Theory beforehand.

Learning Outcomes
The student

- learns the game-theoretic modeling and analysis of auctions,
- learns about various auction formats and their specific characteristics,
- understands the challenge for participating in auctions as bidder,
- understands the challenge of designing auctions as auctioneer,
- gains insight into practice by case studies,
- participates in and analyzes demonstration experiments.

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.

Media
Script, overhead slides, additional printed material.

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

Course: Selected topics in Cryptography [24623]

Coordinators: J. Müller-Quade
Part of the modules: Advanced Topics in Cryptography (p. 69)[IW4INFKRYP]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
The student

- knows applications of cryptographic techniques that exceed encryption,
- knows and understands cryptographic building blocks for larger security applications,
- understands the difficulty in the composition (e.g. in a modular design) of security applications,
- understands and applies the new techniques which enable a modular design.

Content

- Basic security protocols such as fair coin toss over the phone, Byzantine Agreement, Dutch Flower Auctions, Zero Knowledge
- Threat models and security definitions
- Modular design and protocol composition
- Security definitions of simulatability
- Universal Composability
- Deniability as an additional safety feature
- Electronic Voting

Course: Automatic Software Parallelization [APS]

Coordinators: F. Padberg
Part of the modules: Software Methods (p. 76)[IW4INSWM], Parallel Processing (p. 96)[IW4INPV], Software Systems
                           (p. 75)[IW4INSWS]

ECTS Credits	Hours per week	Term	Instruction language
4	2/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Automated Visual Inspection and Image Processing [24169]

Coordinators: J. Beyerer
Part of the modules: Automated visual inspection (p. 107)[IW4INAS], Machine Vision (p. 108)[IW4INMVW], Image-based
                          detection and classification (p. 110)[IW4INBDK]

ECTS Credits	Hours per week	Term	Instruction language
6	4	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Basic knowledge of optics and signal processing are helpful.

Learning Outcomes

- Students have a sound knowledge regarding the basic concepts and methods of image processing (pre-processing and image enhancement, image restoration, image segmentation, morphological filtering, texture analysis, detection, image pyramids, multi-scale analysis and the wavelet transform)

- Students are in the position to work out and to evaluate solution concepts for problems of automated visual inspection

- Students have a sound knowledge of the different sensors and methods for the acquisition of image data as well as of the relevant optical principles

- Students know different concepts to describe image data and they know the essential system theoretical concepts and interrelations

Content

- sensors and concepts for image acquisition

- light and colour

- image signals (system theory, Fourier transformation, stochastic processes)

- excursion to wave optics

- pre-processing and image enhancement

- image restoration

- segmentation

- morphological image processing

- texture analysis

- detection

- image pyramids, multi scale analysis and wavelet-transform

Media
Slides (pdf).

Literature
Elective literature:
- R. C. Gonzalez und R. E. Woods, Digital Image Processing, Prentice-Hall, Englewood Cliffs, New Jersey, 2002
- B. Jähne, Digitale Bildverarbeitung, Springer, Berlin, 2002

Course: Basics of Liberalised Energy Markets [2581998]

Coordinators: W. Fichtner
Part of the modules: Energy Economics and Energy Markets (p. 42)[IW4BWLIIP4]

ECTS Credits	Hours per week	Term	Instruction language
3	2/1	Winter term	en

Learning Control / Examinations
The assessment consists of a written exam according to Section 4(2), 1 of the examination regulation.

Conditions
None.

Learning Outcomes
The student has detailed knowledge concerning the new challenges of liberalised energy markets. He has the ability to:

- Understand the new economic reality of liberalised energy markets

- Obtain a deeper understanding of the different submarkets of the power market

- Identify problems of the liberalised energy markets

Content
1. The European liberalisation process
1.1 The concept of a competitive market
1.2 The regulated market
1.3 Deregulation in Europe
2. Pricing and investments in a liberalised power market
2.1 Merit order
2.2 Prices and investments
2.3 Market flaws and market failure
2.4 Regulation in liberalised markets
2.5 Additional regulation mechanisms
3. The power market and the corresponding submarkets
3.1 List of submarkets
3.2 Types of submarkets
3.3 Market rules
4. Risk management
4.1 Uncertainties in a liberalised market
4.2 Investment decisions under uncertainty
4.3 Estimating future electricity prices
4.4 Portfolio management
5. Market power
5.1 Defining market power
5.2 Indicators of market power
5.3 Reducing market power
6. Market structures in the value chain of the power sector

Media
Media will likely be provided on the e-learning platform ILIAS.

Literature
Elective literature:
Power System Economics; Steven Stoft, IEEE Press/Wiley-Interscience Press, 0-471-15040-1

Remarks
The course "Basics of Liberalised Energy Markets" [2581998] will be reduced to 3 credits in winter term 2015/2016 and the tutorial [2581999] is no longer offered.

Course: Provable Security in Cryptography [24166]

Coordinators: D. Hofheinz
Part of the modules: Advanced Topics in Cryptography (p. 69)[IW4INFKRYP]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None

Recommendations
Course *Security*

Learning Outcomes
The student

- knows the foundations of the security analysis of cryptographic systems that offer provable security guarantees
- understands and explains cryptographically desirable and provable security guarantees of cryptographic systems,
- understands and explains examples of provably secure cryptographic systems

Content
When is an encryption scheme secure? What type of security is guaranteed by a digital signature scheme? How can secure cryptographic systems be constructed? These and more questions are the topic of this lecture. We put particular emphasis on concrete examples: we will present several cryptographic schemes (such as encryption schemes) and analyze their security properties. In this, the notion of a security proof will play a central role. We endeavour to find mathematical proofs that a given system achieves certain desirable properties under well-defined complexity-theoretic assumptions.

Media
Blackboard presentation

Literature

- Lecture notes (available online)
- Jonathan Katz / Yehuda Lindell : Introduction to Modern Cryptography, Chapmann & Hall 2007.

Course: Image Data Compression [2400112]

Coordinators: A. Pak, J. Beyerer
Part of the modules: Automated visual inspection (p. 107)[IW4INAS], Image-based detection and classification (p. 110)[IW4INBDK], Machine Vision (p. 108)[IW4INMVW]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	

Learning Control / Examinations

Conditions
None.

Learning Outcomes
The students will learn various kinds, sources, and uses of image-type data, and the forms of their compression. Students master the basic concepts of information theory, related to data communication and coding. Based on these concepts and general principles and characterization criteria, students are able to compare various schemes of image data representation and coding. Students have in-depth knowledge of a few selected algorithms of entropy coding, pre-coding, and 1D-signal de-correlation.

Students know 2D transform-based de-correlation methods, including Discrete Fourier Transform, Discrete Cosine Transform, Walsh-Hadamard Transform, and the Discrete Wavelet Transform and know how to use them in video coding by exploitation of temporal correlations.

Students understand the human visual system and the statistics of natural images. In addition, the students know two non-standard applications of image data coding: digital watermarking and steganography. As an exercise, students analyze several simple steganographic schemes.

Content
This module conveys to the students the theoretical and practical aspects of the principal stages in image data acquisition and compression. The discussion progresses from the coding of un-correlated sequential data streams to de-correlation of natural 2D images and to exploitation of temporal correlations in video data coding. Each considered technique is provided with a statistical justification and characterised with basic information-theoretic metrics.

In the end of the class, an outlook is given to non-conventional image-based information coding schemes (watermarking and steganography).

Course: Biologically Inspired Robot [24619]

Coordinators: R. Dillmann, Arne Rönnau
Part of the modules: Autonomous Robotics (p. 98)[IN4INAR]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Previous attendance of the lecture „Robotics I" is recommended.

Learning Outcomes
Students apply the 'bionic' design principle and are therefore able to develop bio-inspired robots. They are able to analyse, develop and transfer the kinematics, mechanics, control systems as well as perception and cognition models to new applications. Students know and understand the light-weight design concepts and material characteristics derived from nature. They have knowledge of the principles and methods to develop light-.weight robot components and are aware of the effects on the energy efficiency.
Students are able to distinguish the different human types of muscles and their function. They know the corresponding artificial muscles and are able to deduct the theoretical muscle model. This enables them to develop antagonistic control system for the application of artificial muscles.
Students are able to select technical sensors for robotic applications that correspond to the main human senses. They have knowledge of the stimulus and information coding and processing within the human nervous system.
Students can distinguish a function and structure of a central pattern generator (CPG) and a reflex. They are able to deduce the concept and model of a neuro oscillator and can apply them to create the walking motion of a mulit-legged walking robot. Besides, they are able to create a bio-inspired walking pattern by making use of the 'Cruse rules'.
Students are able to select the correct walking stability measure that corresponds to a desired locomotion type. They have knowledge about the most relevant walking patterns for multi-legged walking robots and are able to design a control system for mobile walking robots.
Students are able to apply machine learning methods like reinforcement learning to parameterize complex control systems. They are aware of relevant algorithms for online learning and are able to transfer and make use of them in the field of robotics.
Students understand the behaviour-based subsumption architecture and are able to characterize the advantages of a reactive control approach. They are able to create new behaviours and combine these into a complex control system.
Students are able to apply Mendels laws and can explain the differences between Meitose and Mitose. They are able to design simple genetic algorithms and apply these to planning and perception tasks.
Students are able to identify the biggest challenges in designing humanoid robots and have knowledge of concepts to solve these challenges as well as concrete humanoid robots, that have addressed these issues.

Content
This lecture focuses on robots whose mechanical construction, sensor concepts or control methods are inspired by Nature. In detail, the lecture presents different bio-inspired design schemes and concepts (e.g. light-weight design based on special structures, artificial muscles) as well as the corresponding robotic technologies, which make use of the discussed principles (e.g. 3D printed parts and artificial muscles).
The current state of the art in the field of bio-inspired robots, e.g. walking robots, snake-like and humanoid robots are presented and discussed. The main focus of the lecture is to present concepts for the control and system architecture of such robots (e.g. behaviour-based control), where the locomotion is shown in greater detail. The lecture closes with an outlook on future developments and the applications of these robots.

Media
Slides as PDF available

Literature
Recent, relevant papers and publications as well as additional literature

Remarks
To sign up please send an e-mail to: sekretariat.dillmann@ira.uka.de
It is recommended to schedule an appointment well in advance.

Course: Biomedric Systems for Person Identification [2403011]

Coordinators: M. Saquib Sarfraz
Part of the modules: Machine Vision (p. 108)[IW4INMVW]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	en

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Biosignals and User Interfaces [24105]

Coordinators: T. Schultz, C. Herff, D. Heger
Part of the modules: Biosignal Processing (p. 89)[IW4INBSV]

ECTS Credits	Hours per week	Term	Instruction language
6	4	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
The students are introduced to the basics of biosignal processing, including the emergence of biosignals, recording mechanisms, and interpretation methodology, and get to know their potential in applications related to human-machine interfaces. They learn to analyze and describe the challenges and chances when using biosignals for user interfaces.

In order to achieve this, students are acquainted with the basic methods of biosignal acquisition, signal processing, and machine learning and classification. The current state-of-the-art in research and development is illustrated with many application examples. After having participated in this lecture, the students shall be able to transfer their knowledge to new requirements in modern biosignal processing.

The practical courses in biosignal processing (24905 and 24289) offer an opportunity to transfer the knowledge obtained in the lectures to a practical scenario.

Content
This module introduces into technologies which use different human biosignals for acquiring information and thereby revolutionize the design of user interfaces. The main focus is the interaction of humans and machines.

We first give an overview of the range of human biosignals, concentrating on those signals which may be recorded non-invasively, like the brain activity (electroencephalogram – EEG), which may be recorded from the head surface, the muscular activity (electromyogram – EMG), which may be recorded from the skin, eye activity (electrooculogram – EOG), and further signals like skin conductance, pulse and breathing frequency.

Subsequently we cover the basics of measuring, processing, and classifying and interpreting these signals. We illustrate these topics with multiple examples of how these methods are used both in literature as well as in our own research.

Further information is available at http://csl.anthropomatik.kit.edu.

Media
slides (online at http://csl.anthropomatik.kit.edu)

Literature
Elective literature:
Will be announced in the lecture.

Remarks
Language of the lecture: German (English by request)

Course: Exchanges [2530296]

Coordinators: J. Franke
Part of the modules: Finance 2 (p. 35)[IW4BWLFBV2]

ECTS Credits	Hours per week	Term	Instruction language
1,5	1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
Students are in a position to discuss and evaluate current developments regarding the organisation of exchanges and securities trading.

Content

- Organisation of exchanges: Changing Zeitgeist - Corporates instead of cooparative structures
- Market models: order driven vs. market maker - Liquidity provision for less frequently traded securities
- Trading systems: The end of an era? - No more need for running traders?
- Clearing: Diversity instead of uniformity - Safety for all?
- Settlement: Increasing importance - Does efficient settlement assure the "value added" of exchanges in the long run?

Literature
Elective literature:
Educational material will be offered within the lecture.

Course: Brain-Computer Interfaces [BCI]

Coordinators: T. Schultz, C. Herff, D. Heger
Part of the modules: Biosignal Processing (p. 89)[IW4INBSV]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Business and IT Service Management [2595484]

Coordinators: G. Satzger
Part of the modules: Service Management (p. 31)[IW4BWLISM6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	en

Learning Control / Examinations
The assessment of this course is a written examination (60 min.) (following §4(2), 1 SPO) and by submitting written papers as part of the exercise (following §4(2), 3 SPO).

Conditions
None.

Learning Outcomes
Students understand the importance of "servitization" for organizations, the challenges for the management of service-oriented enterprises and the interdependence of business and IT services.
Students learn standard concepts and methods of service-oriented management and are able to apply them in practical case studies.
Student get familiar with current research and tools and are able to critically evaluate them.
Students practice to communicate in English and to work on solutions in teams.

Content
The rapid development of information and communication technology transforms many enterprises towards service-oriented structures: with new digital services, new business models and process structures within larger service networks. Thus, strategic and operative management of service-oriented enterprises increasingly gains importance. In this course, we want to systematically acquire relevant know-how and apply this to real word examples. Particular focus will be on the interdependence of business, IT and legal aspects.
The course will be taught in English. It should provide ample opportunity for active participation of students. The course will integrate presentations of experts from business practice as well as a comprehensive case study ("en bloc" for 1 day) in which students will actively work on the strategic service-oriented shift of an enterprise.

Media
Presentation (pdf)

Literature
Fitzsimmons J./Fitzsimmons, M., Service Management, Operations, Strategy and Information Technology, 6. ed., 2007
Maister, David H., Managing The Professional Service Firm, 1997
Teboul, J. , Service is Front Stage: Positioning services for value advantage, 2006
Grönroos, Service Management and Marketing, 2007

Remarks
The credits have been changed from 5 to 4,5.

Course: Business Dynamics [2540531]

Coordinators: A. Geyer-Schulz, P. Glenn
Part of the modules: Advanced CRM (p. 25)[IW4BWLISM1], Electronic Markets (p. 27)[IW4BWLISM2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations
Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation.
The course is considered successfully taken, if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 10) from excersise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	95
1.3	90
1.7	85
2.0	80
2.3	75
2.7	70
3.0	65
3.3	60
3.7	55
4.0	50
5.0	0

Conditions
None.

Learning Outcomes
Students

- aquire the system thinking worldview for economics
- utilize different methods and tools to map the structure of complex economic systems
- are able to relate dynamic effects to these structures
- learn how to simulate systems within the computer for testing purposes
- use simulation results to improve models
- can independently as well as in teams model, analyze, and optimize business processes and applications
- know how to offer business dynamics as a consulting service and work together with client teams

Content
Corporate growth, the diffusion of new technologies, business processes, project management, product development, service quality management — all these are examples for application areas of business dynamics. They all are dynamic systems that are characterized by feedback loops between many different variables. By means of the tools of business dynamics such systems can be modelled. Simulations of complex systems allow the analysis, the goal centered design, as well as the optimization of markets, business processes, policies, and organizations.

Media

- Slides
- System Dynamics Software Vensim PLE: http://www.vensim.com/venple.html

Literature
John D. Sterman. Business Dynamics: Systems Thinking and Modeling for a Complex World. McGraw-Hill, 2000.

Course: Business Plan Workshop [2572184]

Coordinators: M. Klarmann, O. Terzidis
Part of the modules: Marketing   Management   (p.   46)[IW4BWLMAR5],   Entrepreneurship   (EnTechnon)
                          (p. 44)[IW4BWLENT1]

ECTS Credits	Hours per week	Term	Instruction language
3	1	Summer term	de

Learning Control / Examinations
See German version.

Conditions
None.

Learning Outcomes
See German version.

Content
In this workshop the students work in groups to develop a business plan for an innovative business concept.

Remarks
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).
Please note: This course will not be offered in summer term 2015.

Course: Business Administration in Information Engineering and Management [2540500]

Coordinators: A. Geyer-Schulz
Part of the modules: Electronic   Markets   (p.   27)[IW4BWLISM2],   Information   Engineering   and   Management
(p. 19)[IW4WWIW]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	de

Learning Control / Examinations
Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation.
The course is considered successfully taken, if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 10) from excersise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	95
1.3	90
1.7	85
2.0	80
2.3	75
2.7	70
3.0	65
3.3	60
3.7	55
4.0	50
5.0	0

Conditions
None.

Recommendations
Basic knowledge from Operations Research (linear programming) and from decision theory are expected.

Learning Outcomes
The student

- transfers models from Business Administration to situations in business whose basic conditions are changed due to the implementation of information and communication technology,

- applies methods from Business Administration (Decision theory, game theory, operations research, etc.) to questions of Information Engineering and Management,

- analyzes the potential to automize the decision making process in businesses by data bases,

- describes the process to extract relevant data for decision making from operational accounting systems.

Content
In this lecture, classical Business Administration is applied to businesses in an information- and communicationtechnological environment. The process to extract relevant data for decision making from operational accounting systems receives special attention. In order to do so, topics such as activity-based costing and transaction costs models are addressed. The automization of the decision making process in businesses by data bases is another focus of the module. To solve such issues within a company, relevant methods such as decision theory and game theory are lectured. Finally, complex business relevant questions in a dynamically changing environment are adressed by presenting models and methods from system dynamics.

Media
Slides, Audio.

Literature

- G. Bamberg und A. G. Coenenberg (2006). Betriebswirtschaftliche Entscheidungslehre. (13. edition), chapter 1 – 8, pages 1 – 270.

- Russell, S. and Norvig, P. (1995). Artificial Intelligence: A Modern Approach The Intelligent Agent Book. Prentice-Hall, Upper Saddle River. chapter 2, pages 31 – 37.

- Porter, M. E. (1998a). Competitive Advantage: Creating and Sustaining Superior Performance. The Free Press, New York, 2 edition. chapter 1, pages 1 – 30

- Porter, M. E. (1998b). Competitive Strategy: Techniques for Analyzing Industries and Competitors. The Free Press, New York, 2 edition. chapters 1+2, pages 1 − 46

- Horngren, C. T., Datar, S. M., and Foster, G. (2003). Cost Accounting: A Managerial Emphasis. Prentice-Hall, Upper Saddle River, 11 edition. chapter 13, pages 446 − 460

- Cooper,W.W., Seiford, L. M., and Tone, K. (2000). Data Envelopment Analysis. Kluwer Academic Publishers, Boston. chapter 2, pages 21− 25

- Copeland, T. and Weston, F. (1988). Financial Theory and Corporate Policy. Addison-Wesley, Reading, 3 edition. pages 18 − 41 and chapter 4.E, pages 92 − 95].

- Myerson, R. B. (1997). Game Theory. Harvard University Press, London, 3 edition. pages 99–105.

- Milgrom, P. and Roberts, J. (1992). Economics, Organization and Management. Prentice Hill [Chapter 2, pp. 25-39].

Course: Case Studies in Pricing [2572182]

Coordinators: M. Klarmann, Mitarbeiter
Part of the modules: Sales Management (p. 48)[IW4BWLMAR6], Services Marketing (p. 51)[IW4BWLMAR9]

ECTS Credits	Hours per week	Term	Instruction language
1,5	1	Winter term	de

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes
See German version.

Content
The students work in groups applying theories to solve case studies for price management.

Remarks
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

Course: Challenges in Supply Chain Management [2550494]

Coordinators: R. Blackburn
Part of the modules: Operations Research in Supply Chain Management and Health Care Management (p. 59)[IW4OR4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3	Summer term	en

Learning Control / Examinations
The assessment consists of a written paper and an oral exam (according to §4(2), 3 of the examination regulation).

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

Recommendations
Advanced knowledge of Operations Research (e.g., as conveyed in the lectures Facility Location and Strategic SCM, Tactical and operational SCM) is recommended.

Learning Outcomes
The student
- analyzes and evaluates current developments and approaches in the design and planning of supply chain strategis, especially with respect to future challenges in this area,
- explains and utilizes theoretical concepts and methods for the design and strategy of supply chains,
- classifies and accounts for trend-setting theories in the SCM context such as Behavioral Supply Chain Management or Supply Chain Analytics.

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.

Literature
To be defined depending on the topic.

Remarks
Please notice that this course can be attended only in the elective part of the course program.
The number of participants is restricted due to the execution of joint projects with BASF teams and the resulting examination effort. 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.

Course: Computer Vision for Human-Computer Interaction [24180]

Coordinators: R. Stiefelhagen
Part of the modules: Machine Vision (p. 108)[IW4INMVW]

ECTS Credits	Hours per week	Term	Instruction language
6	4	Winter term	de

Learning Control / Examinations
The assessment consists of an oral exam (approx. 30 minutes[R1]) according to sec. 4 subsec. 2 no. 2 study and examination regulations.

Conditions
None.

Learning Outcomes
The student acquires a basic understanding of computer vision topics within the context of human-computer interaction and learns how to apply them.

Content
With methods from Computer Vision it is possible to detect and recognize persons, their identities, actions, gaze and facial expression, among other things in images and image sequences. Such an automated perception of people has a number of applications including human-computer interaction, interactive robots, driver assistance, monitoring of people to improve safety and security and image retrieval.
In this lecture basic and state of the art computer vision methods and algorithms for the visual perception of persons will be presented and discussed. The lecture includes the following topics:

- Applications for vision-based perception of people
- Face detection and recognition
- Facial expression recognition
- Assessment of head orientation and viewing direction
- Holistic and part-based body models for person detection
- Tracking in image sequences
- Articulated body tracking
- Recognition of movements and actions
- Gesture recognition

The lecture comprises two programming projects, in which selected problems, such as for example detecting faces or persons in specific images, will be addressed by the students in teams.

Media
Slides

Literature
Elective literature:
Corresponding scientific publications will be published on the lecture website.

Course: Corporate Financial Policy [2530214]

Coordinators: M. Ruckes
Part of the modules: Applied Strategic Decisions (p. 53)[IW4VWL2], Economic Theory and its Application in Finance (p. 55)[IW4VWL14], Finance 2 (p. 35)[IW4BWLFBV2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	en

Learning Control / Examinations

Conditions
None.

Learning Outcomes
Students

- are in a position to explain the importance of informational frictions for the financing of firms,
- are able to evaluate financing contracts with respect to their incentive effects,
- are able to analyse financing contracts with respect to their information they provide to outsiders,
- are in a position to derive optimal financing contracts in prototypical situations,
- are able to discuss the financial determinants of corporate distribution policy.

Content
The course is concerned with the theory of corporate financing:

- Financing contracts
- Financing capacity
- Issuance of securities
- Capital structure
- Payout policy

Literature
Elective literature:
Tirole, J. (2006): The Theory of Corporate Finance. Princeton University Press.

Course: Current Issues in the Insurance Industry [2530350]

Coordinators: W. Heilmann
Part of the modules: Insurance Management II (p. 37)[IW4BWLFBV7], Insurance Management I (p. 36)[IW4BWLFBV6]

ECTS Credits	Hours per week	Term	Instruction language
2	2/0	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (according to Section 4 (2), 1 of the examination regulation) .
The exam takes place every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Recommendations
For the understanding of this course knowledge of *Private and Social Insurance* [2530050] is required.

Learning Outcomes
Knowledge and understanding of important current characteristics of insurance, e.g. insurance markets, lines, products, investment, company pension schemes, corporate structures and governance as well as controlling.

Content
Current topics in insurance markets.

Literature
Elective literature:
Farny, D. Versicherungsbetriebslehre. Verlag Versicherungswirtschaft; Auflage: 5. 2011
Koch, P. Versicherungswirtschaft - Ein einführender Überblick. Verlag Versicherungswirtschaft. 2005
Tonndorf, F., Horn, G., and Bohner, N. Lebensversicherung von A-Z. Verlag Versicherungswirtschaft. 1999
Fürstenwerth, J., andWeiß, A. Versicherungsalphabet (VA). Verlag Versicherungswirtschaft. 2001
Buttler, A. Einführung in die betriebliche Altersversorgung. Verlag Versicherungswirtschaft. 2008
Liebwein, P. Klassische und moderne Formen der Rückversicherung. Verlag Versicherungswirtschaft. 2009
Gesamtverband der Deutschen Versicherungswirtschaft. *Jahrbuch 2011 Die deutsche Versicherungswirtschaft.*
http://www.gdv.de/wp-content/uploads/2011/11/GDV_Jahrbuch_2011.pdf. 2011
Deutsch, E. Das neue Versicherungsvertragsrecht. Verlag Versicherungswirtschaft. 2008
Schwebler, Knauth, Simmert. Kapitalanlagepolitik im Versicherungsbinnenmarkt. 1994
Seng. Betriebliche Altersversorgung. 1995
von Treuberg, Angermayer. Jahresabschluss von Versicherungsunternehmen. 1995

Remarks
Block course. For organizational reasons, please register with the secretay of the chair: thomas.mueller3@kit.edu.
The credits have been changed from 2,5 to 2.

Course: Customer Relationship Management [2540508]

Coordinators: A. Geyer-Schulz
Part of the modules: Advanced CRM (p. 25)[IW4BWLISM1]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	en

Learning Control / Examinations

Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation.

The course is considered successfully taken, if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 10) from excersise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	95
1.3	90
1.7	85
2.0	80
2.3	75
2.7	70
3.0	65
3.3	60
3.7	55
4.0	50
5.0	0

Conditions

None.

Learning Outcomes

The students

- understand service management as an economic basis for Customer Relationship Management and learn the resulting consequences for the management, the organisation itself and their departments,

- design and develop service concepts and service systems at a conceptual level,

- work on case studies in the CRM-area in small groups with limit time,

- learn English as the technical language in the area of CRM and consult internationale literature from this field for the case studies.

Content

The course begins with an introduction into Service Management as the strategic concept which also covers all CRM applications. The course is divided in the basics of Service Management as well as different topics within this concept like external and internal marketing, quality management and organizational requirements.

Media

Slides, Audio, Reader

Literature

Christian Grönroos. Service Management and Marketing : A Customer Relationship Management Approach. Wiley, Chichester, 2nd edition, 2000.

Elective literature:

Jill Dyché. The CRM Handbook: A Business Guide to Customer Relationship Management. Addison-Wesley, Boston, 2nd edition, 2002.

Ronald S. Swift. Accelerating Customer Relationships: Using CRM and RelationshipTechnologies. Prentice Hall, Upper Saddle River, 2001.

Stanley A. Brown. Customer Relationship Management: A Strategic Imperative in theWorld of E-Business. John Wiley, Toronto, 2000.

Course: Data and Storage Management [24074]

Coordinators: B. Neumair
Part of the modules: Dynamic IT-Infrastructures (p. 88)[IW4INDITI]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes

Content

Course: Data Mining and Applications [2520375]

Coordinators: G. Nakhaeizadeh
Part of the modules: Statistical Methods in Risk Management (p. 64)[IW4STAT2], Econometrics and Statistics II
                        (p. 67)[IW4STAT6], Econometrics and Statistics I (p. 66)[IW4STAT5]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2	Summer term	de

Learning Control / Examinations

- Oral examination 70%
- Conduction of a small empirical study 30%

Conditions
None.

Learning Outcomes
After completing of the course the students:

- know the definition of Data Mining
- are familiar with the CRISP-DM
- are Familiar with at least six important Data Mining Tasks
- can recognize whether a given problem can be formulated as a data mining problem
- are familiar with the most important Data Mining Algorithms like Decision Tree, K-Means, Artificial Neural Networks, Association Rules, Regression Analysis
- are familiar with evaluation of DM-algorithms
- will be able to use a DM-Tool

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

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.

Remarks

The credits for the course have been changed from 5 to 4,5 from summer term 2015 on.

Course: Data Mining Paradigms and Methods for Complex Databases [24647]

Coordinators: K. Böhm, E. Müller
Part of the modules: Theory and Practice of Database Technology (p. 87)[IW4INDBTP], Innovative Concepts of Data and Information Management (p. 84)[IW4INIKDI], Theory and Practice of Data Warehousing and Mining (p. 86)[IW4INDWMTP], Theory and Practice of Big Data Analytics (p. 112)[IW4INADTP], (p. 113)[IN4INDPMD]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	de

Learning Control / Examinations
It will be announced at least 6 weeks in advance if the assessment consists of a written exam (approx. 60 minutes) according to sec. 4 subsec. 2 no. 1 study and examination regulations or of an oral exam (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.

Conditions
None.

Recommendations
Knowledge about database systems, e.g. from the lecture Database Systems.
Basics in data mining, e.g. from the lecture Data Warehousing and Mining

Learning Outcomes
At the end of the lecture, the participants should be aware of – and able to explain – the necessity of advanced data mining concepts. They should be able to assess and compare different approaches of data analysis on large and complex databases with respect to efficiency and applicability. The participants should have gained insights into the current research issues in the area of data mining and should understand which problems are currently unsolved.

Content
The lecture provides insights into advanced data mining methods that form the basis for an ermerging research area. Traditional data mining methods have been considered for several years in the literature and are covered by basic data mining lectures. However, due to the large and complex databases used in today's applications, some of these traditional methods are applicable only on relatively small and simple problem instances. Recently, research has addressed this challenge by proposing novel data mining paradigms for large and high dimensional databases. They aim at scalability with respect to size and dimensionality of databases in todays and future applications.
The lecture will derive novel challenges for data mining out of recent application scenarios. The focus will be on advanced data mining paradigms for knowledge discovery in high dimensional data. We will highlight the characteristic properties of different paradigms and discuss algorithmic solutions in each of these paradigms. Furthermore, novel evaluation techniques will be presented that enable evaluation of these data mining methods in real world applications.
Overview of the content:

- Motivation of novel challenges based on today's application demands.

- Overview of traditional data mining techniques and their drawbacks.

- Abstract challenges due to high dimensional databases.

- Novel data mining paradigms: Subspace Clustering and Projected Clustering aiming at cluster detection in projections of high dimensional data.

- Novel solutions aiming at elimination of redundancy in data mining results. Quality improvement by optimization techniques.

- Knowledge extraction by alternative views on the data. Search for alternatives compared to given results. Analysis of orthogonal subspace projections.

- Outlier mining techniques in high dimensional databases. Challenges and recent solutions in research and industrial projects.

- Overview on our future work in this research area.

Media
Slides

Course: Deployment of Database Systems [2400020]

Coordinators: K. Böhm
Part of the modules: Theory and Practice of Big Data Analytics (p. 112)[IW4INADTP], Theory and Practice of
                          Data Warehousing and Mining (p. 86)[IW4INDWMTP], Entrepreneurship for Computer Scientists
                          (p. 111)[IW4INUKI], Theory and Practice of Database Technology (p. 87)[IW4INDBTP], Innovative
                          Concepts of Data and Information Management (p. 84)[IW4INIKDI]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter term	de

Learning Control / Examinations
It will be announced at least 6 weeks in advance if the assessment consists of an 1h written exam according to section 4
subsection 2 no. 1 study and examination regulations or of a 20 minute oral exam according to section 4 subsection 2 no. 2
study and examination regulations.

Conditions
None.

Recommendations
Knowledge about database systems, e.g., from the lecture *Database Systems* [24516] and *Introduction in Computer Networks*
[24519].

Learning Outcomes
At the end of the course, the participants should be able to explain and compare database concepts (especially data models
and query languages) - in more breadth, compared to database courses at the undergraduate level. They should know and be
able to assess the different possibilities to store complex user data using database technology.

Content
This course introduces students to the deployment of modern database technology, in both breadth and depth. 'Breadth'
is reached by the detailed study and comparison of different philosophies and data models, together with respective query
languages. For instance, we address both so-called NoSQL database concepts as well as semistructured databases (i.e.,
XML databases, with XQuery as one query language) and graph databases. 'Depth' is reached by the study of several non-
trivial applications, such as management of XML or e-commerce data using relational database technology. Since all these
applications are generic problems themselves, the study of such applications is interesting in itself already.

Media
Slides.

Literature

-
- Andreas Heuer, Gunther Saake: Datenbanken - Konzepte und Sprachen. 2. Aufl., mitp-Verlag, Bonn, Januar 2000.
- Alfons Kemper, Andre Eickler: Datenbanksysteme. 6. Aufl., Oldenbourg Verlag, 2006.

Elective literature:

-
- Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: Database Systems: The Complete Book. Prentice Hall, 2002
- Ramez Elmasri, Shamkant B. Navathe: Fundamentals of Database Systems.

Course: Database Implementation and Tuning [db_impl]

Coordinators: K. Böhm
Part of the modules: Theory and Practice of Big Data Analytics (p. 112)[IW4INADTP], Theory and Practice of
                        Data Warehousing and Mining (p. 86)[IW4INDWMTP], Entrepreneurship for Computer Scientists
                        (p. 111)[IW4INUKI], Theory and Practice of Database Technology (p. 87)[IW4INDBTP], Innovative
                        Concepts of Data and Information Management (p. 84)[IW4INIKDI]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	de

Learning Control / Examinations
It will be announced in advance if the assessment consists of an 1h written exam according to section 4 subsection 2 no. 1
study and examination regulations or of a 20 minute oral exam according to section 4 subsection 2 no. 2 study and examination
regulations.

Conditions
Knowledge about database systems, e.g. from the lectures *Database Systems* and *Introduction in Computer Networks*.

Learning Outcomes
The lecture follows several goals. From the point of view of methodical engineering of large scale systems, the role of architecture
and non functional properties should be understood. From the algorithmically point of view, it should be comprehensible at
which point in the architecture which functional and non functional properties define the building blocks of the implementation.
Furthermore, it will be important to understand how the architectural properties influence the algorithms and which range of
possibilities is feasible. As well, the participants of the lecture should become familiar with the classical algorithms of database
technology and get a feeling for its fields of application. From the point of view of a database administrator, the participants
should understand which performance related parameters are vital if a certain query profile is given and how such parameters
are connected with the underlying algorithms.

Content
Database systems form the backbone of all kinds of information processing. Without such systems, business management,
commerce, research and development – as well as everything in the areas of mobile communication, genetics and the web – is
not possible. Therefore, nowadays it belongs to the general knowledge of computer science, to understand how such systems
are composed. In addition to that, many techniques which are today common sense in in computer science, have there roots
in database technology. Finally, many specialists are needed, so called database administrators, who are able to configure the
functionality and performance of database systems. Without the knowledge of what happens inside such systems, it is hardly
possible to configure and tune them.
Such knowledge will be thought in this lecture. As an orientation framework serves a reference architecture which primarily
comes from performance optimisation. Its essential components are the memory and query engine as well as transaction
management. These components are discussed following a layered architecture from file management at the bottom to the user
interface at the top level. This layered architecture allows for determining methodically the necessary and possible means of
performance improvement as well as identifying their place within the architecture. Therefore, the lecture also contributes in the
area of software engineering of large scale systems.

Media
Slides.

Literature
Elective literature:

- T.Härder, E.Rahm: Datenbanksysteme – Konzepte und Techniken der Implementierung. Springer, 1999
- G.Saake, A.Heuer, K.-U.Sattler: Datenbanken: Implementierungstechniken. 2. Aufl. mitp-Verlag, 2005
- A.Kemper, A.Eickler: Datenbanksysteme – Eine Einführung. 6. Aufl. Oldenbourg, 2006
- H.Garcia-Molina, J.D.Ullman, J.Widom: Database Systems – The Complete Book. Prentice-Hall, 2002
- P.C.Lockemann, K.R.Dittrich: Architektur von Datenbanksystemen. dpunkt.verlag 2004

Course: Practical Course Database Systems [24286]

Coordinators: K. Böhm
Part of the modules: Theory and Practice of Database Technology (p. 87)[IW4INDBTP]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Winter term	de

Learning Control / Examinations
The assessment will be an assessment according to sec. 4 subsec. 2 no 3. study and examination regulations and consists of several parts (projects, experiments, presentations and reports). The course will be assessed with "passed" or "failed" (according to sec. 9 subsec. 3 study and examination regulations). For passing the practical course, all partial exercises must have been passed successfully. If the course is dropped after the first session, it will be marked with "failed".

Conditions
Knowledge about database systems, e.g. from the lecture "Communications and Database Systems".

Learning Outcomes
In the practical course, the knowledge from the lecture "Deployment of Database Systems" is reinforced on a practical level. The focus is on database-application programming, the usage of interactive query languages and database design. Furthermore, the students should learn to work in teams in order to work on various projects successfully.

Content
The practical course database systems lets students learn how to deploy database systems in practice, as a supplement to the different lectures on database technology. The participants will work in selected projects with commercial (object-)relational and XML database technology. Furthermore, database design will be practised with real-world examples. The following projects are planned for the course:

- Accessing databases, in particular from user programs,
- data management with non-conventional database technology,
- database design.

Working in teams is another important aspect of all projects.

Media

- Slides.
- Practical course notes.

Literature
Please refer to the literature from the lecture "Deployment of Database Systems".
Elective literature:
Please refer to the literature from the lecture "Deployment of Database Systems".

Course: Database Systems [24516]

Coordinators: K. Böhm
Part of the modules: Communication and Database Systems (p. 83)[IW4INKD]

ECTS Credits	Hours per week	Term	Instruction language
4	2/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Recommendations
It is recommended but not mandatory to attend lectures covering communication networks, system architecture and software engineering.

Learning Outcomes

Content

Media
Slides.

Literature

- Andreas Heuer, Kai-Uwe Sattler, Gunther Saake: Datenbanken - Konzepte und Sprachen, 3. Aufl., mitp-Verlag, Bonn, 2007

- Alfons Kemper, André Eickler: Datenbanksysteme. Eine Einführung, 7. Aufl., Oldenbourg Verlag, 2009

Elective literature:

- S. Abeck, P. C. Lockemann, J. Seitz, J. Schiller: Verteilte Informationssysteme, dpunkt-Verlag, 1. Aulage,2002, ISBN-13: 978-3898641883

- R. Elmasri, S.B. Navathe: Fundamentals of Database Systems, 4. Auflage, Benjamin/Cummings, 2000.

- Gerhard Weikum, Gottfried Vossen: Transactional Information Systems, Morgan Kaufmann, 2002.

- C. J. Date: An Introduction to Database Systems, 8. Auflage, Addison-Wesley, Reading, 2003.

Course: Database Systems and XML [2511202]

Coordinators: A. Oberweis
Part of the modules: Intelligent Systems and Services (p. 100)[IW4INAIFB5], Development of Business Information Systems (p. 104)[IW4INAIFB11]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter term	de

Learning Control / Examinations
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.

Conditions
None.

Learning Outcomes
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.

Content
Databases are a proven technology for managing large amounts of data. The oldest database model, the hierarchical model, was replaced by different models such as the relational or the object-oriented data model. The hierarchical model became particularly more important with the emergence of the extensible Markup Language XML. XML is a data format for structured, semi-structured, and unstructured data. In order to store XML documents consistently and reliably, databases or extensions of existing data base systems are required. Among other things, this lecture covers the data model of XML, concepts of XML query languages, aspects of storage of XML documents, and XML-oriented database systems.

Media
Slides, access to internet resources.

Literature

- M. Klettke, H. Meyer: XML & Datenbanken: Konzepte, Sprachen und Systeme. dpunkt.verlag 2003
- H. Schöning: XML und Datenbanken: Konzepte und Systeme. Carl Hanser Verlag 2003
- W. Kazakos, A. Schmidt, P. Tomchyk: Datenbanken und XML. Springer-Verlag 2002
- R. Elmasri, S. B. Navathe: Grundlagen der Datenbanksysteme. 2009
- G. Vossen: Datenbankmodelle, Datenbanksprachen und Datenbankmanagementsysteme. Oldenbourg 2008

Course: Datamanagement in the Cloud [24109]

Coordinators: K. Böhm
Part of the modules: Theory and Practice of Big Data Analytics (p. 112)[IW4INADTP], Theory and Practice of
Data Warehousing and Mining (p. 86)[IW4INDWMTP], Entrepreneurship for Computer Scientists
(p. 111)[IW4INUKI], Theory and Practice of Database Technology (p. 87)[IW4INDBTP], Innovative
Concepts of Data and Information Management (p. 84)[IW4INIKDI]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter term	de

Learning Control / Examinations
It will be announced in advance if the assessment consists of an 1h written exam according to section 4 subsection 2 no. 1
study and examination regulations or of a 20 minute oral exam according to section 4 subsection 2 no. 2 study and examination
regulations.

Conditions
Knowledge about database systems, e.g. from the lectures *Introduction in Computer Networks* and *Database Systems*.

Learning Outcomes

Content

Media
Slides.

Literature
Wird in der Vorlesung bekanntgegeben, Grundlagen finden sich in den folgenden Büchern:

- Database Systems Implementation, by Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom.
- Concurrency Control and Recovery in Database Systems, by Philip A. Bernstein, Vassos Hadzilacos, and Nathan Goodman.
- Data Management in the Cloud, Challenges and Opportunities, Divyakant Agrawal, Sudipto Das and Amr El Abbadi

Course: Data Privacy Protection in Interconnected Information Systems [24605]

Coordinators: K. Böhm
Part of the modules: Innovative Concepts of Data and Information Management (p. 84)[IW4INIKDI], Entrepreneurship for Computer Scientists (p. 111)[IW4INUKI]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
It will be announced in advance if the assessment consists of an 1h written exam according to section 4 subsection 2 no. 1 study and examination regulations or of a 20 minute oral exam according to section 4 subsection 2 no. 2 study and examination regulations.

Conditions
Knowledge about database systems, distributed information systems, system architecture and communication infrastructures, e.g. from the lectures *Database Systems* [24516] and *Introduction in Computer Networks* [24519].

Learning Outcomes
At the end of the lecture, the participants are aware of the objectives and basic principles of informational self-determination. The participants are able to name and explain the fundamental challenges and impacts of data privacy protection for both individuals and society. Furthermore, the participants are expected to know and to apply current methods and technologies for data privacy protection, e.g., spatial and temporal cloaking. The objective of the lecture is to enable the participants to assess and analyze the risks of unknown technologies towards privacy, to propose methods that can be expected to deal with such risks, and to measure the effectiveness of the methods proposed.

Content
This lecture is intended to explain the impacts of interconnected information systems on data privacy. The lecture addresses both current information systems that can be observed on the Internet and information systems that are under development yet. In order to tackle these challenges, a number of technical methods have been proposed and discussed in research and practice. The lecture introduces such approaches, and points out how effective they are in ensuring data privacy. An examination of the social implications of data privacy challenges and privacy enhancing technologies concludes the lecture.

Media
lecture slides

Literature
Will be announced in the lecture.

Course: Data Protection Law [24018]

Coordinators: G. Sydow
Part of the modules: Public Business Law (p. 116)[IW4JURA6], Governance, Risk & Compliance (p. 117)[IW4JURGRC]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Winter term	de

Learning Control / Examinations
The assessment consists of an written exam (approx. 60 min.) according to § 4(2), 1 SPO.

Conditions
None.

Recommendations
Parallel to the lectures tutoria are offered in which legal thinking and argumentation is practised. Their attendance is strongly recommended.
During the semester, test exams to each lecture are offered with extensive coaching. During the lecture-free time, a Q-and-A-lecture is offered.Details on the homepage of the ZAR (www.kit.edu/zar)

Learning Outcomes
Increasing significance of information technology for data processing and interconnectedness of the society by means of telecommunication does not only enhance the social and economical relevance of data in general, it raises the question about legal rules for the protection of personalised data as well. The problem for those who are responsible for the application of law is that national rules in this area are in constant flux due to technological progress and Europeanisation of law. Additionally there is a vast number of sector-specific regulation (such as labour law). Bearing all this in mind, the lecture's main focus is the presentation of the basic principles of the German Federal Act on Data Protection (Bundesdatenschutzgesetz). In doing so, new concepts of data protection like self-data protection or system data protection will be analysed. A further focal point is the examination of evolution of sector-specific data protection law, considering as example regulation of data protection in connection with teleservice or mediaservice. Students should learn how to negotiate their ways in the interaction of different levels of legal norms and solve simple problems of data protection law.

Content
After illustrating contents and history of data protection law there will be presented backgrounds with respect to Community law and under constitutional law. Further on, the German Federal Act on Data Protection will be focussed. At this will be set forth basic principles of regulation (such as necessity), personalised data as an object of regulation, rights of those who are affected as well as the legitimacy of different procedures of data processing. Oranisational regulations, particularly data security official will be approached as well. Further on, in a case study current concepts of data protection and the problem of video surveillance will be discussed. Finally, there are three units on sector-specific regulation of telecommunication and teleservice / mediaservice.

Media
extensive script with cases; content structure, further information in the lectures

Literature
Will be announced in the course.
Elective literature:
Wil be announced in the course.

Remarks
In cooperation with the House of Competence, Students should be rhetorical trained asking and answering questions (short-answer-and-question-technique). Therefor most likely a coach will attend several lessons.

Course: Derivatives [2530550]

Coordinators: M. Uhrig-Homburg
Part of the modules: Finance 1 (p. 34)[IW4BWLFBV1], Finance 2 (p. 35)[IW4BWLFBV2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
The objective of the Derivatives lecture is to become familiar with financial markets, especially derivatives markets. Traded securities and frequently used trading strategies will be introduced. Furthermore the pricing of derivatives will be derived and their use in risk management will be discussed.

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.

Media
Slides, Exercises/Exercise sheets

Literature

  • Hull (2012): Options, Futures, & Other Derivatives, Prentice Hall, 8th Edition

Elective literature:
Cox/Rubinstein (1985): Option Markets, Prentice Hall

Course: Design Thinking [2545010]

Coordinators: O. Terzidis, Dr. Kneisel, Dr. H. Haller, P. Nitschke
Part of the modules: Entrepreneurship   (EnTechnon)   (p.   44)[IW4BWLENT1],   Innovation   Management
                           (p. 45)[IW4BWLENT2]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
Methods and tools of the Design Thinking approach will be learned and - more than that - actively practiced. This includes leaving class and work on hands on solutions.

Content
See German version.

Literature
See German version.

Remarks
The seminar content will be published on the website of the institute.

Course: Design and Evaluation of innovative user interfaces [24103]

Coordinators: T. Schultz, F. Putze, M. Georgi
Part of the modules: Biosignal Processing (p. 89)[IW4INBSV], Speech Processing (p. 90)[IW4INSV]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Knowledge in the area of biosignal processing or cognitive systems is helpful.

Learning Outcomes
Students have a general overview of the methods from design to evaluation of user interfaces which make use of technique for natural or implicit interaction. Students can classify systems according to the scientific state of the art, evaluate their abilities and limitations and they have basic knowledge for the design of new interfaces.

Content
The lecture centers on innovative user interfaces which make use of technique for biosignal- or speech processing. This comprises on the one hand systems which support natural explicit interaction like spoken dialog systems or systems with gesture input. On the other hand, this comprises also interfaces for implicit interaction, for example by employing biosignal based recognition of emotion or mental workload. The lecture begins with an introduction of the necessary theoretical foundation. Following lectures deal with the design and evaluation of end-to-end systems. A focus of the lecture are the advantages but also the new challenges of such systems, for example in the area of multimodality. Another key point is how real users deal with innovative interfaces and with which methods strengths and weaknesses of such interfaces can be investigated systematically.

Media
Slides.

Literature
Will be announced in the lecture.

Course: Developing Business Models for the Semantic Web [2513305]

Coordinators: R. Studer, M. Maleshkova, F. Keppmann
Part of the modules: Entrepreneurship (EnTechnon) (p. 44)[IW4BWLENT1]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
alternative exam assessment (seminar paper) (following §4(2), 3 of the examination regulation).

Conditions
None.

Recommendations
As a recommendation to attending the seminar, basic knowledge about semantic technologies and concepts should be available. This may be acquired by attending one of the following lectures – Wissensmanagement, Semantic Web Technologies 1, Semantic Web Technologies 2 or by studying related literature. Furthermore the topic entrepreneurship should be of interest.

Learning Outcomes
The Student

- analyzes and develops in small teams a business model from an idea to a complete business plan or
- treats a special topic from the area of Semantic Web in businesses and entrepreneurships.
- learns about basic concepts and problem areas and considers these while building the business plan for a particular business idea.
- understands and considers the viewpoints of different stakeholders in the area of entrepreneurships and their influences on an own business idea.

Content
Semantic technologies such as RDF, SPARQL, OWL, and RIF are still standardised only in their first versions. Still, the multitude of integrated technologies provides the basis for development of new applications and creates, with the help of the initial standardisations, a foundation for attracting investors. The potential and future developments in the field are exemplified by the growing popularity and importance of data, being published as Linked Data, as well as by the increase in applications developed outside the scope of research. The seminar "Developing Business Models for the Semantic Web" aims to explore these opportunities for new business models und business ventures.
The seminar takes place on a weekly basis and consists of two main parts. The first part is a series of presentations, held by external experts who share their experience in the area of entrepreneurship. The aim is to engage a wide variety of presenters, including applicants to programs for supporting young business ventures, startup founders, and people in leadership positions in established companies. Further guest lecturers include experts in the field of business and startup development, tax and enterprise law, as well as entrepreneurs, who have sold their startups or had to give up their ideas.
The second part consists of the contributions of seminar participants. They are required to develop a business model, starting with the initial idea and building it up to a complete business plan. This development process is accompanied by feedback sessions, pitches, mid-term presentations and a final presentation. The student presentations alternate with presentations given by external experts. Furthermore, besides on the development of a business plan, student can work on a specific topic such as "Analysing Existing Business Models on the Web" or "Using Open Source in Startups".
The seminar pass can be obtained by submitting a completed seminar thesis (i.e. the business plan or the specific topic) and by regularly attending the seminar presentations.

Course: Digital signatures [2400057]

Coordinators: D. Hofheinz
Part of the modules: Advanced Topics in Cryptography (p. 69)[IW4INFKRYP]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations

Conditions
None.

Recommendations
Course *Security*

Learning Outcomes
The student

- knows important signature schemes that are relevant in theory and practice (such as DSA and tree-based signatures),

- understands basic security notions and their relation (such as existential unforgeability under chosen-message attacks),

- is able to understand and apply basic proof techniques (such as reductions and hybrid arguments)

Content
Digital signatures are a fundamental primitive of modern cryptography. Their practical applications include, for instance, authenticated e-mail or certificate hierarchies on the internet.
This lecture will give an overview of important signature schemes with theoretical or practical relevance. This includes:
- One-time signatures, tree-based signatures, and chameleon hash functions
- RSA-based signatures
- Signatures in bilinear groups
Goal of this lecture is not only to describe these schemes, but also to discuss their security. Therefore we will introduce various security notions for digital signatures, and analyze whether the presented schemes provably meet these notions (under certain hardness assumptions).
Depending on the student's preferences, the remaining time will be used to discuss advanced topics, such as:
- Schnorr signatures
- Programmable hash functions
- Tightness of reductions
- Analysis of hardness assumptions in the generic group model

Media
Blackboard presentation

Literature
Lecture notes (available online)

Course: Document Management and Groupware Systems [2511212]

Coordinators: S. Klink
Part of the modules: Development of Business Information Systems (p. 104)[IW4INAIFB11]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Summer term	de

Learning Control / Examinations
The assessment consists of an 1h written exam in the first week after lecture period according to Section 4(2), 1 of the examination regulation).

Conditions
None.

Learning Outcomes
Students master the basics of integration and structure of document management systems (DMS) and know the complete DMS process - from document capture of the archiving until retrieval. Students know how to realize operative workflows. They know which activities are needed to carry out the conceptual design and installation of DMS and they are able to apply a DMS as an archive system, workflow system and retrieval system. Furthermore, they know groupware systems exemplarily and can use them for collaborative tasks.

Content
The lecture gives basics of document management and groupware systems. It covers different system categories, their interaction and their use areas and illustrates this with concrete examples. These include document management in the strict sense, scanning, Document Imaging (acquisition and visualization of scanned documents), indexing, electronic archiving, retrieval of relevant documents, workflow, groupware, and office communications.

Media
Slides, access to internet resources.

Literature

- Klaus Götzer, Udo Schneiderath, Berthold Maier, Torsten Komke: Dokumenten-Management. Dpunkt Verlag, 2004, 358 Seiten, ISBN 3-8986425-8-5

- Jürgen Gulbins, Markus Seyfried, Hans Strack-Zimmermann: Dokumenten-Management. Springer, Berlin, 2002, 700 Seiten, ISBN 3-5404357-7-8

- Uwe M. Borghoff, Peter Rödig, Jan Scheffcyk, Lothar Schmitz: Langzeitarchivierung – Methoden zur Erhaltung digitaler Dokumente. Dpunkt Verlag, 2003, 299 Seiten, ISBN 3-89864-258-5

Elective literature:
Further literature is given in each lecture individually.

Course: eEnergy: Markets, Services, Systems [2540464]

Coordinators: C. Weinhardt
Part of the modules: Market Engineering (p. 29)[IW4BWLISM3], Energy Economics and Energy Markets (p. 42)[IW4BWLIIP4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	en

Learning Control / Examinations
The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation). By successful completion of the exercises (according to §4(2), 3 of the examination regulation) 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.

Conditions
None.

Learning Outcomes
The student

- understands the tasks and basic structure of the energy economy, in particular concerning electricity markets,
- understands the change in the energy economy and the necessity for the development of a Smart Grid,
- knows the market mechanisms in the energy market and their role in coordination and allocation of electric energy,
- is able to describe the relation between OTC, spot and balancing energy markets,
- knows the regulation specifications for energy markets and can reflect them critically,
- is able to model smart grid mechanisms and to evaluate them by simulation based methods.

Content
Scope of the lecture *eEnergy: Markets, Services, Systems* is economics and information management in energy markets. Integration of the growing number of renewable energy sources imposes new challenges on energy markets and the power system. To improve coordination between supply and demand it is necessary to interlink centralized and decentralized generators as well as consumers by means of ICT. Current electricity networks are extended by intelligent IT components thus incorporating the "Smart Grid". Existing market structures for electricity have to be adjusted for a successful implementation of demand side management and integration of an increasing number of renewable energy producers as well as electric vehicles. Apart from regulatory and economic concepts, methods for modeling and analysis of energy markets are introduced and explained during the course.
The lecture is structured as follows:

1. **Electricity Markets**
   Market Models, EEX (spot and futures market), OTC Trading, Market Coupling
2. **Regulation**
   Charges and Incentives, Network Congestion (Management)
3. **Demand Side Management**
   Smart Meters, Tariffs, Price Elasticity, Storage Systems, Electric Mobility
4. **Modeling and Analysis of Energy Markets**

Media

- PowerPoint
- E-learning platform ILIAS

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.

Remarks
The lecture has also been added in the IIP Module *Basics of Liberalised Energy Markets*.

Course: Efficient Energy Systems and Electric Mobility [2581006]

Coordinators: R. McKenna, P. Jochem
Part of the modules: Energy Economics and Technology (p. 43)[IW4BWLIIP5]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Summer term	en

Learning Control / Examinations

Conditions
None.

Learning Outcomes

- Understand the concept of energy efficiency as applied to specific systems

- Obtain an overview of the current trends in energy efficiency

- Be able to determine and evaluate alternative methods of energy efficiency improvement

- Overview of technical and economical stylized facts on electric mobility

- Judging economical, ecological and social impacts through electric mobility

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.

Media
Media will likely be provided on the e-learning platform ILIAS.

Literature
Will be anounced in the lecture.

Course: eFinance: Information Engineering and Management for Securities Trading [2540454]

Coordinators: C. Weinhardt
Part of the modules: Market Engineering (p. 29)[IW4BWLISM3], Finance 2 (p. 35)[IW4BWLFBV2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	en

Learning Control / Examinations
The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation) and by submitting written essays as part of the exercise (according to §4(2), 3 of the examination regulation). 70% of the final grade is based on the written exam and 30% is based on assignments from the exercises. The points obtained in the exercises only apply to the first and second exam of the semester in which they were obtained.

Conditions
None.

Learning Outcomes
The students

- are able to understand the theoretical and pracitical aspects of securitites trading,
- are able to handle the relevant electronic tools for the evaluation of financial data,
- are able to identify the incentives of the traders for participation in different market plattforms,
- are able to analyse capital marketplaces concerning their efficiency, weaknesses and technical configuration,
- are able to apply theoretical methods of econometrics,
- are able to understand, criticize and present articles with a finance-scientific background,
- learn to elaborate solutions in a team.

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.

Media

- Powerpoint presentations
- recorded lecture available on the internet

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

Course: Introduction to Video Analysis [24684]

Coordinators: J. Beyerer, Arens
Part of the modules: Image-based detection and classification (p. 110)[IW4INBDK], Machine Vision (p. 108)[IW4INMVW]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
After visiting the lecture and elaborating on the given publications, students possess a broad overview of classical and state-of-the-art methods from different areas in the field of image sequence exploitation. The methods discussed during the lecture include motion detection, establishing of correspondences between images or frames, the estimation of three-dimensional scene structure from camera motion, the detection and tracking of objects in videos, and the conceptual interpretation of visually observable actions and behaviors.
Students analyze problems in the field of image sequence exploitation and judge methods and groups of methods according to fitness regarding a given problem. They will gain the ability to choose the right method and approach.

Content

Course: Introduction to Information Fusion [24172]

Coordinators: M. Heizmann
Part of the modules: Automated visual inspection (p. 107)[IW4INAS], Machine Vision (p. 108)[IW4INMVW], Image-based detection and classification (p. 110)[IW4INBDK]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Knowlegde of the basic principles of stochastics is helpful.

Learning Outcomes

- students have a sound knowledge of different methods for the specification of knowledge subject to uncertainty and its preparation for the purpose of information fusion
- with regard to conditions, model assumptions, methods, and results, students are able to master different concepts of information fusion
- students are in the position, to analyse problems of information fusion and to describe them formally, to synthesize possibilities of solution, and to evaluate the different approaches of information fusion regarding their suitability for a solution

Content

- basics and methods of information fusion
- assumptions for fusion
- specification of information subject to uncertainty
- pre-processing for information fusion, registration
- fusion architectures
- probabilistic methods: Bayesian Fusion, Kalman filter, tracking
- formulation of fusion problems by means of energy functionals
- Dempster-Shafer theory
- fuzzy fusion

Media
Slides (pdf), work sheets including solutions.

Literature
Elective literature:
- David L. Hall: Mathematical Techniques in Multisensor Data Fusion. 2. Aufl., Artech House, 2004 (Fusionssysteme allgemein)
- Edward Waltz, James Llinas: Multisensor Data Fusion. Artech House, 1990 (Fusionssysteme allgemein)
- Yunmin Zhu: Multisensor Decision and Estimation Fusion. Kluwer Academic Publishers, 2003 (Probabilistische Methoden, Bayes'sche Fusion)
- Kevin B. Korb, Ann E. Nicholson: Bayesian artificial intelligence. Chapman & Hall/CRC, 2004 (Bayes'sche Verfahren)

Course: Introduction in Computer Networks [24519]

Coordinators: M. Zitterbart
Part of the modules: Communication and Database Systems (p. 83)[IW4INKD]

ECTS Credits	Hours per week	Term	Instruction language
4	2/1	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
It is recommended but not mandatory to attend lectures covering system architecture and software engineering.

Learning Outcomes

Content
Today's Internet is arguably the most well-known and most complex artefact ever created by mankind: hundreds of millions connected
computers and connecting networks. Millions of users who connect at any time to the Internet via various devices such as mobile phones, PDAs or laptops. Given the large scale as well as the diversity of the Internet, the question arises to which extent it is possible to understand the complex structures behind. Here, this lecture tries to provide an introduction to the world of computer networks by presenting theoretical and practical aspects of computer networks. Therefore, it covers basics of telecommunications engineering, fundamental protocol mechanisms as well as the layers model of current computer networks. Hence, we present all layers starting with the physical medium layer up to the application layer.

Media
Slides.

Literature

- J.F. Kurose, K.W. Ross: Computer Networking - A Top-Down Approach featuring the Internet. Addison-Wesley, 2007.
- W. Stallings: Data and Computer Communications. Prentice Hall, 2006.

Elective literature:

- F. Halsall: Computer Networking and the Internet. Addison-Wesley, 2005.
- P. Lockemann, G. Krüger, H. Krumm: Telekommunikation und Datenhaltung. Hanser Verlag, 1993.
- S. Abeck, P.C. Lockemann, J. Schiller, J. Seitz: Verteilte Informationssysteme. dpunkt-Verlag, 2003

Remarks
This lecture replaces the communication part of the lecture *Kommunikation und Datenhaltung*.

Course: Emissions into the Environment [2581962]

Coordinators: U. Karl
Part of the modules: Industrial Production II (p. 40)[IW4BWLIIP2]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Winter term	de

Learning Control / Examinations
The assessment consists of an oral (30 minutes) or a written (60 minutes) exam (following §4(2), 1 of the examination regulation).
The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
The student should identify problems of industrial pollution control.
The student knows solutions to these problems and their ways of application.

Content
The course will provide an overview of sources of air pollution, waste and municipal waste; methods to monitor and to reduce/manage pollutant flows; regulatory framework on national and international level.
A Air pollution control

- Indtroduction and definitions
- Sources an dpoluuutants
- Regulatory framework
- Emission monitoring
- Air pollution control measures

B Waste management and Recycling

- Introduction and regulatory framework
- Statistics and logistics
- Recycling and disposal
- Waste treatment

C Waste water treatment

- Municipal waste water treatment systems
- Sewage sludge disposal

Media
Media will be provided on learning platform.

Literature
Will be announced in thecourse.

Course: Empirical Software Engineering [24156]

Coordinators: W. Tichy
Part of the modules: Software Methods (p. 76)[IW4INSWM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Basic knowledge of statistics.

Learning Outcomes
At the end of the course the student should be able...

- to describe empirical methodology in software engineering
- to list common sources of errors and how to avoid them
- to explain and to apply statistical analysis methods
- to name and to comment on examples of empirical studies in software engineering
- to plan and to implement empirical studies

Content
The course illustrates the role of empiricism in software engineering. It presents well-established empirical methods and points out common pitfalls in empirical studies. Statistical methods for data analysis and representation are taught. Recent scientific publications are used to exemplify the theoretical concepts.

Course: Theory of endogenous growth [2561503]

Coordinators: I. Ott
Part of the modules: Macroeconomic Theory (p. 54)[IW4VWL8]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations
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.

Conditions
None.

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

Learning Outcomes
Students shall be given the ability to understand, analyze and evaluate selected models of endogenous growth theory.

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

Media

- lecture slides
- exercises

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.

Course: Energy and Environment [2581003]

Coordinators: U. Karl, n.n.
Part of the modules: Energy Economics and Technology (p. 43)[IW4BWLIIP5]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
The examination will be in form of an written exam acc. to §4(2), 2 ER.

Conditions
None.

Learning Outcomes
The student should identify environmental problems of energy from fossil fuels. The student can identify appropriate technologies for pollution control. The student knows methods for assessing environmental problems and their ways of application.

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)

Course: Energy Trade and Risk Management [2581020]

Coordinators: W. Fichtner, D. Keles, C. Cremer
Part of the modules: Energy Economics and Energy Markets (p. 42)[IW4BWLIIP4]

ECTS Credits	Hours per week	Term	Instruction language
4	3	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam according to Section 4(2), 1 of the examination regulation.

Conditions
None.

Learning Outcomes
The student

- has acquired a broad understanding of the different energy commodity markets (power, emissions, gas, oil, hard coal)
- knows the major products traded on the relevant energy commodity markets
- has a deep understanding of pricing mechanisms on these markets
- knows the major evaluation methods from financial mathematics being able to be used for evaluating energy commodity products
- knows the key risk evaluation methods of energy commodity trading (VaR, CVaR, . . .).

Content

1. Introduction to Markets, Mechanisms, Interactions
2. Basics of Risk Management
3. Oil Markets
4. Gas Markets
5. Coal Markets
6. Emission Markets
7. Simulation Game
8. Power Markets
9. Risk Management in Utilities

Media
Media will likely be provided on the e-learning platform ILIAS.

Literature
Elective literature:
Burger, M., Graeber, B., Schindlmayr, G. (2007): *Managing energy risk: An integrated view on power and other energy markets*, Wiley&Sons, Chichester, England
EEX (2010): *Einführung in den Börsenhandel an der EEX auf Xetra und Eurex*, www.eex.de
Erdmann, G., Zweifel, P. (2008), Energieökonomik, Theorie und Anwendungen, Springer, ISBN: 978-3-540-71698-3
Hull, J.C. (2006): *Options, Futures and other Derivatives*, 6. Edition, Pearson Prentice Hall, New Jersey, USA
Borchert, J., Schlemm, R., Korth, S. (2006): *Stromhandel: Institutionen, Marktmodelle, Pricing und Risikomanagement (Gebundene Ausgabe)*, Schäffer-Poeschel Verlag
www.riskglossary.com

Remarks
The credits have been changed from 3.5 to 4.

Course: Energy Policy [2581959]

Coordinators: M. Wietschel
Part of the modules: Energy Economics and Energy Markets (p.)[IW4BWLIIP4]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
See German version.

Content
The course deals with material and energy policy of policy makers and includes the effects of such policies on the economy as well as the involvement of industrial and other stakeholders in the policy design. At the beginning the neoclassical environment policy is discussed. Afterwards the Sustainable Development concept is presented and strategies how to translate the concept in policy decision follows. In the next part of the course an overview about the different environmental instruments classes, evaluation criteria for these instruments and examples of environmental instruments like taxes or certificates will be discussed. The final part deals with implementation strategies of material and energy policy.

Literature
Will be anounced in the lecture.

Course: Energy Systems Analysis [2581002]

Coordinators: V. Bertsch
Part of the modules: Energy Economics and Technology (p. 43)[IW4BWLIIP5]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Winter term	en

Learning Control / Examinations
The assessment consists of a written exam according to Section 4(2), 1 of the examination regulation.

Conditions
None.

Learning Outcomes
The student
- has the ability to understand and critically reflect the methods of energy system analysis, the possibilities of its application in the energy industry and the limits and weaknesses of this approach
- can use select methods of the energy system analysis by her-/himself

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

Media
Media will likely be provided on the e-learning platform ILIAS.

Remarks
Since 2011 the lecture is offered in winter term. Exams can still be taken in summer term.

Course: Entrepreneurial Leadership & Innovation Management [2545012]

Coordinators: O. Terzidis, C. Linz
Part of the modules: Entrepreneurship   (EnTechnon)   (p.   44)[IW4BWLENT1],   Innovation   Management
                          (p. 45)[IW4BWLENT2]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	en

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes
- Seize what determines entrepreneurial performance
- Identify entrepreneurial opportunities and evaluate them
- Develop and sharpen innovative business ideas
- Pitch a business idea in front of potential share-/stakeholders
- Lead new business growth by driving the enterprise evolution
- Effectively deal with critical challenges and overcome obstacles

Content
On campus the seminar combines foundational knowledge, real-world examples, and practical exercise/group work sessions.

Course: Entrepreneurship [2545001]

Coordinators: O. Terzidis
Part of the modules: Entrepreneurship   (EnTechnon)   (p.   44)[IW4BWLENT1],   Innovation   Management
(p. 45)[IW4BWLENT2]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	en

Learning Control / Examinations
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

Conditions
None.

Learning Outcomes
Students are generally introduced to the topic of entrepreneurship. After successful completion of the lecture they should have an overview of the sub-areas of entrepreneurship and have to be able to understand basic concepts of entrepreneurship.

Content
This lecture, as an obligatory part of the module "Entrepreneurship", introduces basic concepts of entrepreneurship. It approaches the individual steps of dynamic corporate development. The focus here is the introduction to methods for generating innovative business ideas, the translation of patents into business concepts and general principles of financial planning.
Other topics are the design and use of service-oriented information systems for founders, technology management, business model generation and lean startup methods for the implementation of business ideas in the way of controlled experiments in the market.

In addition to the lectures the KIT Entrepreneurship Talks, where successful entrepreneurs share their experiences from the early stages of their companies, will be given. Dates and times will be announced in time on the EnTechnon website.

More details: http://etm.entechnon.kit.edu/211.php

Course: Entrepreneurship Research [2545002]

Coordinators: O. Terzidis, Mitarbeiter
Part of the modules: Entrepreneurship (EnTechnon) (p. 44)[IW4BWLENT1]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The performance review is done via a so called other methods of performance review (term paper) according to §4 (2), 3 SPO. The final grade is a result from both, the grade of the term paper and its presentation, as well as active participation during the seminar.

Conditions
None.

Recommendations
None.

Learning Outcomes
The students will work on a specific topic of Entrepreneurship Research. In their term paper, the chosen topic needs to be presented to scientific standards in written format on 15-20 pages. The results of the term paper will be presented during a block period seminar at the end of the semester (20 min presentation, 10 min discussion).
By writing the term paper, basic skills of autonomous scientific work, such as looking for literature, argumentation + discussion, citation and using qualitative, quantitative and simulative methods get trained. The term paper is therefore a preparation for the master thesis. For this reason the seminar is mainly for students that intend to write their master thesis at the Chair of Entrepreneurship and Technology Management.

Content
Content of the seminar is most recently discussed topics in the field of entrepreneurship. Topics and dates will be communicated online via the seminar portal.

Literature
Will be announced during/prior to the seminar as this varies from topic to topic.

Remarks
The topics will be prepared in groups. The presentation of the results is done during a a block period seminar at the end of the semester. Students have to be present all day long during the seminar.

Course: Gas-Markets [2581022]

Coordinators: A. Pustisek
Part of the modules: Energy Economics and Energy Markets (p. 42)[IW4BWLIIP4]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam according to Section 4(2), 1 of the examination regulation.

Conditions
None.

Learning Outcomes

- Technical and economic principles of the natural gas industry
- Assessment of natural gas as energetic source
- Classification and assessment of the natural gas industry in a political and economic context
- Assessment of decisions, actions taken and consequences thereof in the natural gas industry
- Recognition, assessment and valuation of interdependencies between different energy markets
- Development of a qualified market view for natural gas markets

Content

- Introduction and principles

    – Definition and composition of natural gas

    – Main physical parameters of natural gas

    – The natural gas value chain and its interdependencies to other fuels

- Natural gas markets

    – Brief overview of sources and production (incl. shale gas)

    – Worldwide reserves of natural gas

    – Worldwide and European natural gas production and consumption

    – Natural gas market structure in Europe and Germany (incl. the role of hubs)

    – European and German energy (esp. natural gas) prices and their development

    – Parameters not harmonized in European natural gas markets and consequences thereof

- Natural gas (commodity) contracts

    – The impact of the market structure modification to contract structure

    – Main elements of natural gas purchase and sales contracts

    – General comparison of traditional and market based pricing

- Natural gas transportation

    – Technical description of pipeline transportation

    – Historical development of the European natural gas (pipeline) transportation system (incl. new projects)

    – LNG transportation

    – Comparison of LNG and pipeline transportation

    – Main elements of natural gas transportation contracts

    – Costs of natural gas transportation

    – Natural gas transportation pricing systems

    – Transportation capacity trading

- Natural gas storage

    – Storage functions and parameters

    – Technical description of natural gas storages

- **–** Storage types
- **–** Natural gas storage in Europe
- **–** Main elements of natural gas storage contracts
- **–** Costs of storage
- **–** Natural gas storage pricing
- Special topics
  - **–** Selected aspects of regulation and legislation relevant for the natural gas industry
  - **–** Portfolio management and risk management in the natural gas industry
  - **–** „Gas-to-Liquids" – technical description and economic impact
  - **–** Brief overview of revenue management applied in the natural gas industry
  - **–** Brief overview of bio-methane and its impact to natural gas markets in Germany

Media
Media will likely be provided on the e-learning platform ILIAS.

Course: Discrete-event Simulation in Production and Logistics [2550488]

Coordinators: S. Nickel, S. Spieckermann
Part of the modules: Operations Research in Supply Chain Management and Health Care Management (p. 59)[IW4OR4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
The assessment consists of a written paper and an oral exam (according to §4(2), 3 of the examination regulation).

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

Recommendations
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

Learning Outcomes
The student

- knows basic concepts of discrete event simulation models,
- applies computer-based simulation systems,
- structures and implements simulation studies according to specific process models,
- has an in-depthr knowledge for logistics issues and discovers the importance of statistical methods in modeling and evaluation of simulation models,
- explains coupled systems of simulation and meta-heuristics, and characterizes simulation programs.

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.

Remarks
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.

Course: European and International Law [24666]

Coordinators: G. Sydow
Part of the modules: Public Business Law (p. 116)[IW4JURA6]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Summer term	de

Learning Control / Examinations
The assessment consists of an written exam (approx. 60 min.) according to § 4(2), 1 SPO.

Conditions
None.

Recommendations
Parallel to the lectures tutoria are offered in which legal thinking and argumentation is practised. Their attendance is strongly recommended.
During the semester, test exams to each lecture are offered with extensive coaching. During the lecture-free time, a Q-and-A-lecture is offered.Details on the homepage of the ZAR (www.kit.edu/zar)

Learning Outcomes
Due to the Europeanization of national law, the examination of European law is indispensable for everyone aiming to gain basic legal knowledge. Hardly any national activity can be imagined without the consideration of presetting of European Community law. By comparison, the influence of international law is of small importance. In light of this, the lecture predominantly deals with European law and imparts the knowledge of the EU law necessary for the students in order to comprehend how the national law is being covered by European Community law defaults. Afterwards, the student should be able to solve questions regarding European legislation in a problem-oriented manner. As the subject matter partly will be acquired in discourse with the students, it is necessary to acquire a corpus juris (e.g. Beck-Texte "Europarecht").

Content
The lecture predominantly deals with the European law: in the origin, this contains an analysis of history from the EEC to EC and EU, of participants (parliament, commission, council, European Court of Justice), of sources of law (regulations, directives, final judgements, opinions, recommendations) and legislative procedure. Further, the lecture focuses on the basic liberties of the EC, which enable a free flow of goods (for example of beer not matching the German purity law), persons (like the professional footballer Bosman), services (like entrepreneurial activities) and capital. In addition, the charter of fundamental rights of the EC and the rules of competition will be discussed, in each case in the light of a concrete legal case. Moreover, the fundamental rights of the European Convention on Human Rights (ECHR) are being introduced. Concluding, a short survey of international law, especially of the World Trade Organization (WTO), will be given.

Media
extensive script with cases; content structure, further information in the lectures

Literature
Further details will be announced in the lecture.
Elective literature:
Further details will be announced in the lecture.

Course: Experimental Economics [2540489]

Coordinators: C. Weinhardt, T. Teubner
Part of the modules: Market Engineering (p. 29)[IW4BWLISM3], Experimental Economics (p. 58)[IW4VWL17], Applied
                             Strategic Decisions (p. 53)[IW4VWL2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation). By successful completion of the exercises (according to §4(2), 3 of the examination regulation) 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.

Conditions
See corresponding module information.

Learning Outcomes
The students should learn

- how to gain scientific experience and knowledge (philosophy of science),
- how Game Theory and Experimental Economics influenced each other in scientific research,
- about the methods as well as the strengths and weaknesses of Experimental Economics,
- some examples of experimental research, such as markets and auctions, coordination games, bargaining, decision making under risk,
- how to evaluate data.

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 empricial 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.

Media

- PowerPoint
- E-learning platform ILIAS
- Classroom experiments or experiments in the computer laboratory will be conducted

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.

Course: Case studies seminar: Innovation management [2545019]

Coordinators: M. Weissenberger-Eibl
Part of the modules: Innovation   Management   (p.   45)[IW4BWLENT2],   Entrepreneurship   (EnTechnon)
                          (p. 44)[IW4BWLENT1]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Recommendations
Prior attendance of the course *Innovation Management* [2545015] is recommended.

Learning Outcomes
The students

- look critically into current research topics in the field of Innovation Managament

- do literature search based on a given topic, identify relevant literature and evaluate this literature,

- give presentations in a scientific context in front of an auditorium to present the results of the research,

- train their presentation skills,

- present results of the research in a seminar thesis as a scientific publication.

Content
The objective of the seminar is to master selected concepts and methods of innovation management and then to apply these practically. Working in groups, the students apply the described concepts and methods of innovation management to a case study from the automotive industry to answer specific questions. Accordingly, the block seminar involves a switch from input to the application of this input. At the end, the results of the group work are presented in the form of a seminar paper and discussed by the whole course.
A short introduction to presentation techniques is planned to help students prepare the seminar papers.

Course: Fixed Income Securities [2530260]

Coordinators: M. Uhrig-Homburg
Part of the modules: Finance 2 (p. 35)[IW4BWLFBV2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
The objective of this course is to become familiar with national and international bond markets. Therefore, we first have a look at financial instruments that are of particular importance. Thereafter, specific models and methods that allow the evaluation of interest rate derivatives are introduced and applied.

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.

Literature

- Bühler, W., Uhrig-Homburg, M., Rendite und Renditestruktur am Rentenmarkt, in Obst/Hintner, Geld-, Bank- und Börsen-wesen - 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).

Course: Financial Analysis [2530205]

Coordinators: T. Lüdecke
Part of the modules: Finance 2 (p. 35)[IW4BWLFBV2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	en

Learning Control / Examinations

Conditions
None.

Recommendations
Basic knowledge in corporate finance, accounting, and valuation is required.

Learning Outcomes
Students are able to

- understand the key financial statements according to international standards,

- use financial ratios and financial analysis for different purposes,

- evaluate the financial performance of the firm,

- determine the value of the firm by using residual income and cash flow figures, respectively,

- assess the quality of financial statements.

Content
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.

Media
Slides

Literature

- Alexander, D. and C. Nobes (2013): *Financial Accounting – An International Introduction, 5th ed.,* Pearson.

- Penman, S.H. (2013): Financial Statement Analysis and Security Valuation, 5th ed., McGraw Hill.

Remarks
New course starting summer term 2015.

Course: Financial Econometrics [2520022]

Coordinators: M. Schienle
Part of the modules: Econometrics and Statistics II (p. 67)[IW4STAT6], Econometrics and Statistics I (p. 66)[IW4STAT5]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/2	Winter term	en

Learning Control / Examinations
The assessment consists of a written exam (90 minutes) (following §4(2), 1 of the examination regulation).

Conditions
None.

Recommendations
Knowledge of the contents covered by the course "Economics III: Introduction in Econometrics" [2520016]

Learning Outcomes
The student

- shows a broad knowledge of fincancial econometric estimation and testing techniques
- is able to apply his/her technical knowledge using software in order to critically assess empirical problems

Content
ARMA, ARIMA, ARFIMA, (non)stationarity, causality, cointegration, ARCH/GARCH, stochastic volatility models, computer based exercises

Media
slides

Literature
References will be provided in the lectures

Remarks
The course is offered in summer term 2016, in winter term 2017/18 and afterwards every second term

Course: Financial Intermediation [2530232]

Coordinators: M. Ruckes
Part of the modules: Applied Strategic Decisions (p. 53)[IW4VWL2], Economic Theory and its Application in Finance (p. 55)[IW4VWL14], Finance 2 (p. 35)[IW4BWLFBV2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
Students

- are in a position to describe the arguments for the existence of financial intermediaries,
- are able of discuss and analyze both static and dynamic aspects of contractual relationships between banks and borrowers,
- are able to discuss the macroeconomic role of the banking system,
- are in a position to explain the fundamental principles of the prudential regulation of banks and are able to recognize and evaluate the implications of specific regulations.

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

Literature
Elective literature:

- Hartmann-Wendels/Pfingsten/Weber (2014): Bankbetriebslehre, 6th edition, Springer Verlag.
- Freixas/Rochet (2008): Microeconomics of Banking, 2nd edition, MIT Press.

Course: Human brain and central nervous system: anatomy, information transfer, signal processing, neurophysiology and therapy [24139 / 24678]

Coordinators: U. Spetzger
Part of the modules: Medical Simulation and Neural Medicine (p. 106)[IW4INMSNM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Prior attendance at lecture, seminars and laboratory in *Medical Simulation Systems* is recommended but not mandatory.

Learning Outcomes
The students get an insight into neuromedicine and establish a general appreciation to the field of neuroinformatics. In particular, anatomy, information transfer, signal processing, neurophysiology and therapy are covered. Furthermore, the sensoric physiology, various malfunctions of the central nervous system, diagnostic procedures and different modern therapy modalities and treatment options are introduced.

Content
The lecture wants to impart basic knowledge for students of computer sciences and bridges the information gap between engineering and medicine. The purpose is to describe the basis of the composition of the human brain with anatomical details of neural cells and nerve tissue. This represents the comprehension of the complex structure and the sequels within the human brain and spinal cord. It will improve the understanding of sensomotor-prostheses and artificial limbs and closely links to robotic systems. Furthermore, image-guided planning and computer-assisted surgical procedures in neurosurgery are demonstrated on different examples.

Media
Slides or electronic files of the presentations

Literature
Neuro- und Sinnesphysiologie Schmidt, Robert F.; Schaible, Hans-Georg (Hrsg.) 5. Auflage, 2006, Springer Verlag, ISBN: 978-3-540-25700-4 (9,95 Euro)

Course: Mixed Integer Programming I [2550138]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 61)[IW4OR6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
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.

Conditions
None.

Recommendations
It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Learning Outcomes
The student

- knows and understands the fundamentals of linear mixed integer programming,
- is able to choose, design and apply modern techniques of linear mixed integer programming in practice.

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.

Media
Lecture notes.

Literature
Elective 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.

Remarks
The lecture is offered irregularly. The curriculum of the next three years is available online (kop.ior.kit.edu).

Course: Mixed Integer Programming II [25140]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 61)[IW4OR6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations
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.

Conditions
None.

Recommendations
It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Learning Outcomes
The student

- knows and understands the fundamentals of convex and of nonconvex mixed integer programming,
- is able to choose, design and apply modern techniques of nonlinear mixed integer programming in practice.

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. Part I of the lecture deals with linear mixed integer programs.
Part II treats methods for the numerical solution of optimization problems which depend nonlinearly on continuous as well as discrete variables. It is structured as follows:

- Concepts of convex optimization
- Mixed integer convex programming (branch and bound methods)
- Mixed integer nonconvex programming
- Generalized Benders decomposition
- Outer approximation methods
- Heuristics

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.

Media
Lecture notes.

Literature
Elective 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.

Remarks
The lecture is offered irregularly. The curriculum of the next three years is available online (kop.ior.kit.edu).

Course: Geometric basics for Geometry Processing [2400029]

Coordinators: H. Prautzsch
Part of the modules: Curves and Surfaces (p. 91)[IW4INKUF]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
Besoming familiar with geometric concepts that are fundamental for Computer Aided Geometric Design / Geometry Processing.

Content
Affine, euclidean and projective transformations, perspective images, stereo images, reconstruction, volume and distance computations, intersections, medial axis transformation, generalized barycentric coordinates, gear tooth techniques.

Course: Geometric Optimzation [2400026]

Coordinators: H. Prautzsch
Part of the modules: Algorithms in Computer Graphics (p. 94)[IW4INACG]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes

Content
Method of least squares, Levenberg-Marquardt-algorithm, best fitting planes, iterated closed point algorithm, FEM, animation trandfer, approximation with developable surfaces, smoothing of surfaces, parametrizations with minimal distortion, numerical stability, exact arithmetic, smallest enclosing spheres etc.

Media
Blackboard, slides.

Literature
Various papers and textbook chapters as announced during the course.

Course: Business Models in the Internet: Planning and Implementation [2540456]

Coordinators: T. Teubner, R. Knapper
Part of the modules: Entrepreneurship (EnTechnon) (p. 44)[IW4BWLENT1], Business & Service Engineering
                           (p. 30)[IW4BWLISM4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation) and by submitting written essays as part of the exercise (according to §4(2), 3 of the examination regulation). 50% of the final grade is based on the written exam and 50% is based on assignments from the exercises. Successful completion of the exercises is a prerequisite for admission to the written exam. The points obtained in the exercises only apply to the first and second exam of the semester in which they were obtained.

Conditions
None.

Learning Outcomes
The student

- is able to list the most important features of web application lifecycles,

- analyses, designs and implements web applications,

- evaluates and argues internet business models with special requirements and features,

- is able to estimate the practicability of business models.

Content
The emergence of internet economy has resulted in an accelerated evolution of commerce models in eBusiness. Early adopters have experimented with a variety of new business models, technologies and application designs. At the same time, there has been a growing demand for new standards to facilitate the exchange of information, catalogue content and transactions between buyers and sellers. But the true understanding of how to bring buyers and sellers together is still widely missing, leading to multiple cases of costly missed investments. This course focuses on the design and implementation of successful business models for eBusiness applications for the World Wide Web (WWW), imparting the basic knowledge for building successful eBusiness applications. We consider not only technical foundations of eBusiness applications but also economical aspects. In small groups, students develop and implement an eBusiness model that is eventually discussed with a representative from the venture capitalist industry.

Media

- PowerPoint

- E-Learning-System ILIAS

- Videoconferencing, if circumstances allow

Literature
Will be announced within the course.

Course: Business Planning [2545005]

Coordinators: O. Terzidis, Mitarbeiter des Lehrstuhls
Part of the modules: Entrepreneurship (EnTechnon) (p. 44)[IW4BWLENT1]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
Students will learn methods on how to turn patents as well as business ideas into a solid business model and furthermore to develop them into a concrete Business Plan.

Content
This seminar introduces basic concepts of business planning for entrepreneurs to the participants. It focusses on practical concepts and hands-on-methods on how to turn business ideas into solid businesses (e.g. Business Modelling, Market Potential, Planning of Ressorces, and further more) and on the creation of a realistic and viable Business Plan (with or without Venture Capital)

Literature
See German version.

Course: Business Strategies of Banks [2530299]

Coordinators: W. Müller
Part of the modules: Finance 2 (p. 35)[IW4BWLFBV2]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
Students are are in a position to discuss the principles of commercial banking. They are familiar with fundamental concepts of bank management and are able to apply them.

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.

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

Course: Design Príncipes for Interactive Real-Time Systems" [24648]

Coordinators: E. Peinsipp-Byma, O. Sauer
Part of the modules: Human-Machine-Interaction (p. 93)[IW4INMMI]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes

Content

Course: Global Optimization I [2550134]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 61)[IW4OR6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations
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 50% 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 *Global Optimization II* [2550136]. In this case, the duration of the written examination takes 120 minutes.

Conditions
None.

Learning Outcomes
The student

- knows and understands the fundamentals of deterministic global optimization in the convex case,

- is able to choose, design and apply modern techniques of deterministic global optimization in the convex case in practice.

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.

Media
Lecture notes.

Literature
Elective 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

Remarks
Part I and II of the lecture are held consecutively in the *same* semester.

Course: Global Optimization II [2550136]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 61)[IW4OR6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations
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 50% of the exercise points. Therefore the online-registration to the written examinationen is subject to fulfilling the prerequisite.
The examination can also be combined with the examination of *Global Optimization I* [2550134]. In this case, the duration of the written examination takes 120 minutes.

Conditions
None.

Learning Outcomes
The student

- knows and understands the fundamentals of deterministic global optimization in the nonconvex case,
- is able to choose, design and apply modern techniques of deterministic global optimization in the nonconvex case in practice.

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 αBB 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.

Media
Lecture notes.

Literature
Elective 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

Remarks
Part I and II of the lecture are held consecutively in the *same* semester.

Course: Graph Theory and Advanced Location Models [2550484]

Coordinators: S. Nickel
Part of the modules: Mathematical Programming (p. 61)[IW4OR6], Operations Research in Supply Chain Management and Health Care Management (p. 59)[IW4OR4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter / Summer Term	en

Learning Control / Examinations
The assessment is a 120 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.

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

Learning Outcomes
The student

- knows and classifies basic concepts and algorithms of Graph Theory which are used in engineering, economic and socio-scientific problems,
- describes and utilizes models and methods in order to optimize on graphs and networks
- models advanced problem settings in location theory,
- is capable of analyzing practically-relevant settings and current research topics and develops individual solution concepts.

Content
Graph Theory is an important part of Discrete Mathematics. A special attraction is in its clearness and variety of proof techniques. Object of the first part "Graph Theory" is the mediation of basic graph theoretical concepts and algorithms, which are deployed in many areas. In focus is the modeling of different problems with graph theoretical methods und their solutions with efficient algorithms. Significant focal points are Shortest Paths, Flows, Matchings, Colorings and Matroids.
A variety of application areas of location theory has attracted increasing research interest within the last decades, because location decisions are a critical factor in strategic planning. In the second part "Advanced Location Models", some current research questions of modern industrial location theory are discussed after a short introduction. Thereby, practical models and suitable solution methods for location problems in general networks are presented. The lecture goes into details about Pareto Solutions in Networks, Ordered Median Problems, Covering Problems and Allocation Problems.

Literature

- Jungnickel: Graphs, Networks and Algorithms, 2nd edition, Springer, 2005
- Diestel: Graph Theory, 3rd edition, Springer, 2006
- Bondy, Murt: Graph Theory, Springer, 2008
- Nickel, Puerto: Location Theory, Springer, 2005
- Drezner: Facility Location – Applications and Theory, 2nd edition, Springer, 2005

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

Course: Principles of Automatic Speech Recognition [24145]

Coordinators: A. Waibel, Sebastian Stüker
Part of the modules: Speech Processing (p. 90)[IW4INSV]

ECTS Credits	Hours per week	Term	Instruction language
6	4	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
The students are introduced to the principles of the automatic recognition of speech. They are going to get to know the basic layout of a speech recognition system as well as the application of concepts and methods from the area of machine learning, that are utilized in automatic speech recognition.

In order to gain a deeper understanding and in order to motivate the applied techniques, the students shall get to understand the basic concept of human speech production. From this the students shall be able to derive the construction of a speech recognition system.

Further, the students shall be able to analyze different application scenarios for speech recognition systems, and, based on the complexity of the application scenario, be able to design an appropriate speech recognition system.

In particular, the students shall study the details of the components of a speech recognition system - pre-processing, acoustic model, language model and search. After completing this class the students shall be able to implement and apply these components themselves. The students will further gain the ability to access and evaluate the performance of concrete instances of speech recognition systems.

Finally, the students shall be introduced to the principles of advanced techniques in automatic speech recognition, such as the use of model space and feature space adaption and their application.

Content
This class explains the layout of state-of-the-art speech recognition systems. The layout will be motivated based on the human speech production process und its properties. The class treats all processing steps of automatic speech recognition systems in detail: signal pre-processing, training of suitable, statistical models, and the actual recognition process.
The focus will be on statistical methods, as they are being used in current speech recognition systems. In this way the state-of-the-art of the area of automatic speech recognition will be communicated. Further the class will introduce alternative Methods, which were the foundation of the current methods and which are still being used in special circumstances.
Using sample applications und examples from current research projects, the current state-of-the-art and the performance of current systems will be illustrated.
In addition to the basic techniques, the class will also introduce advanced technologies in speech recognition, in order to illustrate the training and application of modern, high-performing speech recognition systems.

Media
Slides, additional materials

Literature

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- Xuedong Huang, Alex Acero, Hsiao-wuen Hon, Spoken Language Processing, Prentice Hall, NJ, USA, 2001
- Fredrick Jelinek (editor), Statistical Methods for Speech Recognition, The MIT Press,1997, Cambridge, Massachusetts, London, England

Elective literature:

-
- Lawrence Rabiner and Ronald W. Schafer, Digital Processing of Speech Signals, Prentice Hall, 1978
- Schukat-Talamazzini, Automatische Spracherkennung

Course: Principles of Information Engineering and Management [2540450]

Coordinators: C. Weinhardt, T. Teubner
Part of the modules: Information Engineering and Management (p. 19)[IW4WWIW]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter term	de

Learning Control / Examinations

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation).

Conditions
None.

Learning Outcomes

The students should be able to understand and analyze the central role of information as an economic good, a production factor, and a competitive factor in today's societies. Students are supposed to be able to identify, evaluate, price, and market information goods with the help of the concepts and methods taught in the lecture. Furthermore, students learn basic aspects about information systems and information flows within and between organizations, as well as their design parameters.

Content

Information plays a central role in today's society. The resulting structures and processes cannot be explained intuitively with traditional approaches of economic theory. Formerly, information has only been implicitly treated as a production factor; its role as a competitive factor used to be neglected. In order to deal with the central role of information we developed the concept of the "information lifecycle" that systematizes all phases from information generation to information distribution. The single phases of that cycle,

- extraction/generation,
- storage,
- transformation,
- evaluation,
- marketing
- and usage of information

are analyzed from the business administration perspective and the microeconomic perspective. The state of the art of economic theory is presented across this information lifecycle within the lectures. The content of the lecture is deepened in accompanying lecture courses.

Media

- PowerPoint
- E-learning platform ILIAS

Literature

- Shapiro, C., Varian, H., Information Rules: A Strategic Guide to the Network Economy. Harvard Business School Press 1999.
- Stahlknecht, P., Hasenkamp, U., Einführung in die Wirtschaftsinformatik. Springer Verlag 7. Auflage, 1999.
- Wirth, H., Electronic Business. Gabler Verlag 2001.

Course: Heterogeneous Parallel Computing Systems [24117]

Coordinators: W. Karl
Part of the modules: Parallel Processing (p. 96)[IW4INPV]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes

Content

Media
Slides

Course: Indexing Structures for Efficient Query Processing on Large Databases [2400015]

Coordinators: K. Böhm, E. Müller
Part of the modules: Theory and Practice of Database Technology (p. 87)[IW4INDBTP], Theory and Practice of Data Warehousing and Mining (p. 86)[IW4INDWMTP], Theory and Practice of Big Data Analytics (p. 112)[IW4INADTP], Innovative Concepts of Data and Information Management (p. 84)[IW4INIKDI], Entrepreneurship for Computer Scientists (p. 111)[IW4INUKI]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Industrial Services [2595505]

Coordinators: H. Fromm
Part of the modules: Service Management (p. 31)[IW4BWLISM6], Service Analytics (p. 32)[IW4BWLKSR1]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations
A final written exam will be conducted

Conditions
None.

Learning Outcomes

Participants understand the interrelation between Front-Office (Customer view, e.g. material availability, technician skills, maintenance quality, repair time) and Back-Office (Provider view, e.g. distribution planning, inventory optimization, technician work schedule, call center). They learn about forecasting algorithms for sporadic demands, which are typical in spare part supply, and they apply common inventory optimization models for stock planning. They also become familiar with full-cost service contracts, as well as with the latest product related services that have been enabled only in recent years by modern IT and mobile technology.

Content

Services are becoming ever more important in business. Today, the gross income share of services in Germany exceeds 70%. Following this trend, many companies that previously focused solely on the sale of goods, strive to an extension of their business model: In order to realize new competitive advantages in domestic and international markets, they enrich their material goods with customer-specific services. This transformation to a provider of integrated solutions is called "Servitization" (Neely 2009). For this reason, so-called industrial services to companies of increasing importance. They benefit from the increasingly detailed data collected (on "Big Data"), e.g. concerning user profiles, failure statistics, usage history, accrued expenses, etc. Only these data allow in principle to end products and spare parts are delivered faster, cheaper and more targeted and technicians can be used more efficiently with the correct skills. This requires, however, also suitable methods of optimization, prognosis or predictive modeling. When used properly, such methods can minimize logistics costs, increase availability, prevent potential failures and improve repair planning. This is also enabled by latest "Technology Enabled Services" along with corresponding data transfer and analysis ("Internet of Things", automatic error detection, remote diagnostics, centralized collection of consumption data, etc.). The change from goods manufacturer to a provider of integrated solutions requires new services, transformation of business models as well as intelligent new contract types, which are addressed in the course as well.
More specifically, the lessons of this lecture will include:

- Servitization – The Manufacturer's Transformationto Integrated Solution Provider
- Service Levels – Definitions, Agreements, Measurements and Service Level Engineering
- The "Services Supply Chain"
- Spare Parts Planning – Forecasting, Assortment Planning, Order Quantities and Safety Stocks
- Distribution Network Planning – Network Types, Models, Optimization
- Service Technician Planning
- Condition Monitoring, Predictive Maintenance, Diagnose Systems
- Call Center Services
- Full Service Contracts
- IT-enabled Value-Add Services – Industrial Service Innovation

Course: Information integration and mobile Web applications [24141]

Coordinators: J. Mülle, A. Rashid
Part of the modules: Innovative Concepts of Data and Information Management (p. 84)[IW4INIKDI], Entrepreneurship for
                           Computer Scientists (p. 111)[IW4INUKI]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
It will be announced in advance if the assessment consists of an 1h written exam according to section 4 subsection 2 no. 1 study and examination regulations or of a 20 minute oral exam according to section 4 subsection 2 no. 2 study and examination regulations.

Conditions
Knowledge about database systems, e.g. from the lecture *Database Systems* [24516].

Learning Outcomes

Content

Media

- Slides.
- Tutorial materials (Execution-Environment, Source-Code, Examples).

Course: Information Technology and Business Information [2571162]

Coordinators: B. Neibecker
Part of the modules: Strategy, Communication, and Data Analysis (p. 49)[IW4BWLMAR7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).
The examination is offered every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
Students have learned the following outcomes and competences:

- To specify the key terms in marketing research

- To design a market research project

- To indentify the main research trends

- To analyze and interpret high level academic articles

- To learn interactive skills to work in teams and to follow a goal-oriented approach

- To gain understanding of methodological research to develop concrete plans for marketing decision-making

Content
The goal of the course is to create a text that is comprehensive, practical, applied, and managerial and that presents a balanced coverage of both, quantitative and qualitative approaches. It takes the perspective of users of marketing research and set out to reflect the current trends in the use of computers (e.g. statistical packages and online research). The course covers as main topics an introduction to interactive mulimedia systems, techniques of internet marketing research, methods of primary data collection including questionnaires and scaling of psychological attributes, methods of observation, program analyzer, psychobiological methods, content analysis and cognitive response approach, experimental designs and panels, secondary data collection, management support systems, a case study in marketing decision support and an overview of philosophy of science.

Literature
(Literature is in English and German, see German description)

Course: Content-based Image and Video Retrieval [24628]

Coordinators: R. Stiefelhagen
Part of the modules: Machine Vision (p. 108)[IW4INMVW]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.

Conditions
Basic knowledge of pattern recognition, as taught in the module *Cognitive Systems* [IN3INKS / IN4INKS], is expected.

Learning Outcomes
This lecture deals with various topics of content-based image and video analysis and includes the following topics:

- Image segmentation and descriptors
- Basic knowledge of machine learning for content-based image and video analysis as well as video cut detection
- Classification of TV genres
- Evaluation of content-based image and video analysis methods
- Automated tagging of persons in photo albums and social networks
- Detection of duplicates (copy detection)
- Semantics in images and videos
- Automatic and interactive search / relevance feedback
- Tools and libraries for image- and video analysis

Content
The number of easily accessible multimedia is increasing drastically. Therefore methods of automatic analysis, which support the users to find the contents requested, are becoming more and more important. For this purpose different technologies are required. On the one hand, the content of the multimedia data is to be modelled in an adequate way, which allows an efficient and successful search, and on the other hand appropriate audio-visual analysis procedures are required. The search can then be either done fully automatically or involve the user interactively in the search process.
This lecture deals with various topics of content-based image and video analysis and includes the following topics:

- Image segmentation and descriptors
- Basic knowledge of machine learning for content-based image and video analysis as well as video cut detection
- Classification of TV genres
- Evaluation of content-based image and video analysis methods
- Automated tagging of persons in photo albums and social networks
- Detection of duplicates (copy detection)
- Semantics in images and videos
- Automatic and interactive search / relevance feedback
- Tools and libraries for image and video analysis

Media
Slides

Remarks
The course is lectured in German and English.

Course: Innovation Management: Concepts, Strategies and Methods [2545015]

Coordinators: M. Weissenberger-Eibl
Part of the modules: Entrepreneurship   (EnTechnon)   (p.   44)[IW4BWLENT1],   Innovation   Management
                          (p. 45)[IW4BWLENT2]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
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.

Conditions
None.

Learning Outcomes
Students develop a differentiated understanding of the different phases and concepts of the innovation process, different strategies and methods in innovation management.

Content
The course 'Innovation Management: Concepts, Strategies and Methods' offers scientific concepts which facilitate the understanding of the different phases of the innovation process and resulting strategies and appropriate methodologies suitable for application.
The concepts refer to the entire innovation process so that an integrated perspective is made possible. This is the basis for the teaching of strategies and methods which fulfil the diverse demands of the complex innovation process. The course focuses particu-larly on the creation of interfaces between departments and between various actors in a company's environment and the organisation of a company's internal procedures. In this context a basic understanding of knowledge and communication is taught in addi-tion to the specific characteristics of the respective actors. Subsequently methods are shown which are suitable for the profitable and innovation-led implementation of inte-grated knowledge.

Media
Script.

Remarks
This course was formerly named "Innovation Management".

Course: Insurance Marketing [2530323]

Coordinators: E. Schwake
Part of the modules: Insurance Management I (p. 36)[IW4BWLFBV6], Insurance Management II (p. 37)[IW4BWLFBV7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	Summer term	de

Learning Control / Examinations
The assessment consists of oral presentations (incl. papers) within the lecture (according to Section 4 (2), 3 of the examination regulation) and a final oral exam (according to Section 4 (2), 2 of the examination regulation).
The overall grade consists of the assessment of the oral presentations incl. papers (50 percent) and the assessment of the oral exam (50 percent).

Conditions
None.

Learning Outcomes
See German version.

Content
See German version.

Literature
Elective literature:

- Farny, D.. Versicherungsbetriebslehre (Kapitel III.3 sowie V.4). Karlsruhe 2011

- Kurtenbach / Kühlmann / Käßer-Pawelka. Versicherungsmarketing.... Frankfurt 2001

- Wiedemann, K.-P./Klee, A. Ertragsorientiertes Zielkundenmanagement für Finanzdienstleister, Wiesbaden 2003

Course: Insurance Production [2530324]

Coordinators: U. Werner
Part of the modules: Insurance Management I (p. 36)[IW4BWLFBV6], Insurance Management II (p. 37)[IW4BWLFBV7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	Winter / Summer Term	de

Learning Control / Examinations
The assessment consists of oral presentations (incl. papers) within the lecture (according to Section 4 (2), 3 of the examination regulation) and a final oral exam (according to Section 4 (2), 2 of the examination regulation).
The overall grade consists of the assessment of the oral presentations incl. papers (50 percent) and the assessment of the oral exam (50 percent).

Conditions
None.

Learning Outcomes
See German version.

Content
See German version.

Literature
Elective literature:
P. Albrecht. Zur Risikotransformationstheorie der Versicherung: Grundlagen und ökonomische Konsequenzen. Mannheimer Manuskripte zur Versicherungsbetriebslehre und Risikotheorie Nr. 36
D. Farny. Versicherungsbetriebslehre. 2011.
H. Neugebauer. Kostentheorie und Kostenrechnung für Versicherungsunternehmen. 1995
A. Wiesehan. Geschäftsprozessoptimierung für Versicherungsunternehmen. München 2001

Remarks
This course is offered on demand. For further information, see: http://insurance.fbv.uni-karlsruhe.de

Course: Insurance Risk Management [2530335]

Coordinators: H. Maser
Part of the modules: Insurance Management II (p. 37)[IW4BWLFBV7], Insurance Management I (p. 36)[IW4BWLFBV6]

ECTS Credits	Hours per week	Term	Instruction language
2,5	2/0	Summer term	de

Learning Control / Examinations
The assessment consists of a written or an oral exam (according to Section 4 (2), 1 or 2 of the examination regulation) .

Conditions
None.

Learning Outcomes
Getting to know basic principles of risk management in insurance companies and credit institutions.

Content

Literature
Elective literature:

- "Mindestanforderungen an ein (Bank-)Risikomanagement", www.bafin.de
- V. Bieta, W. Siebe. Strategisches Risikomanagement in Versicherungen. in: ZVersWiss 2002 S. 203-221.
- A. Schäfer. Subprime-Krise, in: VW2008, S. 167-169.
- B. Rudolph. Lehren aus den Ursachen und dem Verlauf der internationalen Finanzkrise, in: zfbf 2008, S. 713-741.

Remarks
Block course. For organizational reasons, please register with the secretary of the chair: thomas.mueller3@kit.edu.

Course: Integrated Network and Systems Management [2400004]

Coordinators: B. Neumair
Part of the modules: Dynamic IT-Infrastructures (p. 88)[IW4INDITI]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: International Management in Engineering and Production [2581956]

Coordinators: H. Sasse
Part of the modules: Industrial Production II (p. 40)[IW4BWLIIP2]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Winter term	en

Learning Control / Examinations
The examination will be in form of a written exam acc. to §4(2), 1 ER. Exams are offered in every semester and can be re-examined at every ordinary examination date.

Conditions
None.

Learning Outcomes
Students are taught advanced knowledge in the field of international production and the internationalization strategies of manufacturing companies. They acquire a basic understanding of international production companies and learn about the relevant business and economic models and schools of thought on the subject. Different approaches of the design of internationalization strategies and production networks are presented and relevant location factors for their particular design are investigated. Students learn about the risks of internationalization and methods of risk minimization. Issues of supply chain management are discussed in the context of different approaches to the discrete manufacturing and the process industry. The course concludes with selected case studies from the process and discrete manufacturing industry.

Content

- Fundamentals of international business
- Forms of international cooperation and value creation
- Site selection
- Cost driven internationalization and site selection
- Sales and customer driven internationalization and site selection
- Challenges, risks and risk mitigation
- Management of international production sites
- Types and case studies of international production

Media
Media will be provided on the e-learning platform.

Literature
Will be announced in the course.

Remarks
This course was formerly named "International Production".

Course: International Finance [2530570]

Coordinators: M. Uhrig-Homburg, Dr. Walter
Part of the modules: Finance 2 (p. 35)[IW4BWLFBV2]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
The objective of this course is to become familiar with the basics of investment decisions on international markets and to manage foreign exchange risks.

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.

Literature
Elective literature:

- Eiteman, D. et al., Multinational Business Finance, 13. edition, 2012.

- Solnik, B. and D. McLeavey, Global Investments, 6. edition, 2008.

Course: Cost and Management Accounting [2530210]

Coordinators: T. Lüdecke
Part of the modules: Finance 2 (p. 35)[IW4BWLFBV2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (60 min) taking place in the recess period (according to §4 (2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
This course aims at providing students with the understanding of the purposes of alternative costing systems as well as the use of relevant information for decision making. The course will also examine techniques for the purpose of cost management and accounting for control.

Content

- Design of Cost Systems
- Cost Classifications, Cost Behavior, and Principles of Cost Allocation
- Activity-based Costing
- Product Costing
- Production Decisions
- Cost-based Pricing
- Cost Management
- Decisions under Risk
- Cost Accounting for Control

Literature
Elective literature:

- Coenenberg, A.G. Kostenrechnung und Kostenanalyse, 6. Aufl. 2007.
- Ewert, R. und Wagenhofer, A. Interne Unternehmensrechnung, 7. Aufl. 2008.
- Götze, U. Kostenrechnung und Kostenmanagement. 3. Aufl. 2007.
- Kilger, W., Pampel, J., Vikas, K. Flexible Plankostenrechnung und Deckungsbeitragsrechnung , 11. Aufl. 2002.

Remarks
The examination will be offered latest until summer term 2015 (repeaters only).

Course: Internet of Everything [24104]

Coordinators: M. Zitterbart
Part of the modules: Wireless Networking (p. 78)[IW4INWN], Future Networking (p. 80)[IW4INFN]

ECTS Credits	Hours per week	Term	Instruction language
4	2/0	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Knowledge of the lectures *Introduction in Computer Networks* [24519] (or similar lectures) and *Telematics* [24128].

Learning Outcomes

Content

Media
Slides.

Literature
H. Karl, and A. Willig, *Protocols and Architectures for Wireless Sensor Networks*, Wiley and Sons, 2005, ISBN 0470095105.

Course: Internet Law [24354]

Coordinators: T. Dreier
Part of the modules: Intellectual Property Law (p. 114)[IW4JURA4]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
The students have an overview of the legal rules that are touched upon when the Internet is used as a means of communications and for doing business. These legal rules range from the law governing domain names, issues concerning the electronic formation of contracts, distance and electronic commerce contracts, to the issue liability and questions of unfair competition. Students understand how the legal rules depend upon, and interact with, the economic background, legislative policy and information and communication technologies. Students know the rules of national, European and international copyright law and are able to apply these legal rules in practical cases.

Content
The course deals with the legal rules that are touched upon when the Internet is used as a means of communications and for doing business. These legal rules range from the law governing domain names, issues concerning the electronic formation of contracts, distance and electronic commerce contracts, to the issue liability and questions of unfair competition. Students shall understand how the legal rules depend upon, and interact with, the economic background, legislative policy and information and communication technologies. Students shall learn about the rules of national, European and international copyright law and to apply these legal rules in practical cases.

Media
Slides

Literature
Script, Internetrecht (Internet Law)
Elective literature:
Additional literature tba in class.

Remarks
It is possible that this course will be taught in the summer instead of the winter semester.

Course: IT-Security Management for Networked Systems [24149]

Coordinators: H. Hartenstein
Part of the modules: Networking Labs (p. 79)[IW4INNL], Ubiquitous Computing (p. 102)[IW4INAIFB7], Dynamic IT-Infrastructures (p. 88)[IW4INDITI], Networking Security - Theory and Praxis (p. 82)[IW4INNTP]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
Basics in computer networks, according to the lectures *Database Systems* [24516] and *Introduction in Computer Networks* [24519] and *Networked IT-Infrastructures* [24074] respectively are required.

Learning Outcomes

Content
The course of this module teaches how to manage modern highly distributed IT systems and services. As a foundation, key concepts and models commonly used in the areas of IT Security Management, Network Management, Identity Management, and IT Service Management are introduced and discussed.
Based on these concepts, selected technical architectures, protocols, and tools found within the mentioned areas of interest are evaluated. Among others, IT security workflows are illustrated by means of the "BSI Grundschutz". It is explained how highly distributed computer networks can be monitored and controlled, and the management of public IP networks is evaluated. The course also focuses on Identity and Access Management as well as Firewalls, Intrusion Detection, and Prevention. Furthermore, concrete examples taken from the daily operation of the Steinbuch Centre for Computing (SCC), for instance in the context of the glass fiber backbone KITnet, are discussed to underline presented conclusions. By presenting current research activities in the areas of Peer-to-Peer networks (e.g. BitTorrent) and social networks (e.g. Facebook) management approaches are put into a global context

Media
Slides

Literature
Jochen Dinger, Hannes Hartenstein, Netzwerk- und IT-Sicherheitsmanagement : Eine Einführung, Universitätsverlag Karlsruhe, 2008, ISBN: 978-3866442092
Claudia Eckert, IT-Sicherheit. Konzepte - Verfahren - Protokolle, 8. Auflage, Oldenbourg Wissenschaftsverlag, 2013, ISBN: 978-3486721386
Andrew S. Tanenbaum, Computernetzwerke, 5. Auflage, Pearson Studium, 2012, ISBN: 978-3868941371
Messaoud Benantar, Access Control Systems: Security, Identity Management and Trust Models, Springer, 2006, ISBN: 978-0387004457

Course: Knowledge Discovery [2511302]

Coordinators: R. Studer
Part of the modules: Intelligent Systems and Services (p. 100)[IW4INAIFB5]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter term	de

Learning Control / Examinations
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.

Conditions
None.

Learning Outcomes
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.

Content
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.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.

Media
Slides.

Literature

- T. Hastie, R. Tibshirani, J. Friedman. The Elements of Statistical Learning: Data Mining, Inference, and Prediction (http://www-stat.stanford.edu/ tibs/ElemStatLearn/)
- T. Mitchell. Machine Learning. 1997
- M. Berhold, D. Hand (eds). Intelligent Data Analysis - An Introduction. 2003
- P. Tan, M. Steinbach, V. Kumar: Introduction to Data Mining, 2005, Addison Wesley

Course: Cognitive Modeling [24612]

Coordinators: T. Schultz, F. Putze
Part of the modules: Biosignal Processing (p. 89)[IW4INBSV]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Knowledge in the area of cognitive systems or biosignal processing is helpful.

Learning Outcomes
Students have a general overview of the methods for modeling human cognition and affect in the context of human-machine interaction. They are capable of modeling human behavior in a given application, e.g. to simulate realistic virtual environments or to enable natural interaction between user and machine.

Content
The lecture centers on the modeling of human cognition and affect in the context of human-machine interaction. It deals with models which can be used by computer systems to describe, explain and predict human behavior. Important topics of the lecture are: human behavior models, human learning (similarities and differences to machine learning), knowledge representation, models of affect and cognitive architectures. The relevance of cognitive modeling for future computer systems is pointed out and examples of open research questions in the area of human-machine interaction are given.

Media
Slides.

Literature
Elective literature:
Will be announced in the lecture.

Course: Component Based Software Architecture [24667]

Coordinators: R. Reussner, Andreas Rentschler
Part of the modules: Software Methods (p. 76)[IW4INSWM], Software Systems (p. 75)[IW4INSWS]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
Students understand basic and advanced concepts of component-based software engineering. They are able to evaluate existing middleware plattforms regarding their suitability for realising component-based software-systems. They understand the role of component and an explicit software architecture description for an engineering approach to software development. They know approaches to create and use software components. Specific topics like interoperability checks and contractual use are understood and can be applied in projects. Approaches to document, evaluate and reuse architectures are understood and can be applied. More concretely, software architectural patterns and product lines are understood and can be evaluated regarding their project specific suitability.

Content
Enterprise Java Beans (EJBs), CORBA or COM - component-based software development is successful in industry, and shows widespread and growing support within the software engineering discipline. The advantages of component-based software development include the reusability of components and thereby an increased efficiency in the development, shortened development cycles and hence a reduction of time-to-market.

From a scientific point of view, statements about the compatibility and functionality of connected components need particular attention. In addition, component-based approaches are particularly suited for the engineering of software with predictable quality attributes. This allows, for example, determining performance and reliability characteristics before the actual implementation of a software system. On this basis, one can make informed decisions about alternatives during the design phase of software.

In the lecture, paradigms and techniques for a systematic approach to design, implementation and testing of software components will be taught. These include, among other things, UML for the description of static and dynamic aspects of components, interface design, parameterized contracts, component adaptation and interoperability. Using the Palladio component model, trends and advanced technologies are presented, such as performance prediction at design time, role models for design and development of component-based software, and model-driven code generation.

The course deals with UML as a language for describing components and architectures. The evaluation of architectures is illustrated by the SAAM and ATAM process. Attention is also paid to the development process, where the emphasis is placed on developing using model-driven architecture (MDA). In this context, the lecture deals with technologies such as MOF, OCL and architecture-and model-driven software development (AC-MDSD). Modern middleware such as Java EE / EJB is presented together with taxonomy of different types of middleware. Furthermore, software product lines, SOA (service-oriented architectures) and architectural pattern are covered in the course. The treatment of functional architectural features will be complemented by presentation of the methods for analysis of extra-functional properties of architectures, including model-based method for predicting the performance.

Media
Slides

Literature

- Ralf Reussner, Wilhelm Hasselbring: "Handbuch der Software-Architektur", 2. Auflage (dPunkt-Verlag, Heidelberg, 2008)
- Torsten Posch et al.: "Basiswissen Software-Architektur" (dPunkt-Verlag, Heidelberg, 2004)Johannes Siedersleben: "Moderne Software-Architektur" (dPunkt-Verlag, Heidelberg, 2004)
- Paul Clements et al.: "Documenting Software Architectures: Views and Beyond" (Addison-Wesley, Boston, 2005)
- C. Szyperski, D. Gruntz, S. Murer, **Component Software**, Addison-Wesley, 2002, 2nd Ed.Ian Gorton: "Essential Software Architecture" (Springer, Berlin, 2006)

Elective literature:

- W. Beer, D., H.-P. Mössenböck, A. Wöß, ***Die . NET- Technologie. Grundlagen und Anwendungsprogrammierung,*** dPunkt Verlag, 2002

- S. W. Ambler, T. Jewell, E. Roman, ***Mastering Enterprise Java Beans,*** Wiley, 2006, 3rd Ed.
- P. Herzum, O. Sims, ***Business Component Factory,*** Wiley, 1999
- A. W. Brown, ***Large-scale Component-based Development,*** Prentice-Hall, 2000
- J. Cheesman, J Daniels, ***UML Components,*** Addison-Wesley, 2000
- C. Atkinson et al., ***Component-based Product Line Engineering with UML,*** Addison-Wesley, 2002
- Buschmann et al., **Pattern-oriented Software Architecture,** vol. 1-5, Wiley, 1996-2003
- Martin Fowler, **Analysis Patterns - Reusable Object Models** Addison-Wesley, 1997
- d'Souza, Wills, **Object, Components and Frameworks with UML - The Catalysis Approach,** Addison-Wesley, 1998
- Stephen J. Mellor: "MDA Distilled" (Addison-Wesley, Boston, 2004)
- W. Beer, D. Birngruber, H. Mössenböck, A. Wöß: "Die .NET- Technologie. Grundlagen und Anwendungsprogrammierung" (dPunkt-Verlag, Heidelberg, 2003)
- Ed Roman, Rima Patel Sriganesh, Gerald Brose: "Mastering Enterprise Java Beans" (Wiley, New York, 2006, 3rd Ed.)
- John Cheesman and John Daniels: "UML Components" (Addison-Wesley, Boston, 2001)
- Colin Atkinson et al.: "Component-based Product Line Engineering with UML" (Addison-Wesley, Boston, 2002)
- Frank Buschmann et al.: "Pattern-oriented Software Architecture" (Wiley, New York, 1996-2004)
- Desmond Francis D'Souza, Alan Cameron Wills: "Object, Components and Frameworks with UML - The Catalysis Approach" (Addison-Wesley, Boston, 1999)
- Markus Völter and Thomas Stahl: "Model-Driven Software Development" (Wiley, New York, 2006)

Remarks

This lecture will be offered from the summer term 2011 on. It replaces the lectures *Component Based Software Engineering* and *Software Architecture*.

Course: Context Sensitive Systems [24658]

Coordinators: M. Beigl, Till Riedel
Part of the modules: Context Sensitive Systems (p. 92)[IN4INKUS]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
The goal of the course is to provide knowledge about the basics, the methods and techniques of context-sensitive systems. After completing this course, students can

- explain and dicuss the concept of context and list various context that are relevant for information processing by humans and computers
- categorize and separate different types of context-sensitive systems based on different criteria
- derive concrete technical implementations based on a general structure and existing components
- evaluate, rate and compare the performance of specific context-sensitive systems based on experimentally determined metrics
- design new context-sensitive systems themselves using existing "sensor", "machine learning" and "Big Data" design components based on given specifications

Content

- Context and Activity Recognition
- Machine Learning and Predictive Analytics
- Big Data Platforms for Sensor Data Processing
- Sensor Data and Time Series Processing

Literature
Introduction: John Krumm, Ubiquitous Computing Fundamentals, 2009, Chapter 7-9.
Schilit, Bill, Norman Adams, and Roy Want. "Context-aware computing applications." First Workhop on Mobile Computing Systems and Applications, IEEE, 1994. Witten, Ian H., and Eibe Frank. Data Mining: Practical machine learning tools and techniques. Morgan Kaufmann, 2005.
Further literature will be announced.

Course: Convex Analysis [2550120]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 61)[IW4OR6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1		de

Learning Control / Examinations
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.

Conditions
None.

Recommendations
It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Learning Outcomes
The student

- knows and understands the fundamentals of convex analysis,

- is able to choose, design and apply modern techniques of convex analysis in practice.

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

Media
Lecture notes.

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.

Remarks
The lecture is offered irregularly. The curriculum of the next three years is available online (www.ior.kit.edu).

Course: Mechanisms and Applications of Workflow Systems [24111]

Coordinators: J. Mülle, Silvia von Stackelberg
Part of the modules: Innovative Concepts of Data and Information Management (p. 84)[IW4INIKDI], Entrepreneurship for
Computer Scientists (p. 111)[IW4INUKI]

ECTS Credits	Hours per week	Term	Instruction language
5	3	Winter term	de

Learning Control / Examinations
It will be announced in advance if the assessment consists of a written exam (approx. 60 minutes) according to section 4 subsection 2 no. 1 study and examination regulations or of an oral exam (approx. 20 minutes) following according to section 4 subsection 2 no. 2 study and examination regulations.

Conditions
None.

Recommendations
Knowledge about database systems, e.g. from the lecture *Database Systems* [24516].

Learning Outcomes
A goal of the course is that the participants are able to model workflows, to explain modelling aspects and their relationships, to compare modelling methods, and to evaluate the usability of these methods in different application areas. They should understand the technical construction of workflow-management systems with the most important components and different architectures and implementation alternatives. Finally, the participants should have obtained an overview on actual relevant standardization proposals and how to use these approaches, and they should be aware of actual research topics.

Content
Workflow Management Systems (WFMS) support the management of business processes according to pre-defined process descriptions. Managing processes flexibly, i.e., handle deviations, e.g., in order to catch exceptions, adapt processes to modified process environments or to support ad-hoc workflows, becomes more and more important.
The course starts with discussing WFMS in the context of business-information systems and their relationship with the more common business-process modelling. Petri nets and pi-calculus are introduced as basic formalisms. Then, methods to model workflows and the design process for workflow-management applications are presented in detail and supplemented with exercises.
An advanced aspect is new research in WFMS technology. In particular, the use of internet techniques like web services and standardization approaches for process modeling, orchestration, and choreography in service-oriented architectures will be presented.
In the realization part of the course, various implementation techniques and architectural issues to realize workflow-management systems as well as diverse system types and concrete workflow-management systems are presented.
Further, the course presents application-driven procedures for changing and adapting workflows to new reqirements, especially business process reengineering and continous process improvement.
The course concludes with recent research areas and results, e.g., methods and techniques to support flexible, adaptive workflows, security of workflows and process mining.

Media
Slides.

Literature

- Matthias Weske: Business Process Management. Springer, 2007

- Frank Leymann, Dieter Roller: Production Workflows - Concepts and Techniques. Prentice-Hall, 2000

- W.M.P. van der Aalst: Workflow Management: Models, Methods, and Systems. MIT Press, 368 pp., 2002

- W.M.P. van der Aalst: Workflow Management: Models, Methods, and Systems. MIT Press, 368 pp., $40.00, ISBN 0-262-01189-1, 2002

- Michael Havey: Essential Business Process Modeling. O´Reilly Media, Inc., 2005

- S. Jablonski, M. Böhm, W. Schulze (Hrsg.): Workflow-Management - Entwicklung von Anwendungen und Systemen. dpunkt-Verlag, Heidelberg, 1997

Elective literature
Will be announced in the lecture.

Course: Hospital Management [2550493]

Coordinators: S. Nickel, Hansis
Part of the modules: Operations Research in Supply Chain Management and Health Care Management (p. 59)[IW4OR4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	Winter / Summer Term	de

Learning Control / Examinations
The assessment consists of attendance, a seminar thesis and a final exam (according to §4(2), 1 of the examination regulation). The examination is held in the term of the lecture and the following lecture.

Conditions
See German version.

Learning Outcomes
The student

- understands the pronciples of work flows in hospitals,

- utilizes Operations Research methods in so-called non-profit-organisations to improve service qualities,

- explains, classifies and deals with the most important application areas for mathematical models, e.g. personnel planning or quality management.

Content
The lecture "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. Students have the possibility to participate in a final exam.

Remarks
The credits have been changed from 3 to 4,5.
The lecture is held in every semester.
The planned lectures and courses for the next three years are announced online.

Course: Credit Risk [2530565]

Coordinators: M. Uhrig-Homburg
Part of the modules: Finance 2 (p. 35)[IW4BWLFBV2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
The objective of this course is to become familiar with the credit markets and the credit risk indicators like ratings, default probabilities and credit spreads. The students learn about the components of credit risk (e.g. default time and default rate) and quantify these in different theoretical models to price credit derivatives.

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

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).

Course: Cryptographic Voting Schemes [24691]

Coordinators: J. Müller-Quade
Part of the modules: Computer Security (p. 68)[IW4INSICH], Advanced Topics in Cryptography (p. 69)[IW4INFKRYP]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
The student
• knows and understands the basics of different cryptographic voting systems
• judges the properties as well as advantages and disadvantages of cryptographic voting systems
• knows and understands the cryptographic primitives of cryptographic voting schemes and combines them to larger systems
• knows, understands and employs the fundamental definitions and security notions for election schemes
• assesses the security requirements of an election, identifys potential attacks and appraises security measures

Content
This course will present a detailed overview over current cryptographic voting systems for booth voting as well as remote voting (mail voting and internet voting).
• The most important cryptographic primitives such as commitments, homomorphic encryption schemes, mix nets and zero-knowledge proofs will be covered.
• The course presents and explains current security notions for cryptographic voting schemes.
• During the course the requirements of an election, especially with regard to booth and remote voting, will be discussed. From this, attack scenarios are developed and compared to the security properties of the voting schemes and to established security notions.

Course: Curves and Surfaces in CAD I [2400006]

Coordinators: H. Prautzsch
Part of the modules: Curves and Surfaces (p. 91)[IW4INKUF]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
Knowledge of basic techniques enabling the student to attend advanced courses as „Curves and Surfaces II and III", „ Rational Splines" or „Subdivision algorithm"

Content
Bèzier-and B-spline techniques, constructive algorithms, underlying geometric structures, as described in the book "Bèzier-and B-spline techniques".
The first course covers curves and tensor product surfaces, the second course is on constructions of smooth free form surfaces and the third course is devoted to box splines, multivariate splines, fair surfaces, scattered data interpolation and selected topics.

Media
Blackboard, slides.

Literature

- Prautzsch, Boehm, Paluszny: Bézier and B-Spline Techniques, Springer 2002

Elective literature:

- Farin: Curves and Surfaces for CAGD, Fifth Edition, 2002

- de Boor: A practical guide to splines, 2001

Course: Curves and Surfaces in CAD II [CFD2]

Coordinators: H. Prautzsch
Part of the modules: Curves and Surfaces (p. 91)[IW4INKUF]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
Knowledge of the lecture "Curves and surfaces in CAD I" or otherwise aquired knowledge of bezier and b-spline techniques for curves.

Learning Outcomes
Knowledge of basic techniques enabling the student to attend advanced courses as „Curves and Surfaces III", „ Rational Splines" or „Subdivision algorithm".

Content
Bèzier-and B-spline techniques, constructive algorithms, underlying geometric structures, as described in the book "Bèzier-and B-spline techniques".

The first course covers curves and tensor product surfaces, the second course is on constructions of smooth free form surfaces and the third course is devoted to box splines, multivariate splines, fair surfaces, scattered data interpolation and selected topics.

Media
Blackboard, slides.

Literature

- Prautzsch, Boehm, Paluszny: Bézier and B-Spline Techniques, Springer 2002

Elective literature:

- Farin: Curves and Surfaces for CAGD, Fifth Edition, 2002
- de Boor: A practical guide to splines, 2001

Course: Curves and Surfaces in CAD III [KFCAD3]

Coordinators: H. Prautzsch
Part of the modules: Curves and Surfaces (p. 91)[IW4INKUF]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
It is recommended to attend the lecture "Curves and Surfaces in CAD II".

Learning Outcomes
Knowledge of basic techniques enabling the student to attend advanced courses as „Curves and Surfaces III", „ Rational Splines"
or „Subdivision algorithm"

Content
Bèzier-and B-spline techniques, constructive algorithms, underlying geometric structures, as described in the book "Bèzier-and
B-spline techniques". The first course covers curves and tensor product surfaces, the second course is on constructions of
smooth free form surfaces and the third course is devoted to box splines, multivariate splines, fair surfaces, scattered data
interpolation and selected topics.

Remarks
The lecture will presumably be offered again in the summer term 2011.

Course: Reading Group Context Sensitive Systems [24696]

Coordinators: M. Beigl, Till Riedel
Part of the modules: Context Sensitive Systems (p. 92)[IN4INKUS]

ECTS Credits	Hours per week	Term	Instruction language
1	1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
After completing the course, the students can

- discuss complex issues using predefined literature
- naturally translate these issues into a popular science context
- assess and evaluate scientific work independently

Content

Course: Reading Group Human-Machine-Interaction [24697]

Coordinators: M. Beigl
Part of the modules: Human-Machine-Interaction (p. 93)[IW4INMMI]

ECTS Credits	Hours per week	Term	Instruction language
1	1	Summer term	en

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content
This weekly reading group is designed to encourage the discussion of basic and current HCI topics, across the interests of the whole group. The publications discussed in this course are suggested by participants and/or lecturers. This allows the study of up-to-date
publications presented in recent conferences, but fundamental and pioneering publications in past can be also discussed.
Topics covered in this course include HCI fundamentals, Mobile UI, Tangible UI, Augmented Reality, Organic User Interface (OUI), or Human Augmentation, but not limited to these.

Course: Reading Group [24673]

Coordinators: R. Reussner
Part of the modules: Software Systems (p. 75)[IW4INSWS], Software Methods (p. 76)[IW4INSWM]

ECTS Credits	Hours per week	Term	Instruction language
1	1	Winter / Summer Term	de

Learning Control / Examinations
The assessment (not graded) consists of participation in discussions and presentation of an article from a learned journal or conference proceedings.

Conditions
None.

Learning Outcomes
Through critical reading and analysis of scientific publications, the participants of the reading group learn to evaluate and to review related work and scientific publications in general. Thus, they learn how to write good papers, and how to avoid the usual pitfalls. By analysing cutting-edge research papers, the participants gain additional knowledge in the area of software engineering, and the discussions of the reading group complement the conventional self-study for the lectures and exams. The reading group also serves as a forum for networking with peers working in the area of software engineering.

Content
The contents of the reading group cover a broad area, from multi-core programming and performance prediction for enterprise software, over SOA and software evolution and evaluation of software architectures. The concrete scientific publications that are read and discussed are suggested by the participants, and the organisers then select papers that promise the largest benefits to the participants. Thus, the publications are selected dynamically, allowing for new and "hot" papers to be read and discussed. Additionally, visionary and ground-breaking papers of the last few years are discussed where appropriate.

Media
Electronic versions of learned journals will be made available to all participants.

Literature
The learned journals covered in the reading group.
Elective literature:
Sources referenced in the learned journals covered in the reading group.

Course: Markets and Organizations: Principles [2540502]

Coordinators: A. Geyer-Schulz
Part of the modules: Electronic Markets (p. 27)[IW4BWLISM2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations

Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation.

The course is considered successfully taken, if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 10) from excersise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	95
1.3	90
1.7	85
2.0	80
2.3	75
2.7	70
3.0	65
3.3	60
3.7	55
4.0	50
5.0	0

Conditions
None.

Learning Outcomes

The student

- has an overview about the different organizational form and their efficiency,

- names coodination methods and motivation methods and evaluates them regarding their efficiency,

- knows, in the context of markets as a coordination form, the conditions under which markets are not efficient (market failure),

- knows phenomena like adverse selections and moral hazard,

- names reasons for these phenomena and develops methods to encounter them.

Content

What are the conditions that make markets develop? The first part of the lecture treats the selection of the type of organization as an optimization of transaction costs. The second part includes the efficiency of markets (price, information and allocation efficiency) as well as reasons for market failure.

Besides a centralistic approach, markets can be used for decentral coordination of plans and activities. Hereby, optimality can be garuanteed, if the coordination problem has no design or innovation characteristics. Viewed from a bottom-up perspective, given the coordination problem, it is possible to answer questions regarding the centralization or decentralization, the design of coordination mechanisms, and the coherence of business strategies. The last part of the lecture consists of motivation problems, like bounded rationality and information assymetries (private information and moral hazard) and the development of incentive systems.

Literature

Kapitel "Management Control Systems, Dezentralisierung, interne Märkte und Transferpreise" (S. 745-773) in Charles T. Horngren, Srikant M. Datar, and George Foster. Cost Accounting: A Managerial Emphasis. Prentice Hall, Upper Saddle River, 11 edition, 2003.

Paul Milgrom and John Roberts. Economics, Organisation and Management. Prentice Hall, 1 edition, 1992.

Elective literature:

Michael Dell and Catherine Fredman. Direct from DELL: Strategies that Revollutionized an Industry. Harper Collins Publisher, London, 1999.

Andreas Geyer-Schulz, Michael Hahsler, and Maximillian Jahn. Educational and scientific recommender systems: Designing the information channels of the virtual university. International Journal of Engineering Education, 17(2):153 – 163, 2001.

Friedrich A. Hayek. The use of knowledge in society. The American Economic Review, 35(4):519 – 530, Sep 1945.

Norbert Hochheimer. Das kleine QM-Lexikon. Wiley-UCH, Weinheim, 2002.
Adam Smith. An Inquiry into the Nature and Causes of the Wealth of Nations, volume II. 1976.

Remarks
The course is not offered at the moment. The last exam takes place at the end of summer term 14.

Course: Management Accounting 1 [2579900]

Coordinators: M. Wouters
Part of the modules: Management Accounting (p. 52)[IW4BWLIBU1]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/2	Summer term	en

Learning Control / Examinations
The assessment consists of a written exam (90 minutes) (following §4(2), 1 of the examination regulation) at the end of each semester.

Conditions
None.

Learning Outcomes
Students have an understanding of theory and applications of management accounting topics. They can use financial information for various purposes in organizations.

Content
The course covers topics in management accounting in a decision-making framework. Some of these topics in the course MA1 are: short-term planning, investment decisions, budgeting and activity-based costing.
We will use international material written in English.
We will approach these topics primarily from the perspective of the users of financial information (not so much from the controller who prepares the information).
The course builds on an introductory level of understanding of accounting concepts from Business Administration courses in the core program. The course is intended for students in Industrial Engineering.

Media
The recorded lectures and the teaching materials are available on Ilias during the current and next semester.

Literature

- Marc Wouters, Frank H. Selto, Ronald W. Hilton, Michael W. Maher: Cost Management – Strategies for Business Decisions, 2012, Publisher: McGraw-Hill Higher Education (ISBN-13 9780077132392 / ISBN-10 0077132394)

- In addition, several papers that will be available on ILIAS.

Course: Management Accounting 2 [2579902]

Coordinators: M. Wouters
Part of the modules: Management Accounting (p. 52)[IW4BWLIBU1]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/2	Winter term	en

Learning Control / Examinations
The assessment consists of a written exam (90 minutes) (following §4(2), 1 of the examination regulation) at the end of each semester.

Conditions
None.

Recommendations
It is recommended to take part in the course "Management Accounting 1" before this course.

Learning Outcomes
Students have an understanding of theory and applications of management accounting topics. They can use financial information for various purposes in organizations.

Content
The course covers topics in management accounting in a decision-making framework. Some of these topics in the course MA2 are: cost estimation, product costing and cost allocation, financial performance measures, transfer pricing, strategic performance measurement systems and customer value propositions.
We will use international material written in English.
We will approach these topics primarily from the perspective of the users of financial information (not so much from the controller who prepares the information).
The course builds on an introductory level of understanding of accounting concepts from Business Administration courses in the core program. The course is intended for students in Industrial Engineering.

Media
The recorded lectures and the teaching materials are available on ILIAS during the current and next semester.

Literature

- Marc Wouters, Frank H. Selto, Ronald W. Hilton, Michael W. Maher: Cost Management – Strategies for Business Decisions, 2012, Publisher: McGraw-Hill Higher Education (ISBN-13 9780077132392 / ISBN-10 0077132394)

- In addition, several papers that will be available on ILIAS.

Course: Managing New Technologies [2545003]

Coordinators: T. Reiß
Part of the modules: Entrepreneurship (EnTechnon) (p. 44)[IW4BWLENT1]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	de

Learning Control / Examinations
Written exam 100% following §4, Abs. 2.

Conditions
None.

Learning Outcomes
New technologies can contribute substantially to the international competitiveness of different industrial sectors. This course provides the necessary knowledge for understanding how industrial enterprises and policy-makers are dealing with the challenge to realise in time the potentials of new technologies and to use them most efficiently. Key tasks of the management of new technologies will be practised.

Content
The course provides an overview of the international development of a selected number of key technologies such as biotechnology, nanotechnology, neurotechnologies, converging technologies. Methods for monitoring new technologies including foresight approaches will be presented and the economic and social impacts of new technologies will be discussed.

Media
Slides.

Literature

- Hausschildt/Salomo: Innovationsmanagement; Borchert et al.: Innovations- und Technologiemanagement;

- Specht/Möhrle; Gabler Lexikon Technologiemanagement

Course: Management of IT-Projects [2511214]

Coordinators: R. Schätzle
Part of the modules: Development of Business Information Systems (p. 104)[IW4INAIFB11]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	de

Learning Control / Examinations
The assessment of this course is a written examination (60 min) in the first week after lecture period according to Section 4(2), 1 of the examination regulation.

Conditions
None.

Learning Outcomes
Students

- explain the terminology of IT project management and typical used methods for planning, handling and controlling,
- apply methods appropiate to current project phases and project contexts,
- consider organisational and social impact factors.

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.

Media
Slides, access to internet resources.

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.

Course: IT Complexity in Practice [2511404]

Coordinators: D. Seese, Kreidler
Part of the modules: Development of Business Information Systems (p. 104)[IW4INAIFB11]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter term	de

Learning Control / Examinations
see German version.

Conditions
see German version.

Learning Outcomes
see German version.

Content
see German version

Literature
Elective literature:
Will be announced in the lecture.

Course: Trademark and Unfair Competition Law [24136 / 24609]

Coordinators: Y. Matz
Part of the modules: Intellectual Property Law (p. 114)[IW4JURA4]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Winter / Summer Term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
The students have competent knowledge in the area of trademark rights in the national as well as the European and International context, The students have good capabilities especially with the procedures of registration and the claims, which result from the infringements of trademark rights, as well as with the right of other marks in the MarkenG

Content
The course deals with the subject matter of trademark rights: what is a trademark, how can I get the registration of a trademark, what rights and claims do owner of trademarks have, which other marks do exist? The students shall learn about the rules of national, European an international trademark law.

Literature

- Berlit, Wolfgang: Markenrecht, Verlag C.H.Beck, ISBN 3-406-53782-0, neueste Auflage.

Course: Market Engineering: Information in Institutions [2540460]

Coordinators: C. Weinhardt
Part of the modules: Market Engineering (p. 29)[IW4BWLISM3], Electronic Markets (p. 27)[IW4BWLISM2], Applied Strategic Decisions (p. 53)[IW4VWL2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	en

Learning Control / Examinations
The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation). By successful completion of the exercises (according to §4(2), 3 of the examination regulation) up to 6 bonus points can be obtained. The bonus points only apply to the first and second exam of the semester in which they were obtained.

Conditions
None.

Learning Outcomes
The students

- understand the role of an economist as an engineer to design markets,

- compare different markets and market mechanisms to evaluate their efficiency,

- apply game theoretic modelling and mechanism design as well as auction theory for interdisciplinary evaluation.

Content
The ongoing advancements in information technology have revolutionized traditional business processes and given rise to electronic marketplaces. In contrast to physical marketplaces, electronic markets do not just evolve, but must be carefully designed, implemented and monitored and evaluated. Moreover electronic markets demand open and flexible platforms as well as adequate standards and information services. Future Market Engineers must therefore be able to consider the economic, legal and technological dimension of markets simultaneously. The lecture focuses on the discussion of (1) Microstructure, (2) IT infrastructure, and (3) Business Structure of electronic markets. Hence, students will be taught the economic incentives that a market can impose on market participants, development models for implementing markets, and business models for the application of markets.

Media

- PowerPoint

- E-learning platform ILIAS

Literature

- Roth, A., The Economist as Engineer: Game Theory, Experimental Economics and Computation as Tools for Design Economics. Econometrica 70(4): 1341-1378, 2002.

- Weinhardt, C. ,Holtmann, C., Neumann, D., Market Engineering. Wirtschaftsinformatik, 2003.

- Wolfstetter, E., Topics in Microeconomics - Industrial Organization, Auctions, and Incentives. Cambridge, Cambridge University Press, 1999.

- Smith, V. „Theory, Experiments and Economics", The Journal of Economic Perspectives,Vol. 3, No. 1, 151-69 1989

Course: Marketing Analytics [2572170]

Coordinators: M. Klarmann
Part of the modules: Evidence-based Marketing (p. 50)[IW4BWLMAR8]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	en

Learning Control / Examinations
The assessment consists of a written exam (60 min) (according to Section 4(2), 1 of the examination regulation)

Conditions
In order to attend Marketing Analytics, students are required to have passed the course Market Research [2571150].

Learning Outcomes
Students

- receive based on the course market research an overview of advanced empirical methods
- learn in the course of the lecture to handle advanced data collection and data analysis methods
- are based on the acquired knowledge able to interpret results and derive strategic implications

Content
In this course various relevant market research questions are addressed, as for example measuring and understanding customer attitudes, preparing strategic decisions and sales forecasting. In order to analyze these questions, students learn to handle social media data, panel data, nested observations and experimental design. To analyze the data, advanced methods, as for example multilevel modeling, structural equation modeling and return on marketing models are taught. Also, problems of causality are addressed in-depth. The lecture is accompanied by a computer-based exercise, in the course of which the methods are applied practically.

Media
Script

Literature
References will be given in the course.

Remarks
For further information please contact the Marketing & Sales Research Group (marketing.iism.kit.edu).
Exchange students can bypass the requirement of passing Market Research if they can prove that they possess sufficient statistical knowledge based on courses attended at their home institution. This will be examined individually by the Marketing & Sales Research Group.

Course: Marketing Strategy Business Game [2571176]

Coordinators: M. Klarmann, Mitarbeiter
Part of the modules: Marketing Management (p. 46)[IW4BWLMAR5]

ECTS Credits	Hours per week	Term	Instruction language
1,5	1	Summer term	de

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes
Students
- are able to operate the strategic marketing simulation software "Markstrat"
- are able to take strategic marketing decisions in groups
- know how to apply strategic marketing concepts to practical contexts (e.g. for market segmentation, product launches, coordination of the marketing mix, market research, choice of the distribution channel or competitive behavior)
- are capable to collect and to select information usefully with the aim of decision-making
- are able to react appropriately to predetermined market conditions
- know how to present their strategies in a clear and consistent way
- are able to talk about the success, problems, critical incidents, external influences and strategy changes during the experimental game and to reflect and present their learning success

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.

Remarks
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).
Please note: The number of participants for this course is limited. The Marketing & 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.

Course: Marketing Communication [2540440]

Coordinators: J. Kim
Part of the modules: Marketing Management (p. 46)[IW4BWLMAR5], Services Marketing (p. 51)[IW4BWLMAR9]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
The assessment consists of a written examination (60 min) (according to Section 4 (2),1 of the examination regulation).

Conditions
None.

Learning Outcomes
Students

- get to know marketing communications objectives and strategies
- gain knowledge about positioning and integrated marketing communications as part of advertising strategy
- know how to apply social-technique rules on advertising
- learn techniques for measuring the advertising effects from activation through to actual behavior
- learn about online marketing instruments and how to measure their success
- learn about budgeting models and media planning
- learn about economic and behavioral theories of promotions
- gain knowledge about CSR and how it is connected to marketing

Content
The aim of this lecture is to provide an overview of research on marketing communication tools, such as offline and online advertising, budgeting and media planning, price promotions and corporate social responsibility activities.

Media
Lecture slides will be provided in ILIAS

Literature

- Esch, F-R./Herrmann, A./Sattler, H. "Marketing – Eine managementorientierte Einführung"
- Kroeber-Riel, W./Esch, F-R. "Strategie und Technik der Werbung"
- Fuchs, W./Unger, F. (2007): „Management der Marketing Kommunikation"
- Stokes, Rob (2012), "eMarketing: The Essential Guide to Online Marketing," hier erhältlich:http://students.flatworldknowledge.com/cou
- Gedenk, Karen (2002), "Verkaufsförderung"

See lecture slides for further recommendations on literature

Remarks
New course starting summer term 2015.
The credits for the course have been changed from 3 to 4,5 from summer term 2016 on.

Course: Market Research [2571150]

Coordinators: M. Klarmann
Part of the modules: Marketing Management (p. 46)[IW4BWLMAR5], Evidence-based Marketing (p. 50)[IW4BWLMAR8], Sales Management (p. 48)[IW4BWLMAR6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

Conditions
Please note that this course has to be completed successfully by students interested in seminar or master thesis positions at the chair of marketing.

Learning Outcomes
Topics addressed in this course are for example:

Theoretical principles of market research
Statistical foundations of market research
Measuring customer attitudes
Understanding of customer reactions
Strategical decision making

Content
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

Remarks
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

Course: Market Microstructure [2530240]

Coordinators: T. Lüdecke
Part of the modules: Finance 2 (p. 35)[IW4BWLFBV2]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Winter term	de

Learning Control / Examinations

Conditions
Knowledge of the content of the course *Asset Pricing* [2530555] is assumed.

Learning Outcomes
This lecture makes students familiar with the fundamental models of trading in financial markets. It starts with generic design features of financial markets which are used to frame price discovery as the key element of the trading process. The link between market design and market quality is pointed out by using alternative measures of market quality. Seminal models of market microstructure are used to show how dealer inventoy and/or asymmetric information affect market prices and the pricing of securities. Theoretical models are shown to provide predictions which are consistent with empiricial evidence.

Content
The focus of this lecture is on the question how the microstructure of financial markets affects price discovery and market quality. First, issues in designing market structure are presented and linked to fundamental dimensions of market quality, i.e liquidity and trading costs. In particular, the services and privileges of market makers are stressed. The main part of the lecture covers inventory-models of dealer markets and models of information-based trading. The final part gives attention to some econometric models to analyze the short-term behavior of security prices.

Media
Slides.

Literature
keine
Elective literature:
See reading list.

Remarks
This lecture will not be provided any more. The examination will be offered latest until winter term 2015/2016 (repeaters only).

Course: Machine Learning 1 - Basic Methods [24150]

Coordinators: R. Dillmann, J. Zöllner, S. Ulbrich, M. Zofka
Part of the modules: Automated visual inspection (p. 107)[IW4INAS], Image-based detection and classification (p. 110)[IW4INBDK]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.
The exam can be taken every semester during the lecture period.

Conditions
None.

Recommendations
Previous attendance of the lectures *Formal Systems* and *Cognitive Systems* is helpful, but not mandatory.

Learning Outcomes

- Students acquire knowledge on the fundamental methods of the field of machine learning

- They are able to classify these methods, know their formal description and evaluate them.

Content
The topic of knowledge acquisition and machine learning is a rapidly expanding field and is topic to countless research and development projects. Knowledge can be acquired by many different means: A system can benefit from prior experiences, it can be trained, or it can deduce new knowledge from an exhaustive knowledge base.
This lecture presents the topics of symbolic learning such as inductive learning (i.e., learning from examples and observations), deductive learning and learning from analogies. Furthermore, sub-symbolic techniques such as artificial neural networks, support vector machines, genetic algorithms and reinforcement learning are addressed.
This lecture introduces the fundamental principles and structures of learning systems and learning theory and analyses existing algorithms. They are demonstrated and explained on accompanying examples from robotics, autonomous mobile systems and image processing.

Media
Lecture slides

Literature
Lecture slides are available as PDF.
Elective literature:
Tom Mitchell: "Machine Learning", McGraw Hill, 1997
Duda, Hart, Stork: "Pattern Classification", 2nd Ed., John Wiley & Sons, 2001
Berthold, Hand: "Intelligent Data Analysis", 2nd Ed., Springer, 2003
Michalski et al.. "Machine Learning - An Artificial Intelligence Approach", Vol. 1-4, Morgen Kaufmann, 1983-1994
More (specific) literature on selected topics will be announced in the lecture.

Course: Machine Learning 2 – Advanced methods [24620]

Coordinators: J. Zöllner, R. Dillmann, S. Ulbrich, M. Weber
Part of the modules: Image-based detection and classification (p. 110)[IW4INBDK]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Prior attendance of the lecture *Machine Learning 1* or a comparable lecture will be helpful for comprehending the lecture, but it is not mandatory.

Learning Outcomes

- Students have a deeper understanding of the concepts of machine learning and their application
- Students can classify methods and formally describe and evaluate them
- They can embed these methods into complex decision making and inference systems
- The students are capable of selecting adequate models and methods for solving problems arising in the field of machine learning.

Content
The domain of machine reasoning and machine learning under the constraints of real life application is an expanding area with many ongoing research projects.

The focus of this lecture lies on extended methods of machine learning algorithms like semi-supervised and active learning, deep neural networks, spiking neural networks, hierarchical learning like for instance in reinforcement learning and dynamic, probabilistic relational models. The integration and application of machine learning in real systems is also discussed.

The lecture introduces the newest principles and extended structures and analyzes known algorithms. The structure and working principles of applied learning systems is shown and explained on different application areas, mainly from the field of technical, semi-autonomous (robotics, neurorobotics, perception etc.) systems.

Media
Slides.

Literature
Lecture slides are available as PDF.
Elective literature:

- Stuart J. Russell, Peter Norvig: *„Künstliche Intelligenz: Ein moderner Ansatz"*, Pearson Studium, 2004
- More (specific) literature on selected topics will be announced in the lecture.

Course: Master Seminar in Information Engineering and Management [2540510]

Coordinators: A. Geyer-Schulz
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment of this course is according to §4(2), 3 of the examination regulation in form of an examination of the written seminar thesis and a presentation.
The grade is given, if the presentation is held and the seminar thesis is handed in.
The grade of this course is based on the grade of the seminar thesis. The presentation can improve or worsen the grade of the seminar thesis by up to two grade levels (up to 0.7 grades).

Conditions
None.

Learning Outcomes
The student is able to

- to perform a literature search for a given topic, to identify, find, value and evaluate the relevant literature.
- to commit to a topic (pr.n., in teamwork); this may include technical conceptial work and implementation.
- to write his seminar thesis of 15-20 pages in a structured scientific manner.
- to communicate his results in a presentation with discussion afterwards.

Content
The seminar servers on one hand to improve the scientific working skills. On the other hand, the student should work intensively on a given topic and develop a scientific work, that is based on a profound literature research.
The seminar can also be a implementation of software for a scientific problem (e.g. Business Games/dynamic systems) according to the individual focus in the current semester. The software has to be well documented. The written elaboration covers a description and explanation of the software as well as a discussion about limits and extensibility. Furthermore the software must be deployable und shall be presented on the infrastructure stack of the chair. An implementation of a software has to examine the scientific state of the art in a critical way, too.
A concrete description of the current topics is announced in time for the begin of the application stage.

Course: Mathematical Theory of Democracy [2525537]

Coordinators: A. Melik-Tangyan
Part of the modules: Collective Decision Making (p. 57)[IW4VWL16]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	

Learning Control / Examinations
The assessment consists of a written exam (120 min.) according to §4 (2), 1 of the examination regulation. It may be an oral exam (20 - 30 min.) (according to §4 (2), 2 of the examination regulation) in the case of poor attendance.

Conditions
None.

Recommendations
None.

Learning Outcomes
The student understands the foundations of democracy and the implementation problems and the masters the operationalization of the problems by mathematical models

Content
The mathematical theory of democracy deals with the selection of representatives who make decisions on behalf of the whole society. The concept of representation is operationalized with the popularity index (average percentage of the population represented on a number of issues), and with the universality index (percentage of cases when a majority of the population is represented). With these indexes, the characteristics of individual representatives (president, dictator) and representative bodies (parliament, coalition, cabinet, council, jurors) are investigated. To bridge the representative and direct democracies, an alternative election method is proposed, which is not based on voting, but on the indexing of the candidates with regard to the political profile of the electorate. In addition, societal applications (federal election, surveys) and non-social applications (multi-criteria decisions, finances, traffic control) are considered.

Media
PowerPoint

Literature
Tangian, Andranik (2013) Mathematical Theory of Democracy. Springer, Berlin-Heidelberg

Course: Mechano-Informatics and Robotics [2400077]

Coordinators: T. Asfour
Part of the modules: Autonomous Robotics (p. 98)[IN4INAR]

ECTS Credits	Hours per week	Term	Instruction language
4	4	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Medical Simulation Systems I [24173]

Coordinators: R. Dillmann, Speidel
Part of the modules: Algorithms in Computer Graphics (p. 94)[IW4INACG], Medical Simulation and Neural Medicine (p. 106)[IW4INMSNM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
The student gains insight into medical computer science. In particular, special methods and algorithms in medical image acquisition, image processing, segmentation, registration and visualization are covered. After attending the lecture, the student should be able to analyze a given problem, choose appropriate methods and design a system in the field of preoperative diagnosis and intraoperative assistance.

Content
The research field of medical computer science and simulation systems is an expanding area with lots of ongoing research projects. Systems are needed for preoperative diagnosis as well as intraoperative assistance. The lecture covers the process chain starting with image acquisition up to intraoperative assistance.

The lecture focuses on imaging, image processing, segmentation, registration and visualization with augmented reality. The design of special systems system in the field of preoperative diagnosis and intraoperative assistance is shown and explained on different examples. Numerous examples of research projects and clinical life give an insight in this area of computer science.

Media
Slides.

Course: Medical Simulation Systems II [24676]

Coordinators: R. Dillmann, Suwelack
Part of the modules: Algorithms in Computer Graphics (p. 94)[IW4INACG], Medical Simulation and Neural Medicine
(p. 106)[IW4INMSNM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Prior attendance of the lecture *Medical Simulation Systems I* [24173] is recommended.

Learning Outcomes
Students know the basic applications for numerical simulation systems in medical engineering. In particular, they have an understanding of the challenges that are involved in simulating biological systems. They can explain and assess fundamental methods for modeling and simulating soft tissue mechanics and the fluid dynamics of blood flow. Based on this knowledge they are able to design their own medical simulation system for typical scenarios.
Students are particularly proficient in phenomenological modelling of soft-tissue using spring-mass-models and in physical modelling using elastic potentials and conservation equations. They understand resulting boundary value problems and know adequate finite-element methods including meshing algorithms for their numerical solution. Furthermore, they know the conservation equations of fluids dynamics and are able to solve simple problems analytically. They know methods for the coupling of structure and fluid mechanical problems and understand the concept of Lagrangian, Eulerian, and Arbitrary-Lagrangian-Eulerian frames of reference. Finally, students know typical simulation scenarios in medicine, particularly the brain-shift problem, endoscopic visceral surgery, the heart and its functional cycle as well as the aorta and the Windkessel effect.

Content
The lecture deals with the field of medical simulation systems. Continuing lecture Medical Simulation Systems I, modeling and simulation of biological systems are considered. The focus is on solid mechanics for describing soft tissue and on fluid mechanics for describing blood flow. Furthermore finite element methods are presented as a numerical technique for the computation of the simulations. Insights in clinical problems and applications as well as in clinical validation methods complete the lecture.

Media
Slides.

Course: Human-Machine-Interaction [24659]

Coordinators: M. Beigl
Part of the modules: Human-Machine-Interaction (p. 93)[IW4INMMI]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes

Content

Literature
David Benyon: Designing Interactive Systems: A Comprehensive Guide to HCI and Interaction Design. Addison-Wesley Educational Publishers Inc; 2nd Revised edition edition; ISBN-13: 978-0321435330
Steven Heim: The Resonant Interface: HCI Foundations for Interaction Design. Addison Wesley; 1 edition (March 15, 2007) ISBN-13: 978-0321375964

Course: Microprocessors II [24161]

Coordinators: W. Karl
Part of the modules: Parallel Processing (p. 96)[IW4INPV]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes

Content

Media
Slides

Course: Mobile Communication [24643]

Coordinators: O. Waldhorst, M. Zitterbart
Part of the modules: Wireless Networking (p. 78)[IW4INWN], Future Networking (p. 80)[IW4INFN]

ECTS Credits	Hours per week	Term	Instruction language
4	2/0	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Knowledge of the lectures *Introduction in Computer Networks* [24519] (or similar lectures) and *Telematics* [24128].

Learning Outcomes
The students are introduced to the fundamental terms used in mobile communications. They are equipped with a portfolio of basic methods for implementing mobile communication systems. Furthermore, they learn how prominent mobile communication systems with practical relevance are structured and operated. In this context, the students will develop an understanding of typical problems in mobile communication systems and learn how to chose and apply methods from the portfolio to solve them.

Content
The course starts with a discussion of typical problems related to wireless transmissions, e.g., signal propagation and fading, reflections and interference. Subsequently, it develops a portfolio of methods for modulation of digital data, multiplexing, coordination of concurrent medium access, and mobility management. To illustrate where and how these methods are applied in practice, typical mobile communication systems are introduced. These include wireless local area networks using IEEE 802.11, wireless personal area networks using Bluetooth, as well as wireless telecommunication systems using GSM, UTMS with HSPA and LTE. Discussions of network-layer mechanisms (e.g., mobile ad-hoc networks and MobileIP) and transport layer protocols close the course.

Media
Slides.

Literature
J. Schiller; Mobilkommunikation; Addison-Wesley, 2003.
Elective literature:
C. Eklund, R. Marks, K. Stanwood, S. Wang; IEEE Stadard 802.16: A Technical Overview of the WirelessMANTM Air Interface for the Broadband Wireless Access; IEEE Communications Magazine, June 2002.
H. Kaaranen, A. Ahtiainen, et. al., UMTS Networks – Architecture, Mobility and Services, Wiley Verlag, 2001.
B. O'Hara, A. Petrick, The IEEE 802.11 Handbook – A Designers Companion IEEE, 1999.
B. A. Miller, C. Bisdikian, Bluetooth Revealed, Prentice Hall, 2002
J. Rech, Wireless LAN – 802.11-WLAN-Technologien und praktische Umsetzung im Detail, Verlag Heinz Heise, 2004.
B. Walke, Mobilfunknetze und ihre Protokolle, 3. Auflage, Teubner Verlag, 2001.
R. Read, Nachrichten- und Informationstechnik; Pearson Studium 2004.
What You Should Know About the ZigBee Alliance http://www.zigbee.org.
C. Perkins, Ad-hoc Networking, Addison Wesley, 2000.
H. Holma, WCDMA For UMTS, HSPA Evolution and LTE, 2007

Course: Modeling and Analyzing Consumer Behaviour with R [2540470]

Coordinators: V. Dorner, C. Weinhardt
Part of the modules: Service Management (p. 31)[IW4BWLISM6], Service Analytics (p. 32)[IW4BWLKSR1]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation). By successful completion of the exercises (according to §4(2), 3 of the examination regulation) 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.

Conditions
None.

Learning Outcomes
The students

- learn to use the statistic software R on an advanced level

- understand the approach on how to model and simulate decision support systems

- know methods for evaluating, analyzing, and visualizing data

Content
The students use the R software for handling case studies from the fields of e-commerce and decision support system (DSS). On the implementation level, participants learn to write functions in R to simulate data, e.g., corporate data. On the user level, participants learn methods for analyzing and visualizing data, e.g., for the analysis of product reviews.
Main topics covered by the lecture:
1. Data types and programming concepts in R
2. Data selection and restructuring in data frames
3. Text Mining with R
4. Optimization with R
5. Visualization with R

Media
Lecture notes

Literature
Field, A., Miles, J., Field, Z., Discovering Statistics Using R, SAGE 2014
Jones, O., Maillardet, R., Robinson, A., Scientific Programming and Simulation Using R, Chapmann & Hall / CRC Press 2009
Venables, W.N., Smith, D.M. and the R Core Team, "An Introduction to R", 2012 (Version 2.15.2), http://cran.r-project.org/doc/manuals/R-intro.pdf
Wickham, Hadley, ggplot2: Elegant Graphics for Data Analysis (Use R!), Springer 2009 (2nd edition)

Remarks
Limited number of slots
The course has been added summer term 2015.

Course: Models of Parallel Processing [24606]

Coordinators: T. Worsch
Part of the modules: Parallel Processing (p. 96)[IW4INPV]

ECTS Credits	Hours per week	Term	Instruction language
5	3	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
Students know the basic methods of parallel processing and different possibilities to realize them on models which use different approaches to parallelism,and the relevant basic notions from computational complexity.
Students are able to assess the efficiency of parallel algorithms for different parallel models, to identify weak points and to the develop approaches to remove them.

Content

- Models of the first machine class (Turing machines, cellular automata, random access machines with weak instruction sets) and models of the second machine class (PRAM, uniform circuit families, alternating TM, tree CA, RAM with powerful instruction sets) and models „beyond" the second machine class (NL-PRAM)
- aspects of physical realizability
- MPI

Media
Slides.

Literature
Vollmar, Worsch: Modelle der Parallelverarbeitung, Teubner
Elective literature:
Scientific articles of journals and conferences.

Course: Modeling Strategic Decision Making [2577908]

Coordinators: H. Lindstädt
Part of the modules: Strategic Corporate Management and Organization (p. 38)[IW4BWLUO1], Strategic Decision Making and Organization (p. 39)[IW4BWLUO4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2	Summer term	de

Learning Control / Examinations
Written exam 100% following §4, Abs. 2.

Conditions
None.

Learning Outcomes
After passing this course students are able to

- discuss individual decisions under multiple goals and subjective expected utility theory.

- handle group decisions.

- assess the implications of asymmetric information and conflicting goals (Agency Theory) on the design of decision tasks

- recognize limits of the basic models and of the expected utility theory.

- illustrate and explain advancements in subjective expected utility theory.

Content
Starting from the basic model of economic decision theory, fundamental decision principles and calculi for multi-attribute decisions in certain and uncertain conditions up to subjective expected utility theory and the economic assessment of information are described. Subsequently participants will become familiar with agency-theoretical approaches and models for the function and design of organizational information and decision-making systems. To confront numerous infringements by decision-makers against principles and axioms of this calculus, in addition non-expected utility calculi and advanced models for decisions by economic agents are discussed; these are especially important for management decisions.

Media
Slides.

Literature

- Eisenführ, F.; Weber, M.: *Rationales Entscheiden*. Springer, 4. Aufl. Berlin 2003.[1]

- Laux, H.: Entscheidungstheorie. Springer, 6. Aufl. Berlin 2005.[2]

- Lindstädt, H: *Entscheidungskalküle jenseits des subjektiven Erwartungsnutzens*. In: Zeitschrift für betriebswirtschaftliche Forschung 56 (September 2004), S. 495 - 519.

Course: [24657]

Coordinators: R. Reussner, Lucia Kapova
Part of the modules: Software Systems (p. 75)[IW4INSWS], Software Methods (p. 76)[IW4INSWM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
The students should be enabled to understand model-driven approaches to software engineering, as well as to use and assess them. Specifically, this includes creating own meta-models and transformations in accordance with established development processes as well as applying current standards defined by the OMG (MOF, QVT, XMI, UML, etc.). Moreover, the theoretical backgrounds of model transformation languages should be known. Beyond that, students are expected to critically reflect the standards and techniques and to be able to name the respective advantages and disadvantages as well as to weigh them up against each other.

Content
Model-driven software development is directed towards developing software systems based on models. To this end, models are used not only for documentational purposes within the analysis or design phase, as it is common for classical software development, but rather are perceived as primary artifacts of the software development process, ideally allowing for the system to be fully generated from the models. Perceiving models as primary artifacts yields a number of advantages, such as an increased abstraction level of the system specification, an improved communication between stakeholders by the use of domain-specific languages (DSL), and an improved efficiency of the software creation using automatic transformations from created models to the source code constituting the system. However, there are yet unsolved challenges when using model-driven software development, such as model versioning and evolution of DSLs, maintenance of transformations or the combination of teamwork and MDSD. Although MDSD is due to the mentioned benefits already employed in practice, these challenges pose a potential for current research.

The lecture introduces concepts and techniques related to MDSD. As a foundation, the systematic design of meta-models and DSLs is covered along with all required parts (concrete and abstract syntax, static and dynamic semantics). Thereafter, the lecture discusses concepts of transformation languages and gives an introduction into a number of selected transformation languages. The integration of MDSD into the software development process lays the foundation for their practical use. The remainder of the lecture deals with advanced issues like model versioning, model coupling, MDSD standards, teamwork based on models, testing of software created using model-driven techniques, as well as the maintenance and evolution of models, meta-models and transformations. Finally, model-driven approaches for the analysis of software architecture models are covered. The lecture delves deeper into concepts of existing lectures like software engineering and compiler construction. Beyond that, transformation languages make use of graph grammars, logical calculi or relational algebras.

Course: Modeling and Simulation of Networks and Distributed Systems [24669]

Coordinators: H. Hartenstein
Part of the modules: Networking (p. 81)[IW4INNW], Wireless Networking (p. 78)[IW4INWN], Dynamic IT-Infrastructures
                      (p. 88)[IW4INDITI], Networking Labs (p. 79)[IW4INNL]

ECTS Credits	Hours per week	Term	Instruction language
4	2/0	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
Basic knowledge in computer networks, according to the lectures *Database Systems* and *Introduction in Computer Networks* is required. Additionally the lecture *Wahrscheinlichkeitstheorie und Statistik* is required.

Learning Outcomes

Content
The simulation of networks and distributed systems is a means to analyze and evaluate protocols in a quick and cost-efficient way and is therefore a valuable tool in the research of networks and distributed systems. While analytical approaches are often challenged by the complexity of scenarios and field tests are challenged by a high hardware configuration effort and resulting costs, simulations allow for the efficient investigation of the parameter space regarding network topologies, communication patterns and dependencies to other protocols. However, simulation results are only of relevance if the modeling and evaluation has been done accurately. Therefore, the lecture provides the required basics in mathematics and algorithms, practical experience in the use of simulators and simulation tools as well as an illustration of how simulations can be applied to answer recent research questions,e.g. in the field of vehicular networks or social networks.

Media
Slides

Literature

   • Averill Law, W. David Kelton, Simulation Modeling and Analysis, 4th ed., McGraw-Hill, 2006.

Course: Modelling, Measuring and Managing of Extreme Risks [2530355]

Coordinators: U. Werner, S. Hochrainer
Part of the modules: Insurance Management I (p. 36)[IW4BWLFBV6], Insurance Management II (p. 37)[IW4BWLFBV7]

ECTS Credits	Hours per week	Term	Instruction language
2,5	2	Summer term	de

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Recommendations
None.

Learning Outcomes
See German version.

Content

- Risk preferences under uncertainty, risk management strategies using utility functions, risk aversion, premium calculations, insurance principle, exceptions, Arrow Lind theorem. Probability and statistics introduction, distributions, Lebesgue integration.

- Introduction to Extreme value theory, Catastrophe models: Introduction to extreme value theory, asymptotic models, extremal types theorem, Generalized extreme value distributions, max-stability, domain of attraction inference for the GEV distribution, model generalization: order statistics. Catastrophemodelapproaches, simulationof extremes.

- Threshold models, generalized pareto distribution, threshold selection, parameter estimation, point process characterization, estimation under maximum domain: Pickands's estimator, Hill's estimator, Deckers-Einmahl-de Haan estimator.

- Catastrophe model approaches, simulation of earthquakes, hurricanes, and floods, vulnerability functions, loss estimation. Indirectvsdirecteffects.

- Introduction to financial risk management against rare events. Basic risk measures: VaR, CVar, CEL and current approaches. Risk management measures against extreme risk for different risk bearers: Insurance principle, loading factors, credits, reserve accumulation, risk aversion.

- Risk preferences in decision making processes. Utility theory, certainty equivalent, Arrow Lind proof for risk neutrality, exceptions in risk neutrality assumptions.

- The Fiscal Risk Matrix, Fiscal Hedge Matrix, Dealing with Risk in Fiscal Analysis and Fiscal Management (macroeconomic context, specific fiscal risks, institutional framework). Reducing Government Risk Exposure (Risk mitigation with private sector, Risk transfer and risk-sharing mechanisms, Managing residual risk).

- Approaches to Managing Fiscal Risk (Reporting on financial statements, Cost-based budgeting, Rules for talking fiscal risk, Market-type arrangements). Case: Analyzing Government Fiscal Risk Exposure in China (Krumm/Wong), The Fiscal Risk of Floods: Lessons of Argentina (AlciraKreimer).

- Case study presentations: Household level index based insurance systems (India, Ethiopia, SriLanka, China), insurance back-up systems coupled with public private partnerships (France, US), Reinsurance approaches (Munich Re, Swiss Re, Allianz).

- Climate Change topics: IPCC report, global and climate change.

Literature

- Woo G (2011) Calculating Catastrophe. Imperial College Press, London, U.K.

- Grossi P and Kunreuther H (eds.) (2005) Catastrophe Modeling: A New Approach to Managing Risk. New York, Springer.

- Embrechts P, Klüppelberg C, Mikosch, T (2003) ModellingExtremal Events for Insurance and Finance. Springer,New York(corr. 4th printing, 1st ed. 1997).

- Wolke, T. (2008). Risikomanagement. Oldenbourg, Muenchen.

- Klugman, A.S, Panjer, H.H, and Willmot, G.E. (2008) Loss Models: From Data to Decisions. 3rd edition. Wiley, New York.

- Slavadori G, Michele CD, Kottegoda NT and Rosso R (2007) Extremes in Nature: An Approach Using Copulas. Springer, New York.

- Amendola et al. (2013) (eds.): *Integrated Catastrophe Risk Modeling. Supporting Policy Processes.* Advances in Natural and Technological Hazards Research, New York, Springer,

- Hochrainer, S. (2006). Macroeconomic Risk Management against Natural Disasters. *German University Press (DUV)*, Wiesbaden, Germany.

Course: Modern Development Environments using the example of .NET [24634]

Coordinators: W. Tichy, Gelhausen, Ladani
Part of the modules: Software Methods (p. 76)[IW4INSWM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
Good programming skills in Java are required.

Learning Outcomes

- Being able to explain and compare the concepts of modern programming platforms;
- Being able to compare performance predictions for miscellaneous implementation methods;
- Being able to judge effects of newly introduced programming constructs and make behavioral predictions.

Content
The first part of the course is to thoroughly elaborate on the programming language C# on the basis of the ECMA standard 334. The focus will be on extensions in comparison with Java. The main part of the lecture will be to study the exact semantics and the complete syntax of programming constructs. Going into detail especially with marginal cases will help to understand the internal functionality of a modern programming language.
The second part of the lecture will deal with the runtime environment CLR. In the course of this, tasks as well as protection and performance potentials of modern virtual machines will be discussed.

Course: Multicore Computers and Computer Clusters [24112]

Coordinators: W. Tichy
Part of the modules: Parallel Processing (p. 96)[IW4INPV], Software Systems (p. 75)[IW4INSWS]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam according to section 4 subsection 2 no. 1 study and examination regulations.

Conditions
None.

Recommendations
The course requires basic knowledge of C/C++, Java, operating systems, computer architecture. The course is is self-contained, but can be taken in conjuction with the summer course „Software Engineering for Modern, Parallel Platforms".

Learning Outcomes
Understand basics of systems architecture, programming models, algorithms for parallel shared-memory and distributed-memory systems.

Content
This course discusses system architectures and programming approaches for parallel shared-memory and distributed-memory systems. For shared-memory systems, the course explains how to write parallel programs in OpenMP, Java, and other models (e.g., Transactional Memory); it elaborates on MPI and ZPL for distributed-memory architectures. The course also discusses basics of networking (Gigabit Ethernet, Myrinet, Infiniband), resource management and scheduling, as well as parallel algorithms needed for cluster programming.

Media
Lecture presentations

Literature
Elective literature:
Additional literature will be announced in class.

Course: Multilingual Human-Machine Communication [24600]

Coordinators: T. Schultz, F. Putze
Part of the modules: Biosignal Processing (p. 89)[IW4INBSV], Speech Processing (p. 90)[IW4INSV]

ECTS Credits	Hours per week	Term	Instruction language
6	4	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
The students will be introduced to the foundations of automatic speech recognition and processing. The lecture begins with the theoretical background on signal processing and models of speech production and perception. The focus here is on statistical methods. The current state of the art is presented using many real-world applications. After attending the lecture, students should be able to assess the potential as well as the challenges and limitations of modern speech technology and applications.

Content
The lecture offers an introduction to the foundations of automatic speech recognition and processing. The lecture begins with the theoretical background on signal processing and models of speech production and perception. The focus here is on statistical methods. Then, the central approaches and methods for a successful transition from theory to practice are presented. The current requirements for speech recognition and processing regarding globalization and multilingualism are illustrated using several examples of state of the art systems.
For further information, see http://csl.anthropomatik.kit.edu.

Media
slides (online at http://csl.anthropomatik.kit.edu)

Literature
Elective literature:
Xuedong Huang, Alex Acero und Hsiao-wuen Hon, Spoken Language Processing, Prentice Hall PTR, NJ, 2001
Tanja Schultz und Katrin Kirchhoff (Hrsg.), Multilingual Speech Processing, Elsevier, Academic Press, 2006

Remarks
Language of the lecture: German (English by request)

Course: Multimedia Communications [24132]

Coordinators: R. Bless, M. Zitterbart
Part of the modules: Networking (p. 81)[IW4INNW], Future Networking (p. 80)[IW4INFN]

ECTS Credits	Hours per week	Term	Instruction language
4	2/0	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Knowledge of the lectures *Introduction in Computer Networks* [24519] (or similar lectures) and *Telematics* [24128].

Learning Outcomes
Objective of the lecture is to present techniques, procotols, and latest developments in Internet-based multimedia communications. Especially in the context of increasing amount of voice communications over the Internet (Voice over IP), key technologies and protocols such as RTP and SIP are intensively discussed so that their function and principles are understood in detail.

Content
This lecture describes techniques and protocols to transmit audio and video data over the Internet. Topics are audio/video conferences, audio/video transport protocols, Voice over IP SIP for signaling, establishment and control of multimedia sessions, RTP for transport of multimedia data over the Internet, RTSP for control of A/V streams, ENUM, A/V Streaming, Middleboxes and Caches, DVB, Advanced TVand Video on Demand.

Media
Slides. Protocol traces.

Literature
James F. Kurose, Keith W. Ross: Computer Networking, 6th Edition,
Pearson, 2013, ISBN-10: 0-273-76896-4, ISBN-13 978-0-273-76896-8,
Chapter Multimedia Networking
Weiterführend:
Stephen Weinstein: The Multimedia Internet, Springer, 2005, ISBN 0-387-23681-3
Alan B. Johnston: SIP – understanding the Session Initiation Protocol, 2nd ed., Artech House, 2004
R. Steinmetz, K. Nahrstedt: Multimedia Systems, Springer 2004, ISBN 3-540-40867-3
Ulrick Trick, Frank Weber: SIP, TPC/IP und Telekommunkationsnetze, Oldenbourg, 4. Auflage, 2009

Course: Multivariate Statistical Methods [2520317]

Coordinators: O. Grothe
Part of the modules: Analytics and Statistics (p. 65)[IW4STAT4], Statistical Methods in Risk Management (p. 64)[IW4STAT2], Econometrics and Statistics II (p. 67)[IW4STAT6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/2	Summer term	de

Learning Control / Examinations
The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation. The exam is offered every semester. Re-examinations are offered only for repeaters.

Conditions
None.

Recommendations
It is strongly recommended to attend the courses *Statistics 1*, *Statistics 2* and *Analysis of multivariate Data*.

Learning Outcomes
Students

- choose appropriate methods for the illustration of multivariate data, for structure analysis as well as dimension reduction, and apply these.
- apply regression models.
- apply software.

Content

- Graphical methods for multivariate Data
- Regression Analysis (incl. logistic regression)
- Principal Component, Factor and Correspondence Analysis
- Multidimensional Scaling
- Hierarchical Classification

Remarks
The credits for the course "Multivariate Statistical Methods" have been changed from 5 to 4,5 from winter term 2015/2016 on.

Course: Pattern Recognition [24675]

Coordinators: J. Beyerer
Part of the modules: Automated visual inspection (p. 107)[IW4INAS], Automated Planning and Decision-making (p. 109)[IW4INAPE], Machine Vision (p. 108)[IW4INMVW], Image-based detection and classification (p. 110)[IW4INBDK]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Knowledge of the basic principles of stochastics, signal and image processing are helpful.

Learning Outcomes

- Students have a sound knowledge for the selection, construction, and properties of features which are useful for the characterization of objects that have to be classified. Students know how feature space can be explored, how features can be transformed and how distances in feature space can be calculated. Students master feature normalization and the construction of features. Additionally, students know techniques to reduce the dimensionality of the feature space.

- Students have a sound knowledge for the selection and adaptation of appropriate classifiers for different tasks. They know Bayesian decision theory, parameter estimation and parameter-free methods, linear discriminance functions, support vector machines and matched filters. In addition they know how to do classification with nominal features.

- Students are in the position to solve pattern recognition problems, considering the efficiency of classifiers and interrelations of the processing chain object - pattern - features – classifier. Students know general principles for classifier performance evaluation as well as boosting.

Content

- types of features
- exploration of the feature space
- transformation of the features
- distance measures within the feature space
- normalization of features
- selection and construction of features
- reduction of the dimension of the feature space

Classifiers:

- Bayesian decision theory
- parameter estimation
- parameter free methods
- linear classifiers
- support vector machine
- template matching, matched filter
- classification with rejection
- classification with regard to nominal features

General principles:
Vapnik-Chervonenki

Media
Slides (pdf).

Literature
Elective literature:

- Richard O. Duda, Peter E. Hart, Stork G. David. Pattern Classification. Wiley-Interscience, second edition, 2001
- K. Fukunaga. Introduction to Statistical Pattern Recognition. Academic Press, second edition, 1997
- R. Hoffman. Signalanalyse und -erkennung. Springer, 1998
- H. Niemann. Pattern analysis and understanding. Springer, second edition, 1990
- J. Schürmann. Pattern classification. Wiley & Sons, 1996
- S. Theodoridis, K. Koutroumbas. Pattern recognition. London: Academic, 2003
- V. N. Vapnik. The nature of statistical learning theory. Springer, second edition, 2000

Course: Nature-inspired Optimisation Methods [2511106]

Coordinators: P. Shukla
Part of the modules: Organic Computing (p. 103)[IW4INAIFB8], Advanced Algorithms: Design and Analysis
(p. 72)[IW4INAADA], Advanced Algorithms: Engineering and Applications (p. 73)[IW4INAALGOB]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	en

Learning Control / Examinations
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).

Conditions
None.

Learning Outcomes
To learn:

1. Different nature-inspired methods: local search, simulated annealing, tabu search, evolutionary algorithms, ant colony optimization, particle swarm optimization

2. Different aspects and limitation of the methods

3. Applications of such methods

4. Multi-objective optimization methods

5. Constraint handling methods

6. Different aspects in parallelization and computing platforms

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.

Media
Powerpoint slides with annotations on graphics screen, access to Internet resources, recorded lectures

Literature
F. Glover and M. Laguna. „Tabu Search" In: Handbook of Applied Optimization, P. M. Pardalos and M. G. C. Resende (Eds.), Oxford University Press, pp. 194-208, 2002. G. Raidl and J. Gottlieb: Empirical Analysis of Locality, Heritability and Heuristic Bias in Evolutionary Algorithms: A Case Study for the Multidimensional Knapsack Problem. Evolutionary Computation, MIT Press, 13(4), pp. 441-475, 2005.
Weiterführende Literatur:
E. L. Aarts and J. K. Lenstra: „Local Search in Combinatorial Optimization". Wiley, 1997. D. Corne and M. Dorigo and F. Glover: „New Ideas in Optimization". McGraw-Hill, 1999. C. Reeves: „Modern Heuristic Techniques for Combinatorial Optimization". McGraw-Hill, 1995. Z. Michalewicz, D. B. Fogel: „How to solve it: Modern Heuristics". Springer, 1999. E. Bonabeau, M. Dorigo, G. Theraulaz: „Swarm Intelligence". Oxford University Press, 1999. A. E. Eiben and J. E. Smith: „Introduction to Evolutionary Computing". Springer, 2003. K. Weicker: „Evolutionäre Algorithmen". Teubner, 2002. M. Dorigo, T. Stützle: „Ant Colony Optimization". MIT Press, 2004. K. Deb: „Multi-objective Optimization using Evolutionary Algorithms", Wiley, 2003.

Course: Meshes and point clouds [24122]

Coordinators: H. Prautzsch
Part of the modules: Curves and Surfaces (p. 91)[IW4INKUF], Algorithms in Computer Graphics (p. 94)[IW4INACG]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
Students are introduced into an active research area and will be acquainted with the important common techniques.

Content
Data structures for point clouds and triangular meshes, triangulation algorithms, marching cubes, fairing and mesh smoothing, parametrization, hierarchical representations, segmentation, deformation transfer, animation.

Media
Blackboard and slides

Literature
Elective literature:
See http://i33www.ira.uka.de/pages/Lehre/Vorlesungen/NetzeUndPunktwolken.html

Course: Network Security: Architectures and Protocols [24601]

Coordinators: M. Zitterbart
Part of the modules: Networking Security - Theory and Praxis (p. 82)[IW4INNTP], Networking Labs (p. 79)[IW4INNL], Wireless Networking (p. 78)[IW4INWN], Networking (p. 81)[IW4INNW]

ECTS Credits	Hours per week	Term	Instruction language
4	2/0	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Knowledge of the lectures *Introduction in Computer Networks* [24519] (or similar lectures) and *Telematics* [24128].

Learning Outcomes
The course aims at teaching fundamental concepts of the design of secure communication protocols. More advanced topics include existing security protocols of the internet and local networks.

Content
The lecture Network Security: Architectures and Protocols considers challenges and technologies in the design of secure communication protocols, as well as topics of data security and privacy. Complex systems like Kerberos will be discussed explicitly and their design decision considering security aspects will be outlined. A special focus is set on PKI-basics, infrastructures, as well as on specific PKI-formats. Furthermore, an emphasis is set on the commonly used security protocols IPSec, TLS/SSL, and protocols of infrastructure security.

Media
Slides.

Literature
Roland Bless et al. Sichere Netzwerkkommunikation. Springer-Verlag, Heidelberg, Juni 2005.
Elective literature:

- Charlie Kaufman, Radia Perlman, and Mike Speciner. Network Security: Private Communication in a Public World. 2nd Edition. Prentice Hall, New Jersey, 2002.

- Carlisle Adams and Steve Lloyd. Understanding PKI. Addison Wesley, 2003

- Rolf Oppliger. Secure Messaging with PGP and S/MIME. Artech House, Norwood, 2001.

- Sheila Frankel. Demystifiying the IPsec Puzzle. Artech House, Norwood, 2001.

- Thomas Hardjono and Lakshminath R. Dondeti. Security in Wireless LANs and MANs. Artech House, Norwood, 2005.

- Eric Rescorla. SSL and TLS: Designing and Building Secure Systems. Addison Wesley, Indianapolis, 2000.

Course: Next Generation Internet [24674]

Coordinators: R. Bless, M. Zitterbart
Part of the modules: Networking (p. 81)[IW4INNW], Future Networking (p. 80)[IW4INFN]

ECTS Credits	Hours per week	Term	Instruction language
4	2/0	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Knowledge of the lectures *Introduction in Computer Networks* [24519] (or similar lectures) and *Telematics* [24128].

Learning Outcomes
Objective of the lecture is to present latest developments in Internet-based networks and to explain the related advanced methods and techniques that are used. Furthermore, architectural principles of the current Internet are discussed and it is described which new challenges threaten the Internet architecture.

Content
In the main focus of the lecture are latest developments in the area of Internet-based network technologies. At first architectural principles of the current Internet are described and discussed. Next, nowadays and future challenges are presented. Methods to support quality of service (QoS), signaling of QoS requirements as well as IPv6 and multicast support for group communications are described. Application of the presented technologies in IP-based networks are discussed. Advanced approaches like active and programmable networks are presented in this lecture and recent developments in peer-topeer networks.

Media
Slides

Literature
James F. Kurose, Keith W. Ross: Computer Networking, 6th Edition,
Pearson, 2013, ISBN-10: 0-273-76896-4, ISBN-13 978-0-273-76896-8
Elective literature:
Ralf Steinmetz, Klaus Wehrle (Eds) Peer-to-Peer Systems and Applications LNCS 3854, Springer 2005
M. Blanchet: *Migrating to IPv6: A Practical Guide to Implementing IPv6 in Mobile and Fixed Network*,
John Wiley & Sons, ISBN 0-471-49892-0, November 2005

Course: Non- and Semiparametrics [2521300]

Coordinators: M. Schienle
Part of the modules: Econometrics and Statistics I (p. 66)[IW4STAT5], Econometrics and Statistics II (p. 67)[IW4STAT6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/2	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam (90 minutes) (following §4(2), 1 of the examination regulation).

Conditions
None.

Recommendations
Knowledge of the contents covered by the course *"Applied Econometrics"* [2520020]

Learning Outcomes
The student

- shows comprehensive knowledge of non- and semiparametric estimation techniques

- is able to apply his/her technical knowledge using software in order to critically assess empirical problems

Content
Kernel density estimator, local constant and local polynomial regression, choice of bandwidth, Series- and Sieve-Estimators, additive models, semiparametric models

Media
Slides

Literature
Li, Racine: Nonparametric Estimation

Course: Nonlinear Optimization I [2550111]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 61)[IW4OR6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
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 Optimization II* [2550113]. In this case, the duration of the written examination takes 120 minutes.

Conditions
The successful completion of a compulsory prerequisite is mandatory for admission to the exam.

Learning Outcomes
The student

- knows and understands fundamentals of unconstrained nonlinear optimization,

- is able to choose, design and apply modern techniques of unconstrained nonlinear optimization in practice.

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.

Media
Lecture notes.

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

Remarks
Part I and II of the lecture are held consecutively in the *same* semester.

Course: Nonlinear Optimization II [2550113]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 61)[IW4OR6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
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 Optimization I* [2550111]. In this case, the duration of the written exam takes 120 minutes.

Conditions
The successful completion of a compulsory prerequisite is mandatory for admission to the exam.

Learning Outcomes
The student

- knows and understands fundamentals of constrained nonlinear optimization,

- is able to choose, design and apply modern techniques of constrained nonlinear optimization in practice.

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.

Media
Lecture notes.

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

Remarks
Part I and II of the lecture are held consecutively in the *same* semester.

Course: Public Media Law [24082]

Coordinators: C. Kirchberg
Part of the modules: Public Business Law (p. 116)[IW4JURA6]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
As the traditional media (print, radio, TV) the "new media" (online-services and the Internet) is governed by public law, yet with a different extent of regulation and with apparent effects on private law. The main influences for the media law are constitutional law and European community law. The lectures aims at providing an overview of the common grounds and differences of the current media law regime and of the conceivable perspectives of media convergence. Current developments in politics and economics, which are relevant for public media law, will be used as examples in the lecture. Besides, it is planned to attend a court hearing of the Federal Constitutional Court (Bundesverfassungsgericht) and/or the Federal Court (Bundesgerichtshof).

Content
Initially, the lecture will deal with the constitutional basis of the media law regime. i.e. the responsibilities of the Federal and the State legislatures, freedom of speech, freedom of information, constitutional media rights (Art. 5 para. 1 Constitutional Law) and its limitations by general laws, the ban on censorship and the counterstatement law. In addition, the European community principles on broadcasting and media law will be part of the lecture. Next will be an overview of the individual media laws, namely the broadcasting law (especially Rundfunkstaatsvertrag) the press law of the States and the statute on the so-called "telemedia" services. Finally, the protection of minors in the media will be dealt with (Act on Protection of Minors and Treaty on the Protection of Minors in the Media).

Literature
To understand the legal framework it is necessary for the students to have the relevant statutes, for example "Telemediarecht, Telekommunikations- und Multimediarecht", beck-Texte im dtv , 7. Auflage 2007.
As an introduction it is recommended to read: Frank Fechner, Medienrecht, Verlag Mohr Siebeck, Verlag Mohr Siebeck, 8. Auflage 2007.

Course: Life Cycle Assessment [n.n.]

Coordinators: H. Keller
Part of the modules: Industrial Production II (p. 40)[IW4BWLIIP2]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2	Winter term	de

Learning Control / Examinations
The assessment consists of an oral exam (30 min.) or a written exam (60 min.).

Conditions
None.

Recommendations
None.

Learning Outcomes
Students

- understand why it is essential for the future viability of companies and other stakeholders in society to assess products and services based on their whole life cycles.
- have knowledge in basics and methodology of life cycle assessment.
- apply life cycle assessment in basic decision contexts.
- are aware of contexts that require further in-depth knowledge in sustainability assessment.

Content
Our society has reached a historically unique material prosperity. At the same time, environmental burdens and resource consumption are continuously reaching new peaks - not only regarding greenhouse gas emissions and oil production rates. It is obvious that the material and energy intensity of products and services has to decrease if we want to keep our current level of material prosperity on the long run. Enormous efficiency gains, as they have been reached e.g. for labour productivity, however, require that environmental burdens and resource consumption per unit of product are in the first place known, transparent and can thus be optimised. This data and its calculation are increasingly requested and sooner or later will have to become as essential for management as e.g. unit labour costs.

Life cycle assessment is a methodology in sustainability assessment that provides this information and deduces optimisation potentials and decision support for companies, politics, consumers etc. To this end, material and energy flows are compiled along the whole life cycle of a product from extraction of raw materials, via production and use of a product until its disposal. Subsequently, environmental impacts of these flows are analysed.

This lecture describes structure and individual steps of life cycle assessments in detail. Furthermore, it explains its application in decision support. In interactive phases, participants recapitulate the theoretical basis by own calculations. As an outlook, further instruments in sustainability assessment are introduced that analyse other sustainability aspects.

Remarks
The course will be offered from winter term 2015/16 and replace the course "Material Flow Analysis and Life Cycle Assessment [2581995]".

Course: Marketing Communication [2572200]

Coordinators: J. Kim
Part of the modules: Services Marketing (p. 51)[IW4BWLMAR9]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	

Learning Control / Examinations
The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation)

Conditions
None.

Learning Outcomes
Students

- know about current topics (research and practice) in online marketing and learn how the transparency of the internet provides new opportunities to measure the success of marketing instruments
- learn about relevant marketing metrics
- know how to differentiate terms like SEO, SEM, social media, content marketing and gamification.
- are able to implement their marketing knowledge in a practical context

Content
The aim of this lecture is to provide an overview of research on online marketing tools. Students learn about current topics (research and practice) in online marketing and learn how the transparency of the internet provides new opportunities to measure the success of marketing instruments.

Media
Lecture slides will be provided in ILIAS

Literature
Stokes, Rob (2012), "eMarketing: The Essential Guide to Online Marketing," available here:http://students.flatworldknowledge.com/course?ci
See lecture slides for further recommendations on literature

Remarks
new course starting winter term 2015/2016

Course: Open Innovation – Concepts, Methods and Best Practices [2571199]

Coordinators: A. Hahn
Part of the modules: Marketing Management (p. 46)[IW4BWLMAR5]

ECTS Credits	Hours per week	Term	Instruction language
1,5	1/0	Summer term	en

Learning Control / Examinations
alternative exam assessment (presentation) (following §4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes
Students

- know approaches, objectives, advantages and disadvantages of Open Innovation,
- know strategy, processes, methods and fields of application of Open Innovation,
- understand success factors by means of best practices from real life projects,
- can apply Open Innovation methods on their own.

Content
Joy's Law: "No matter who you are, most of the smartest people work for someone else" (Bill Joy, Co-Founder Sun Microsystems) This lecture conveys an understanding and practical application of Open Innovation, i.e. the collaborative opening of the innovation process to customers, suppliers, partners, competitors, new markets. . . . The contents encompass among others:

- approaches, objectives, advantages and disadvantages of Open Innovation
- knowledge of approaches, objectives, advantages and disadvantages of Open Innovation
- strategy, processes, methods and fields of application of Open Innovation
- focus mainly on customer integration into the innovation process (e.g. Netnography, Crowdsourcing, Lead User, Trend Receiver,. . .)
- Understanding of success factors by means of best practices from real life projects (Digital Open Innovation, Idea Contests, Ideation, Hackathons, Idea Management, Customer Engagement, Lead User, Trend Receiver,. . .)
- Independent application of Open Innovation methods.

Literature
To be announced in the course.

Remarks
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).
Please note that only one of the following courses can be chosen in the Marketing Management Module: Marketing Strategy Business Game, Strategic Brand Management, Open Innovation – Concepts, Methods and Best Practices or Business Plan Workshop.
Exception: In summer term 2016 exceptionally two courses can be chosen or, in case one course has already been chosen previously, a second course can be chosen.
Please note: The number of participants for this course is limited. The Marketing & 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.

Course: Operations Research in Health Care Management [2550495]

Coordinators: S. Nickel
Part of the modules: Operations Research in Supply Chain Management and Health Care Management (p. 59)[IW4OR4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter / Summer Term	en

Learning Control / Examinations
The assessment is a 120 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.

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

Learning Outcomes
The student

- knows applications of basic and advanced methods of Operations Research applied to health services,
- gains the ability to use quantitative models for the operations planning and logistics in a hospital environment, e.g. appointment, transportation, operating room planning or nurse rostering as well as inventory management and layout planning
- describes the advantages and benefits of simulation models and OR methods to plan home health care services,
- applies the introduced methods in detail in practical case studies.

Content
In the last years reforms of the German health system, e.g. the introduction of the G-DRG-system, have put an increasing cost pressure on hospitals. Therefore their target is to improve quality, transparency, and efficiency of hospital services, e.g. by reducing the length of stay of patients. To achieve this, processes have to be analyzed in order to optimize them if necessary. When looking at the targets of optimization not only efficiency but also quality of care and patient satisfaction (e.g. waiting times) have to be taken into account.
Besides hospitals also home health care services and their planning are discussed in this lecture. Because of the demographic development this is an emerging field in the health care sector. Here, e.g. nurse rosters have to be built which give details about which nurse visits which patient at what time. While doing so different targets have to be regarded, e.g. the continuity of nurse-patient relationship or the minimization of the distances the nurses have to travel.

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

Remarks
The lecture is planned to be held in the summer term 2016. The planned lectures and courses for the next three years are announced online.

Course: Operations Research in Supply Chain Management [2550480]

Coordinators: S. Nickel
Part of the modules: Operations Research in Supply Chain Management and Health Care Management (p. 59)[IW4OR4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter / Summer Term	en

Learning Control / Examinations
The assessment is a 120 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.

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

Recommendations
Advanced knowledge of Operations Research (e.g., as conveyed in the lectures *Facility Location and Strategic SCM*, *Tactical and operational SCM*) is recommended.

Learning Outcomes
The student

- knows and applies basic and advanced modeling techniques playing an important role in today's problem solving occurring in supply networks
- models problems with a mathematical approach to technical-economical problems, and derives optimal solutions,
- classifies problems both conceptually and mathematically by identifying central variables and parameters in a specific problem setting,
- evaluates current developments in operations research and supply chain management.

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.

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

Remarks
The lecture is planned to be held in the winter term 2016/17. The planned lectures and courses for the next three years are announced online.

Course: Optimization in a Random Environment [25687]

Coordinators: K. Waldmann
Part of the modules: Stochastic Modelling and Optimization (p. 62)[IW4OR7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1/2	Winter / Summer Term	de

Learning Control / Examinations
The assessment consists of an 1h written exam following Section 4(2), 1 of the examination regulation. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by a 2/3 step of a full grade (according to Section 4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes
Students are enabled to apply their knowledge about techniques and methodology on current problems such as the measurement and evaluation of operational risk as required by the Basel II accord. Subject matter of the course will be announced in due time.

Content
The course is concerned with the quantitative analysis of selected problems arising in engineering and natural sciences. Subject matter of the course will be announced in due time.

Media
Blackboard, slides, flash-animations, java tools, simulation software.

Literature

- Lecture Notes
- Elective literature: problem-oriented

Remarks
The lecture is offered irregularly. The curriculum of the next two years is available online.

Course: OR-oriented modeling and analysis of real problems (project) [25688]

Coordinators: K. Waldmann
Part of the modules: Stochastic Modelling and Optimization (p. 62)[IW4OR7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1/2	Winter / Summer Term	de

Learning Control / Examinations
Presentation and documentation of the rssults.

Conditions
None.

Learning Outcomes
Students are enabled to apply their knowledge about techniques and methodology on real problems and to develop a practically oriented solution an an OR-lab; e.g. in the public health sector. Subject matter of the course will be announced in due time.

Content
The course is concerned with the quantitative analysis of selected problems arising in engineering and natural sciences. Subject matter of the course will be announced in due time.

Media
Blackboard, slides, flash-animations, java tools, simulation software.

Literature

- Lecture Notes
- Elective literature: problem -oriented.

Remarks
The lecture is offered irregularly. The curriculum of the next two years is available online.

Course: Organic Computing [2511104]

Coordinators: H. Schmeck
Part of the modules: Organic Computing (p. 103)[IW4INAIFB8], Ubiquitous Computing (p. 102)[IW4INAIFB7], Advanced
Algorithms: Engineering and Applications (p. 73)[IW4INAALGOB]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	en

Learning Control / Examinations
The assessment of this course consists of a written examination (60 min) (following §4(2), 1 SPO) and of submitting written exercises that recapitulate the content of the course. The exercises include theoretical questions as well as practical programming. For providing a successful solution to all exercises, a bonus will be granted, improving the grade of a passed exam by one grade-step (0.3 or 0.4, respectively, following §4(2), 3 SPO). The course will be offered every second semester (summer term) and exams may be repeated at every ordinary exam date.

Conditions
None.

Learning Outcomes
The student acquires the ability to master methods and concepts of Organic Computing and to demonstrate innovation skills regarding the used methods.
Therefore the course aims at the teaching of fundamentals and methods of Organic Computing within the context of its applicability in practice. On the basis of a fundamental understanding of the taught concepts and methods the students should be able to choose the adequate methods and concepts, if necessary further develop them according to the situation and use them properly when facing related problems in their later job. The students should be capable of finding arguments for the chosen solutions and express them to others.

Content
The mission of Organic Computing is to tame complexity in technical systems by providing appropriate degrees of freedom for self-organized behaviour adapting to changing requirements of the execution environment, in particular with respect to human needs. According to this vision an organic computer system should be aware of its own capabilities, the requirements of the environment, and it should be equipped with a number of "self-x" properties allowing for the anticipated adaptiveness and for a reduction in the complexity of system management. These self-x properties include self-organisation, self-configuration, self-optimization, self-healing, self-protection and self-explanation. In spite of these self-x properties, an organic system should be open to external control actions which might be necessary to prevent undesired behaviour. The course addresses major concepts and methods of Organic Computing and highlights the impact and potential of Organic Computing with respect to real-world applications, specifically in traffic and energy scenarios.

Media
powerpoint slides with annotations, access to applets and Internet ressources, lecture recording (camtasia).

Literature

- Autonomic Computing: Concepts, Infrastructure and Applications. M. Parashar and S. Hariri (Ed.), CRC Press. December 2006.
- Self-Organization in Biological Systems. S. Camazine, J. Deneubourg, N. R. Franks, J. Sneyd, G. Theraulaz and E. Bonabeau. Princeton University Press, 2003.
- Complex Adaptive Systems: An Introduction. H. G. Schuster, Scator Verlag, 2001.
- Introduction to Evolutionary Computing. A. E. Eiben and J. E. Smith. Natural Computing Series, Springer Verlag, 2003. Swarm Intelligence: From Natural to Artificial Systems.Eric Bonabeau, Marco Dorigo and Guy Theraulaz. Oxford University Press, 1999.
- Control of Complex Systems. K. Astrom, P. Albertos, M. Blanke, A. Isidori and W. Schaufelberger. Springer Verlag, 2001.
- Organic Computing - A Paradigm Shift for Complex Systems. C. Müller-Schloer, H. Schmeck, T. Ungerer (eds): Springer, Autonomic Systems, Basel, 627 p., 2011

Elective literature:

- **Adaptive and Self-organising Systems,** Christian Müller-Schloer, Moez Mnif, Emre Cakar, Hartmut Schmeck, Urban Richter,
  June 2007. Preprint.Submitted to ACM Transactions on Autonomous and Adaptive Systems (TAAS)
- **Organic Computing - Addressing Complexity by Controlled Self-organization,** Jürgen Branke, Moez Mnif, Christian Müller-Schloer, Holger Prothmann, Urban Richter, Fabian Rochner, Hartmut Schmeck, In Tiziana Margaria, Anna Philippou, and Bernhard Steffen, *Proceedings of ISoLA 2006*, pp. 200-206. Paphos, Cyprus, November 2006.

- Evolutionary Optimization in Dynamic Environments. J. Branke. Kluwer Academic Publishers, 2002.

- Self-star Properties in Complex Information Systems: Conceptual and Practical Foundations (Lecture Notes in Computer Science. O. Babaoglu, M. Jelasity, A. Montresor, C. Fetzer, S. Leonardi, A. van Moorsel and M. van Steen. Springer Verlag, 2005.

- Design and Control of Self-organizing Systems. C. Gershenson. PhD thesis, Vrije Universiteit Brussel, Brussels, Belgium, 2007.

- VDE / ITG / GI - Positionspapier: Organic Computing - Computer- und Systemarchitektur im Jahr 2010. Juli 2003. it - Information Technology, Themenheft Organic Computing, Oldenbourg Verlag. Volume: 47, Issue: 4/2005.

further references will be announced in class

Course: Managing Organizations [2577902]

Coordinators: H. Lindstädt
Part of the modules: Strategic Corporate Management and Organization (p. 38)[IW4BWLUO1]

ECTS Credits	Hours per week	Term	Instruction language
3.5	2/0	Winter term	de

Learning Control / Examinations
The assessment will consist of a written exam (60 min) taking place at the beginning of the recess period (according to Section 4 (2), 2 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
After passing this course students are able to

- evaluate strengths and weaknesses of existing organisational structures and rules.
- compare alternatives of organisational structure in practice and assess and interpret them regarding their effectiveness and efficiency.
- assess the management of organisational changes.

Content
The course should enable the participants to assess the strengths and weaknesses of existing organisational structures and rules using systematic criteria. Here concepts and models for designing organisation structures, regulating organizational processes and managing organisational changes are presented and discussed using case studies. The course is structured to relate to actions and aims to give students a realistic view of the opportunities and limits of rational design approaches.

Media
Slides.

Literature

- Laux, H.; Liermann, F.: *Grundlagen der Organisation*, Springer. 6. Aufl. Berlin 2005.
- Lindstädt, H.: *Organisation*, in Scholz, C. (Hrsg.): Vahlens Großes Personallexikon, Verlag Franz Vahlen. 1. Aufl. München, 2009.
- Schreyögg, G.: *Organisation. Grundlagen moderner Organisationsgestaltung*, Gabler. 4. Aufl. Wiesbaden 2003.

The relevant excerpts and additional sources are made known during the course.

Remarks
The credits for the course "Managing Organizations" have been changed from 4 to 3,5 from summer term 2015 on.

Course: Organization Theory [2577904]

Coordinators: H. Lindstädt
Part of the modules: Strategic Corporate Management and Organization (p. 38)[IW4BWLUO1], Strategic Decision Making and Organization (p. 39)[IW4BWLUO4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam following §4, Abs. 2, 1 of the examination regulation.

Conditions
None.

Learning Outcomes
The participants are made familiar with mostly classical principles of economic organisational theory and institutional economics. This includes transaction cost theory and agency-theory approaches, models for the function and design of organisational information and decision-making systems, transfer price models to coordinate the exchange of goals and services within companies. The course therefore lays the basis for a deeper understanding of the advanced literature on this key economic area.

Content
Concretely, after passing this course the students should be able to assess effects and implications of the following aspects:

- Design of transactional relationships between different steps of the value-adding process
- Design of decision tasks under diverse aspects
- Organisation under asymmetric information and conflicting goals (agency theory)

Media
Folien.

Literature

- Laux, H.; Liermann, F.: Grundlagen der Organisation. Springer, 5. Aufl. Berlin 2003.
- Milgrom, P.; Roberts, J.: Economics, Organization and Management. Prentice Hall, Englewoods Cliffs 1992.

The relevant excerpts and additional sources are made known during the course.

Remarks
The course "Organization Theory" will not be offered any more from summer term 2015 on. The examination will be offered latest until winter term 2015/2016 (repeaters only).

Course: P&C Insurance Simulation Game [INSGAME]

Coordinators: U. Werner
Part of the modules: Insurance Management II (p. 37)[IW4BWLFBV7], Insurance Management I (p. 36)[IW4BWLFBV6]

ECTS Credits	Hours per week	Term	Instruction language
3	3	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
See German version.

Content

Course: [2520320]

Coordinators: W. Heller
Part of the modules: Econometrics and Statistics I (p. 66)[IW4STAT5], Econometrics and Statistics II (p. 67)[IW4STAT6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/2	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Parallel Algorithms [2400053]

Coordinators: P. Sanders
Part of the modules: Advanced Algorithms: Engineering and Applications (p. 73)[IW4INAALGOB], Parallel Processing
                           (p. 96)[IW4INPV], Advanced Algorithms: Design and Analysis (p. 72)[IW4INAADA]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Knowlege from lectures as *Algorithms I/II* are recommended.

Learning Outcomes
The Students are to learn basic techniques for the design of parallel algorithms as well as a selection of important parallel algorithms.

Content
Models and their relationship to real machines:

- Shared memory - PRAM
- Message passing, BSP
- Circuits

Analysis: speedup, efficiency, scalability
Basic techniques:

- SPMD
- Parallel divide and conquer
- Collective communication
- Load balancing

Examples of real algorithms:

- Collective Communication (also for large data sets): broadcast, reduce, prefix sums, all-to-all exchange
- Matrix arithmetic
- Sorting
- List ranking
- Minimum spanning trees
- Load balancing: master worker with adaptive problem size, random polling, random distribution

Media
Slides (pdf), scientific articles

Literature
Elective literature:

- Sanders, Worsch. Parallele Programmierung mit MPI – ein Praktikum
- Kumar, Grama, Gupta und Karypis. Introduction to Parallel Computing.
- JáJá. An Introduction to Parallel Algorithms

Course: Parallel computer systems and parallel programming [24617]

Coordinators: A. Streit
Part of the modules: Dynamic IT-Infrastructures (p. 88)[IW4INDITI]

ECTS Credits	Hours per week	Term	Instruction language
4	2/0	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Basic knowledge of the lecture *Rechnerstrukturen* [24570] is helpful.

Learning Outcomes

Content

Media
Slides, program examples

Course: Parametric Optimization [2550115]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 61)[IW4OR6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1		de

Learning Control / Examinations
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.

Conditions
None.

Recommendations
It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Learning Outcomes
The student

- knows and understands the fundamentals of parametric optimization,
- is able to choose, design and apply modern techniques of parametric optimization in practice.

Content
Parametric Optimization deals with the impact of parameter changes on the solution of optimization problems. In practical applications this is of fundamental importance, for example, to assess the quality of a numerically computed solution or to derive quantative statements about its parameter dependence. Moreover, many optimization algorithms are controlled by variing parameters, and applications may be found in noncooperative game theory, geometric optimization and robust optimization. The lecture provides a mathematically sound introduction to these topics and is structured as follows:

- Introductory examples and terminology
- Stability and regularity conditions
- Sensitivity
- Applications: semi-infinite optimization and Nash games

Media
Lecture notes.

Literature
Elective literature:

- J.F. Bonnans, A. Shapiro, Perturbation Analysis of Optimization Problems, Springer, New York, 2000.
- W. Dinkelbach, Sensitivitätsanalysen und parametrische Programmierung, Springer, Berlin, 1969.
- J. Guddat, F. Guerra Vasquez, H.Th. Jongen, Parametric Optimization: Singularities, Pathfollowing and Jumps, Wiley, Chichester, and Teubner, Stuttgart, 1990.
- R.T. Rockafellar, R.J.B. Wets, Variational Analysis, Springer, Berlin, 1998.

Remarks
The lecture is offered irregularly. The curriculum of the next three years is available online (www.ior.kit.edu).

Course: Patent Law [24656]

Coordinators: P. Bittner
Part of the modules: Intellectual Property Law (p. 114)[IW4JURA4]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
It is the aim of this course to provide students with knowledge in the area of patent law and the business of technical intellectual property that builds upon, and goes beyond the knowledge the students have already acquired in the general lecture of *Industrial and intellectual property law*. Students shall understand how the legal rules depend upon, and interact with, the economic background and the legislative policy in the field of technical intellectual property, particularly in the field of information and communication technologies. Students shall learn about the rules of national, European and international patent law as well as know-how protection law and to apply these legal rules in practical cases, in particular in the area of utilizing technical intellectual property through agreements and lawsuits. The conflict between the monopoly of a patent and the antitrust law policies in Europe will be reviewed with the students.

Content
The course deals with the subject matter of the law of technical intellectual property, in particular inventions, patents, utility models, design patents, know-how, the rights and obligations of employees as creators of technical IP, licensing, limitations and exceptions to patenting, term of protection, enforcement of the rights and defence against these in invalidation and revocation actions. The course does not merely focus on German patent law, but likewise puts European, US and international patent law into perspective. Students shall understand how the legal rules depend upon, and interact with, the economic background and the legislative policy in the field of technical intellectual property, particularly in the field of information and communication technologies. Students shall learn about the rules of national, European and international patent law as well as know-how protection law and to apply these legal rules in practical cases, in particular in the area of utilizing technical intellectual property through agreements and lawsuits. The conflict between the monopolyöf a patent and the antitrust law policies in Europe will be reviewed with the students.

Media
transparancies

Literature

- Schulte, Rainer Patentgesetz Carl Heymanns Verlag, 7. Aufl. 2005 ISBN 3-452-25114-4
- Kraßer, Rudolf, Patentrecht Verlag C.H. Beck, 5. Aufl. 2004 ISBN 3-406-384552

Elective literature:
tba in the transparencies

Course: Personalization and Services [2540533]

Coordinators: A. Sonnenbichler
Part of the modules: Advanced CRM (p. 25)[IW4BWLISM1], Business & Service Engineering (p. 30)[IW4BWLISM4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations

Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation.

The course is considered successfully taken, if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 10) from excersise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	95
1.3	90
1.7	85
2.0	80
2.3	75
2.7	70
3.0	65
3.3	60
3.7	55
4.0	50
5.0	0

Conditions
None.

Learning Outcomes

The student

- knows the options and opportunities of personalization especially in the area of Internet based services
- knows important methods for authentication, authorization, and accounting
- can use these methods practically in internet-based services.

Content

Media
Slides.

Remarks

As of summer term 2014 this lecture is hold in alternation with the lecture "2540506 - Recommendersystems". The current schedule can be seen on the chair's website (http://www.em.uni-karlsruhe.de/studies/).

Course: Simulation Game in Energy Economics [2581025]

Coordinators: W. Fichtner
Part of the modules: Energy Economics and Energy Markets (p. 42)[IW4BWLIIP4]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam according to Section 4(2), 1 of the examination regulation.

Conditions
Visiting the course "Introduction to Energy Economics"

Learning Outcomes
Students

- understand market mechanisms, pricing and investment decisions in a liberalised electricity market,

- apply methods and instruments in a subarea of "Energy Economics",

- choose the appropriate methods to solve given problems (unit dispatch, investment planning) and apply them,

- find and discuss arguments for solution approaches.

Content

- Introduction
- Agents and market places in the electricity industry
- Selected planning tasks of energy service companies
- Methods of modelling in the energy sector
- Agent-based simulation: The PowerACE model
- Simulation game: Simulation in energy economics (electricity and emission trading, investment decisions)

The lecture is structured in a theoretical and a practical part. In the theoretical part, the students are taught the basics to carry out simulations themselves in the practical part which comprises amongst others the simulation of the power exchange. The participants of the simulation game take a role as a power trader in the power market. Based on various sources of information (e.g. prognosis of power prices, available power plants, fuel prices), they can launch bids in the power exchange.

Media
Media will likely be provided on the e-learning platform ILIAS.

Literature
Elective literature:
Möst, D. und Genoese, M. (2009): Market power in the German wholesale electricity market. The Journal of Energy Markets (47–74). Volume 2/Number 2, Summer 2009

Course: Portfolio and Asset Liability Management [2520357]

Coordinators: M. Safarian
Part of the modules: Mathematical and Empirical Finance (p. 63)[IW4STAT1], Statistical Methods in Risk Management
                            (p. 64)[IW4STAT2], Econometrics and Statistics II (p. 67)[IW4STAT6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	en

Learning Control / Examinations
The assessment of this course consists of a written examination (following §4(2), 1 SPO) and of possible additional assignments
during the course (following §4(2), 3 SPO).

Conditions
None.

Learning Outcomes
Introduction and deepening of various portfolio management techniques in the financial industry.

Content
Portfolio theory: principles of investment, Markowitz- portfolio analysis, Modigliani-Miller theorems and absence of arbitrage, ef-
ficient 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

Media
transparencies, exercises.

Literature
To be announced in lecture.
Elective literature:
To be announced in lecture.

Remarks
The credits for the course have been changed from 5 to 4,5 from winter term 2015/2016 on.

Course: Practical Course in Algorithm Design [ALGTprak]

Coordinators: P. Sanders, D. Wagner
Part of the modules: Advanced Algorithms: Engineering and Applications (p. 73)[IW4INAALGOB], Advanced Algorithms:
Design and Analysis (p. 72)[IW4INAADA]

ECTS Credits	Hours per week	Term	Instruction language
6	4		de

Learning Control / Examinations
The assessment consists of an oral exam according to sec. 4 subsec. 2 no. 2 study and examination regulations. In addition
there will be multiple projects and a final presentation.

Conditions
None.

Recommendations
Knowledge of the lecture Algorithms II is recommended.

Learning Outcomes
The purpose of the practical course in algorithm design is to make learned knowledge work. The students are given varying
topics from algorithmics, which they have to implement in small working groups. Possible Topics are, for exmaple, algorithms for
flow problems, shortest path problems, or clustering techniques. In this way students learn to write efficient code.

Content
In the practical course *Algorithm Engineering* the students are given miscallaneous questions from algorithmics, which they
have to implement independently in small working groups. The main focus lies on object oriented programming with Java or
C++. Linear programming may also occur.

Course: Advanced Lab Applied Informatics [25070p]

Coordinators: A. Oberweis, H. Schmeck, R. Studer
Part of the modules: Intelligent Systems and Services (p. 100)[IW4INAIFB5], Web Data Management
                         (p. 99)[IW4INAIFB4], Semantic Technologies (p. 101)[IW4INAIFB6], Development of Business
                         Information Systems (p. 104)[IW4INAIFB11], Organic Computing (p. 103)[IW4INAIFB8]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment of this course are practical work, presentations and a written seminar thesis according to §4(2), 3 of the examination regulation. Practical work, presentations and a written thesis are weighted according to the course.

Conditions
None.

Learning Outcomes
Students are able to

- implement a prototype at the computer based on the given topic.
- write the thesis with a minimal learning curve by using format requirements such as those recommended by well-known publishers.
- give presentations in a scientific context in front of an auditorium. These techniques are presented and learned during the course.
- present results of the research in written form as generally found in scientific publications.

Content
The lab intensifies and extends specific topics which are discussed within corresponding lectures. Knowledge of these lecture topics is an advantage but not a precondition.

Media
Slides, access to internet resources

Literature
Literature will be given individually.

Remarks
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 http://www.aifb.uni-karlsruhe.de/Lehre

Course: Practical Course Automatic Speech Recognition [24298]

Coordinators: A. Waibel, Stüker
Part of the modules: Speech Processing (p. 90)[IW4INSV]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
The prior completion or parallel attendance of the lecture *Principles of Automatic Speech Recognition* [24145] is of advantage.

Learning Outcomes

- The students experience the implementation of algorithms from the area of automatic speech recognition in the example of the Janus Recognition Toolkit.
- The students learn to autonomously study an existing software using an existing documentation and under human supervision
- The students improve their teamwork skills and their ability to conduct a project in a team, managing the project flow themselves.
- The student learns to communicate with his co-students taking this class, as well as with the supervisor of the class.
- After completion of this class, the student will be familiar with the use of the speech recognition system Janus Recognition Toolkit.
- This class teaches the necessary steps in designing and training a speech recognition system.
- The students learn the basic skills for participating and conducting competitive evaluations for automatic speech recognition systems.

Content

- Using the „Janus" speech recognition system, which has been developed at our institute, the students shall learn through consecutive exercises the methods for training and evaluating a state-of-the-art speech recognition system.
- The open object structure of Janus makes it possible, to gain insight into every stage of the training and recognition process, and to enhance the understanding of the methods applied.
- During the first half of the class, the students complete a tutorial for learning the use of the Janus Recognition Toolkit and the use of the scripting language Tcl/Tk which is necessary in order to control Janus.
- During the second half of the class the students will train in teamwork a speech recognition system for a surprise language, and will participate in a competitive evaluation.

Media
web-based tutorial

Literature
Elective literature:

- A. Waibel, K.F. Lee: Readings in Speech Recognition
- F. Jelinek: Statistical Methods of Speech Recognition
- Schukat-Talamazzini: Automatische Spracherkennung

Course: Practical course: Geometric Modeling [2400007]

Coordinators: H. Prautzsch, Diziol
Part of the modules: Algorithms in Computer Graphics (p. 94)[IW4INACG]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
Programming knowledge in C++

Learning Outcomes
Practical skills to work with free form curves and surfaces. Team work.

Content
Classical techniques of computer aided geometric design, interpolation, periodic curves, approximation, tensor product surfaces, curvature, offsets, ball pivoting algorithm.
AC ++ library is used and it has to be extended.

Media
Practical course material, slides

Literature
Elective literature:
Prautzsch, Boehm, Paluszny: Bézier and B-Spline Techniques, Springer 2002.
Farin: Curves and Surfaces for CAGD, Fifth Edition, 2002.
de Boor: A practical guide to splines, 2001.
Piegl, Tiller: The NURBS book, 1997

Course: Practical Course Modeling and Simulation of Networks and Distributed Systems [24878]

Coordinators: H. Hartenstein
Part of the modules: Networking Labs (p. 79)[IW4INNL], Dynamic IT-Infrastructures (p. 88)[IW4INDITI]

ECTS Credits	Hours per week	Term	Instruction language
5	0/2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
The requirements are explained in the module description.

Learning Outcomes

Content
The simulation of networks and distributed systems is a means to analyze and evaluate protocols in a quick and cost-efficient way and is therefore a valuable tool in the research of networks and distributed systems. While analytical approaches are often challenged by the complexity of scenarios and field tests are challenged by a high hardware configuration effort and resulting costs, simulations allow for the efficient investigation of the parameter space regarding networktopologies, communication patterns and dependencies to other protocols. However, simulation results are only of relevance if the modeling and evaluation has beendone accurately.

In this practical course the students will acquire practical experiences by using the concepts, tools and simulators introduced in the lecture.

More specifically the following topics are covered:

- Introduction to the simulation of computer networks and distributed systems in general
- Hands-on experience with respect to state-of-the-art simulators, in particular ns-3, OMNeT++ and OPNET
- Simulation of wired and wireless networks
- Distributed simulations
- Agent-based simulations
- How to implement your own simulator: algorithms and their quality

Media
Slides, problems, code fragments

Literature
Averill Law, W. David Kelton, Simulation Modeling and Analysis, 4th ed., McGraw-Hill, 2006.

Course: Lab Protocol Engineering [PEprak]

Coordinators: M. Zitterbart
Part of the modules: Networking (p. 81)[IW4INNW]

ECTS Credits	Hours per week	Term	Instruction language
4	4	Winter term	

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Advanced Lab in Ubiquitous Computing [24146p]

Coordinators: H. Schmeck
Part of the modules: Ubiquitous Computing (p. 102)[IW4INAIFB7]

ECTS Credits	Hours per week	Term	Instruction language
4	2/0	Winter / Summer Term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Practical Course Distributed Data Management [praktvd]

Coordinators: K. Böhm
Part of the modules: Theory and Practice of Database Technology (p. 87)[IW4INDBTP]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Winter term	de

Learning Control / Examinations
The assessment will be an assessment according to sec. 4 subsec. 2 no 3. study and examination regulations and consists of several parts (projects, experiments, presentations and reports). The course will be assessed with "passed" or "failed" (according to sec. 9 subsec. 3 study and examination regulations). For passing the practical course, all partial exercises must have been passed successfully. If the course is dropped after the first session, it will be marked with "failed".

Conditions
Course *Database Systems* has to passed.
Knowledge about database systems, e.g. from the lectures *Database Systems*, as well as basic knowledge of Java programming.

Learning Outcomes
During this practical course, the students should

1. deepen selected topics from the lecture "Distributed Data Management" in the context of sensor networks,

2. gain experiences in programming sensor nodes,

3. develop self-containedly a solution for a given problem from the research-area of query processing in sensor networks and

4. get experience in developing and programming in teams as well as getting familiar with the according tools.

Content
Characteristics of modern information systems like massively distributed data creation, query processing over the internet and an increased demand regarding the robustness of such systems require distributed storage and query processing. Traditional database systems initially did not meet these new requirements, but met them by offering additional software extensions. These extensions suffer from the fact that the original system was not designed with a distributed system in mind and therefore the extension either only offer limited functionality or their applicability is tailored to a specific scenario. This course offers a broad introduction into distributed database technology, that does not have the drawbacks of afore mentioned extensions. Furthermore the participants get an in-depth look on selected research topics through theoretical course work and hands-on experience with different distributed database systems: The first block of the course will introduce database schemas for distributed storage and based on this, the participants will use SQL to execute queries over distributedly stored data. The second block of the course will focus on query processing in sensor networks, which is an application of distributed databases, where extensions of standard database technology are not sufficient for several reasons. After an introductional phase into sensor databases, the students will develop a solution to a complex research problem over several weeks. For the development and testing of this solution, we will provide Sun SPOT sensor nodes (www.sunspotworld.com).

Media

- Slides.
- Practical course notes.

Literature
Please refer to the literature from the lecture "Distributed Data Management".
Elective literature:
Please refer to the literature from the lecture "Distributed Data Management".

Remarks
The course is not offered.

Course: Practical Course Web Engineering [24880]

Coordinators: H. Hartenstein, M. Nußbaumer, M. Keller
Part of the modules: Applied Web Engineering (p. 77)[IW4INPWE]

ECTS Credits	Hours per week	Term	Instruction language
5	4	Winter / Summer Term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
The lecture Web Engineering (24124) has to be taken.

Recommendations
Knowledge of HTML is required, basic programming knowledge (e.g. Java, C++/C or C#, etc.) is expected.

Learning Outcomes
The practical course is based on the lecture Web Engineering. The exercise help develop a fundamental understanding of server- and client-side technologies and their interaction. According to the lecture the aspects data, interaction, navigation, presentation, communication and processes are covered.

A larger project will be realized in the second half of the practical course, to broaden the knowledge about the whole Web application lifecycle and the project management process. The project and most of the exercises will be carried out in form of teamwork.

Content
The practical course consists of two parts. In the first half the basic technologies and methods of the Web Engineering discipline are introduced. This includes declarative languages like (X)HTML/CSS and XML/XSL as well as component-based approaches and frameworks. Another thematic focus of the course is on Web services as a fundamental building block for realizing service-oriented applications. The second half of the practical course emphasizes the structured and disciplined application of the learnt technologies and methods by realizing a software project.

Media
Slides, homepages.

Remarks
The course is lectured for the last time in the summer term 2014. Examination is possible until summer term 2015.

Course: Analyzing Big Data - Laboratory Course [24874]

Coordinators: K. Böhm
Part of the modules: Theory and Practice of Data Warehousing and Mining (p. 86)[IW4INDWMTP], Theory and Practice
                           of Big Data Analytics (p. 112)[IW4INADTP]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Summer term	de

Learning Control / Examinations
The assessment will be an assessment according to sec. 4 subsec. 2 no 3. study and examination regulations and consists of several parts (projects, experiments, presentations and reports). The course will be assessed with "passed" or "failed" (according to sec. 9 subsec. 3 study and examination regulations). For passing the practical course, all partial exercises must have been passed successfully. If the course is dropped after the first session, it will be marked with "failed".

Conditions
None.

Learning Outcomes
l

Content

Media

- Slides.

- Practical course notes.

Literature
Elective literature:

- J. Han und M. Kamber: "Data Mining: Concepts and Techniques", Morgan Kaufmann, 2006.

- I. H. Witten und E. Frank: "Data Mining - Practical Machine Learning Tools and Techniques", Morgan Kaufmann, 2005.

- D. Hand, H. Mannila und P. Smyth: "Principles of Data Mining", MIT Press, 2001.

- L. I. Kuncheva: "Combining Pattern Classifiers", Wiley-Interscience, 2004.

- A. Bauer, H. Günzel: "Data Warehouse Systeme – Architektur, Entwicklung, Anwendung", dpunkt.verlag, 2004.

Course: Practical Course: Context Sensitive ubiquitous Systems [24895]

Coordinators: M. Beigl
Part of the modules: Context Sensitive Systems (p. 92)[IN4INKUS]

ECTS Credits	Hours per week	Term	Instruction language
5	4	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
The practical course should ideally be taken in parallel to accompany the lecture Context-Sensitive Systems (24658).

Learning Outcomes
After completion of the course, students can

- implement new context-sensitive systems using existing "sensor", "Machine Learning" and "Big Data" components
- select and adapt existing components and algorithms
- process data records and identify suitable methods for this task
- evaluate and compare different methods and parameterizations through experiments
- make application-specific improvements of methods and processing chains through analysis of the experimental results

Content
Context-awareness is often referred to as a key component of ubiquitous systems. Systems that can recognize and process the context of their users, can provide optimal services and ideally without explicit input from users (see also the description of lecture 24658).
In the practical course, students deepen their knowledge on techniques, methods and software of context acquisition and processing in the fields of sensors, sensor-based distributed information processing, time series processing and machine learning on large data sets in the form of small projects in a practical manner.
The practical tasks take place in the context of current scientific work as well as current platforms and technologies. The course is research-oriented and focuses thematically on current projects at Smart Data Innovation Lab at KIT. This insight into current problems focuses in particular on industrial applications. The goal is to develop innovative, efficient and practical solutions based on concrete applications and scientifically present them as technology demos.
The participants are assisted in the implementation by the academic staff.

Literature
Introduciton: John Krumm, Ubiquitous Computing Fundamentals, 2009, Chapter 7-9.
Schilit, Bill, Norman Adams, and Roy Want. "Context-aware computing applications." First Workhop on Mobile Computing Systems and Applications, IEEE, 1994.
Witten, Ian H., and Eibe Frank. Data Mining: Practical machine learning tools and techniques. Morgan Kaufmann, 2005.

Course: Practical Course: Sensor-based HCI Systems [24875]

Coordinators: M. Beigl
Part of the modules: Human-Machine-Interaction (p. 93)[IW4INMMI]

ECTS Credits	Hours per week	Term	Instruction language
5	4	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes

The practical course has the goal to deepen existing knowledge in the field of sensor-based human-computer interaction. Students gain practical skills in the design and evaluation of sensor-based HCI systems and appliances. After completion of the course, students are able to

- conceive and design information appliances
- accordingly identify and develop tasks to design, implement and evaluate sensor-based HCI systems
- practically implement the developed concept
- find suitable interaction methods, implement them, and evaluate their usability

Content

Literature

Indtroduction:
David Benyon: Designing Interactive Systems: A Comprehensive Guide to HCI and Interaction Design. Addison-Wesley Educational Publishers Inc; 2nd Revised edition edition; ISBN-13: 978-0321435330
Steven Heim: The Resonant Interface: HCI Foundations for Interaction Design. Addison Wesley; 1 edition (March 15, 2007) ISBN-13: 978-0321375964
John Krumm, Ubiquitous Computing Fundamentals

Course: Multicore Programming in Practice: Tools, Models, Languages [24293]

Coordinators: W. Tichy, T. Karcher, L. Rodríguez
Part of the modules: Software Systems (p. 75)[IW4INSWS], Parallel Processing (p. 96)[IW4INPV]

ECTS Credits	Hours per week	Term	Instruction language
6	4	Winter term	de

Learning Control / Examinations
The assessment will be an assessment according to sec. 4 subsec. 2 no. 3 study and examination regulations and consists of multiple parts. The performance is assessed on the basis of exercise sheets, results of a programming project, a final presentation and a final report.

Conditions
This course can **not** be taken in the study course Information Engineering and Management.

Recommendations
The course requires basic knowledge of C/C++, Java, operating systems, computer architecture, software engineering.

Learning Outcomes
Understand basics of parallel programming for multicore systems. Use parallel programming languages and tools.

Content
Multicore processors are standard and require parallel programming. This course focuses on developing the practical skills that are necessary for the development of parallel programs for shared-memory parallel computers. It presents selected topics from parallel programming models, parallel design patterns, programming languages, and debugging techniques for parallel programs. This course has a significant amount of practical work: labs, case studies, and a large software project have to be completed throughout the semester. This course can be graded with a mark for Diplom/Master's students in Computer Science, but alternatively can also be graded with a „Praktikumsschein" for Diplom students due to is large amount of practical work. The grading is entirely done throughout the course; there is no exam after the course. The course requires pre-registration.

Media
Slides

Literature
Will be announced in the lecture.
Elective literature:
Will be announced in class.

Course: Consulting in Practice [PUB]

Coordinators: K. Böhm, Stefan M. Lang
Part of the modules: Innovative Concepts of Data and Information Management (p. 84)[IW4INIKDI], Entrepreneurship for
                         Computer Scientists (p. 111)[IW4INUKI]

ECTS Credits	Hours per week	Term	Instruction language
1,5	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment will be an assessment according to sec. 4 subsec. 2 no 3. study and examination regulations and consists of
several parts. These include talks, market studies, projects, case studies and reports.
The course will be assessed with "passed" or "failed". For passing the practical course, all partial exercises must have been
passed successfully.

Conditions
None.

Learning Outcomes
At the end of the course, the participants

- have gained knowledge and understanding for the activities of the consulting process in general,
- have gained function-specific knowledge and understanding of IT consulting,
- have an overview about consulting companies,
- know concrete consulting examples,
- have experienced how effective teams work and
- have got an insight into the professional field "consulting".

Content
The market for consulting services grows annually by 20% and is therefore one of the leading growth sectors and professional
fields in the future. This trend is in particular driven by the IT industry. Here, widely used standard software moves the focus of
the future professional field from software development to consulting. In this context, consulting services have usually a broad
definition, reaching from pure IT-focused consulting (e.g., deployment of SAP) to strategic consulting (strategy, organisation
etc). In contrast to common rumors, a qualification in business studies is not a must. This opens up a diversified and exciting
field with exceptional development perspectives for computer science students. The copurse deals thematically with the two
fields consulting in general and function-specific consulting (with IT consulting as an example).

The structure of the course is oriented along the phases of a consulting project:

- Diagnosis: The consultant as an analytic problem solver.
- Strategic adjustment/redesign of the core processes: Optimisation/redesign of essential business functionality to solve
  the diagnosed problems in cooperation with the client.
- Implementation: Installation of the solutions in the client's organisation for assuring the implementation.

Emphasised topics in the course are:

- Elementary problem solving: Problem definition, structuring of problems and focussing through the usage of tools (e.g.,
  logic and hypothesis trees), creative techniques, solution systems etc.
- Obtaining information effectively: Access of information sources, interview techniques etc.
- Effective communication of findings/recommendations: Analysis/planning of communication (media, audience, formats),
  communication styles (e.g., top-down vs. bottom-up), special topics (e.g., arrangement of complex information) etc.
- Efficient teamwork: Tools for optimising efficient work, collaboration with clients, intellectual and process leadership in the
  team etc.

Media
Slides, case studies.

Remarks
Seats are limited, so please register with Prof. Böhm's office.
This course is offered every three semesters.

Course: Selling IT-Solutions Professionally [PLV]

Coordinators: K. Böhm, Hellriegel
Part of the modules: Innovative Concepts of Data and Information Management (p. 84)[IW4INIKDI], Entrepreneurship for
                           Computer Scientists (p. 111)[IW4INUKI]

ECTS Credits	Hours per week	Term	Instruction language
1,5	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment will be an assessment according to sec. 4 subsec. 2 no 3. study and examination regulations and consists of several parts. These include group work and role playing, written summaries and the presentation thereof and occasionally playing roles such as account manager, sales manager and project manager.
The course will be assessed with "passed" or "failed". For passing the practical course, all partial exercises must have been passed successfully.

Conditions
None.

Learning Outcomes
At the end of the course, the participants:

1. Have gained knowledge and understanding for the sales process.

2. Have obtained knowledge and understanding for typical roles and tasks.

3. Have gained an insight into practical and application-oriented aspects through an extensive case study and role plays.

Content
One of the key qualifications in IT sales (activities related to the customer) is the understanding of sales mechanisms as well as having the corresponding basic skills. This applies not only to the marketing staff, but also to consultants of customers, project managers and developers. After a short overview of the different types of businesses and the resulting requirements regarding marketing and sales in general, the course focuses in particular on the process of selling IT-solutions professionally.

The topics are structured as follows:

1. Understanding the market: which information regarding the markets of clients and suppliers needs to be obtained and where can such information be found.

2. Knowing the customer: what should a provider know about the customer and its staff? This goes up to the question with which characters one has to deal with.

3. Planning the sales process: sales builds on phases, milestones and formally describable intermediate results.

4. Building a sales team: solutions are developed and sold with a team consisting of "players" having different expertise. How does one play this game?

5. Positioning the solution: obviously, it is necessary to develop a solution which is competitive, both technically and commercially.

6. To contract: what is important at the very last steps: how to convince the customers.

Based on a real-world case study, the students have the opportunity to reflect and practice the learned theory by means of teamwork and role plays. This aims at establishing a first connection to reality. The topics of the course are enriched with many examples from practice.

Media
Presentation, case studies and group work material.

Literature
Elective literature:
Reiner Czichos: Creaktives Account-Management.

Remarks
Seats are limited, so please register with Prof. Böhm's office.

Course: Practical seminar: Health Care Management (with Case Studies) [2550498]

Coordinators: S. Nickel
Part of the modules: Operations Research in Supply Chain Management and Health Care Management (p. 59)[IW4OR4]

ECTS Credits	Hours per week	Term	Instruction language
7	2/1/2	Winter / Summer Term	de

Learning Control / Examinations
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).

Conditions
None.

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

Learning Outcomes
The student

- is familiar with real problems arising in a hospital

- develops solution approaches for these problems by using well-known methods of Operations Research,

- is able to analyze processes and structures, to collect relevant data as well as to develop and solve models for hospital-specific problems.

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.

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

Remarks
The lecture is offered every term.
The planned lectures and courses for the next three years are announced online.

Course: Predictive Mechanism and Market Design [2520402]

Coordinators: P. Reiss
Part of the modules: Applied Strategic Decisions (p. 53)[IW4VWL2], Experimental Economics (p. 58)[IW4VWL17]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	en

Learning Control / Examinations
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.

Conditions
None.

Recommendations
Basic knowledge of mathematics, statistics, and game theory is assumed.

Learning Outcomes
Students

- are provided with theoretical predictions in a variety of applications of mechanism and market design;
- learn about the robustness and usefulness of theoretical predictions in mechanism and market design;
- shall be able to design mechanisms and market for real-life problems.

Content
Frequently economic agents - individuals, firms, the government - need to define allocation mechanisms and can design the rules of market interactions. Examples include the provision of public goods (e.g., the reduction of CO_2 emissions), the solution of matching problems (e.g., the assignment in kidney exchange), resource allocation (e.g., radio spectrum usage rights), and procurement (e.g., choice of supplier and contractual terms). Theoretical predictions are derived and confronted with data from the laboratory and the field. The course focusses on the interplay of theory with evidence to learn about the accuracy and the robustness of the theoretical predictions.

Media
Slides, problem sets.

Literature
A selection of published papers is compulsory reading for the course. The course syllabus provides references and is announced at the beginning of the course.

Remarks
See German version.

Course: Price Negotiation and Sales Presentations [2572198]

Coordinators: M. Klarmann, M. Schröder
Part of the modules: Sales Management (p. 48)[IW4BWLMAR6]

ECTS Credits	Hours per week	Term	Instruction language
1,5	1	Winter term	de

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Recommendations
None.

Learning Outcomes
Students

- gain a clear impression of the theoretical knowledge about price negotiations and sales presentations

- improve their own negotiation abilities

Content

Course: Pricing [2572157]

Coordinators: J. Kim
Part of the modules: Sales Management (p. 48)[IW4BWLMAR6], Strategy, Communication, and Data Analysis (p. 49)[IW4BWLMAR7], Services Marketing (p. 51)[IW4BWLMAR9], Strategic Decision Making and Organization (p. 39)[IW4BWLUO4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

Conditions
None.

Learning Outcomes
See German version.

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

Remarks
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

Course: Principles of Insurance Management [2550055]

Coordinators: U. Werner
Part of the modules: Insurance Management II (p. 37)[IW4BWLFBV7], Insurance Management I (p. 36)[IW4BWLFBV6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	Summer term	de

Learning Control / Examinations
The assessment consists of oral presentations (incl. papers) within the lecture (according to Section 4 (2), 3 of the examination regulation) and a final oral exam (according to Section 4 (2), 2 of the examination regulation).
The overall grade consists of the assessment of the oral presentations incl. papers (50 percent) and the assessment of the oral exam (50 percent).

Conditions
None.

Learning Outcomes
See German version.

Content
See German version.

Literature

- D. Farny. *Versicherungsbetriebslehre.* Karlsruhe 2011.

- P. Koch. *Versicherungswirtschaft - ein einführender Überblick.* 2005.

- M. Rosenbaum, F. Wagner. Versicherungsbetriebslehre. Grundlegende Qualifikationen. Karlsruhe 2002.

- U. Werner. Einführung in die Versicherungsbetriebslehre. Skript zur Vorlesung.

Elective literature:
Will be announced during the lecture.

Course: Private and Social Insurance [2530050]

Coordinators: W. Heilmann, K. Besserer
Part of the modules: Insurance Management II (p. 37)[IW4BWLFBV7], Insurance Management I (p. 36)[IW4BWLFBV6]

ECTS Credits	Hours per week	Term	Instruction language
2,5	2/0	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam (according to Section 4 (2), 1 of the examination regulation) .
The exam takes place every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
Getting to know basic terms and functioning of private and social insurance.

Content
Basic terms of insurance, i.e. characteristics, judicial and political background and functioning of private and social insurance as well as their economic and societal and political meaning.

Literature
Elective literature:

- F. Büchner, G. Winter. Grundriss der Individualversicherung. 1995.

- P. Koch. Versicherungswirtschaft. 2005.

- Jahrbücher des GDV. Die deutsche Versicherungswirtschaft:
  http://www.gdv.de/2011/11/jahrbuch-der-deutschen-versicherungswirtschaft-2011/

Remarks
Block course. For organizational reasons, please register with the secretariat of the chair: thomas.mueller3@kit.edu

Course: Probabilistic Planning [24603]

Coordinators: J. Beyerer, Marco Huber
Part of the modules: Automated Planning and Decision-making (p. 109)[IW4INAPE]

ECTS Credits	Hours per week	Term	Instruction language
6	4	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
The student can evaluate and name the differences between the three lecture topics Markov decision processes, planning under measurement uncertainty, and reinforcement learning.
The student analyzes a given planning problem and the student can assign the problem to one of the three topics.
The student transfers the learned theoretical basics to a real-world planning problem and therefore, the student applies learned techniques for approximate but efficient calculation of policies.
The student analyses and evaluates scientific literature about probabilistic planning.
The student is able to relate cognate areas like utility theory, decision theory, game theory, or estimation theory.
The student deepens the necessary mathematical skills.

Content

Course: Problem solving, communication and leadership [2577910]

Coordinators: H. Lindstädt
Part of the modules: Strategic Corporate Management and Organization (p. 38)[IW4BWLUO1]

ECTS Credits	Hours per week	Term	Instruction language
2	1/0	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (30 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.

Conditions
None.

Recommendations
None.

Learning Outcomes
After passing this course students are able to

- structure problem solving processes.

- apply the principles of focused communication based on charts and presentations.

- understand leadership in the context of situation and personality.

Content
The course deals with various aspects of problem solving and communication processes and is divided into two parts. The first part of the course addresses the fundamental steps in the problem-solving process; namely, problem identification, problem structuring, problem analysis and communication of solution. Ideas for structuring problem solving processes will be discussed and the perquisites for and principles of structured communication based on charts and presentations will be explained. The second part of the course addresses important concepts in leadership, including the context-specificity of influence, the choice of leader and the characteristics of employees. The course content reflects current issues in management and communication practice and is oriented toward the practical application of theoretical insights to these issues. In this respect, the course aims to develop interdisciplinary skills.

Media
Slides.

Literature
The relevant excerpts and additional sources are made known during the course.

Course: Product and Innovation Marketing [2571154]

Coordinators: M. Klarmann
Part of the modules: Marketing Management (p. 46)[IW4BWLMAR5]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

Conditions
None.

Learning Outcomes
See German version.

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.

Remarks
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

Course: Production and Logistics Management [2581954]

Coordinators: M. Fröhling
Part of the modules: Industrial Production III (p. 41)[IW4BWLIIP6]

ECTS Credits	Hours per week	Term	Instruction language
5,5	2/2	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (90 minutes) (following § 4(2), 1 of the examination regulation). The exam takes place in every semester. Reexaminations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes

- Students discuss the basic tasks of an operative production and logistics management.
- Students discuss approaches to solve these tasks and shall be able to apply certain ones.
- Students explain the interdependencies between the tasks and methods to solve.
- Students discuss possible IT tools for production and logistics management.
- Students describe emerging trends in production and logistics management.

Content
This course covers central tasks and challenges of operational production and logistics management. Systems analytically, central planning tasks are discussed. Exemplary solution approaches for these tasks are presented. Further practical approaches are explained. Students get to know the set-up and mode of operation of planning systems such as PPS-, ERP- and Advanced Planning Systems to cope with the accompanying planning tasks. Alongside to MRP II, students will be introduced to integrated supply chain management approaches in Supply Chain Management.

Media
Media will be provided on the e-learning platform.

Literature
will be announced in the course

Course: Project Management [n.n.]

Coordinators: F. Schultmann
Part of the modules: Industrial Production III (p. 41)[IW4BWLIIP6]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/1	Winter term	en

Learning Control / Examinations
The examination will be in form of a written exam acc. to §4(2), 1 ER. Exams are offered in every semester and can be re-examined at every ordinary examination date.

Conditions
None.

Recommendations
None.

Learning Outcomes
The students get to know the context, rationale, strategy and tactics of project management with emphasis on the importance of project planning and project control and by identifying and examining project phases. The students discuss various approaches and standards of project management. They explain the iterative processes and the core skills required by successful project managers. The context and learning of the course enable the participants to apply project management skills to projects in a variety of industries including engineering, information technology, consulting, production, procurement, maintenance, logistics and supply chain, construction, and manufacturing. By focussing on providing knowledge in core areas of scope, time, cost and quality, and facilitating areas of risk, procurement, HR, integration, and communication management, the participants are able to confidently deal with the ever growing complexities and challenges of project management.

Content

1. Introduction
2. Principles of Project Management
3. Project Scope Mangement
4. Time Management and Resource Scheduling
5. Cost Management
6. Quality Management
7. Risk Management
8. Stakeholder
9. Communication, Negotiation and Leadership
10. Project Controlling

Media
Media will be provided on the e-learning platform.

Literature
Will be announced in the course.

Remarks
The course will be offered from winter term 2015/16 and replace the course "The Management of R&D Projects with Case Studies [2581963]".

Course: Project Management in Practice [2400005]

Coordinators: K. Böhm, W. Schnober
Part of the modules: Innovative Concepts of Data and Information Management (p. 84)[IW4INIKDI], Entrepreneurship for Computer Scientists (p. 111)[IW4INUKI]

ECTS Credits	Hours per week	Term	Instruction language
1,5	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment is an assessment according to sec. 4 subsec. 2 no 3. study and examination regulations and consists of several parts. These include presentations, project work, papers and seminar theses.
The course will be assessed with "passed" or "failed" (according to sec. 7 subsec. 3 study and examination regulations). For passing the practical course, all partial exercises must have been passed successfully.

Conditions
None.

Learning Outcomes
At the end of the course, the participants:

- Know the principles of project management and are able to make use of them in real-world case studies.
- Have profound knowledge about project phases, principles of project planning, fundamental elements such as project charter & scope definitions, descriptions of project goals, activity planning, milestones, project-structure plans, agenda and cost planning and risk management. Further, they know principle elements of project implementation, crisis management, escalation and, last but not least, project-termination activities.
- Understand and are able to adopt the fundamentals of planning as well as the subjective factors which are relevant in a project. This includes topics such as communication, group processes, teambuilding, leadership, creative solution methods and risk-assessment methods.

The following key skills are taught:

- Project planning
- Project control
- Communication
- Leadership behavior
- Crisis management
- Identification of and solutions of difficult situations
- Team building
- Motivation (of oneself and of others)

Content

- General project conditions
- Project goals / creative methods for identifying project goals and priorities
- Project planning
- Activity planning
- Cost/time/resource planning
- Phase models
- Risk management
- Project control / success control / monitoring
- Crisis management
- Project termination / lessons learned

Media
Slides, SW-screenshots, misc. presentation techniques

Remarks
The course materials are partly in English.
Places are limited, so please register with Prof. Böhm's office.

Course: Practical Course Computer Vision for Human-Computer Interaction [24893]

Coordinators: R. Stiefelhagen, Manuel Martinez
Part of the modules: Machine Vision (p. 108)[IW4INMVW]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations

The assessment consists of a written summary of the lab work and a presentation thereof according to sec. 4 subsec. 2 no. 3 study and examination regulations.

The grade corresponds to the grade of the written summary, but may be raised or lowered by up to two grade points by the performance in the presentation and in the practical tasks.

Conditions

- Basic knowledge of computer vision and man-machine interaction is helpful.

- Knowledge of C/C++ and/or Python is required.

Learning Outcomes

The student acquires practical experience in computer vision methods in the field of human-computer interaction. For this purpose the student should understand the basic ideas of computer vision and learn how to apply them. The student learns in teams how to build up a computer vision system, to develop solutions for arising practical problems and finally to evaluate the components developed.

In addition to this, the student should gather his first experience in estimating the time requirements for the individual development phases. An additional goal is to foster the students' ability to present his own work by working in teams and giving a final presentation.

Content

The purpose of this practical course is the implementation of computer vision methods and machine learning in real systems for the visual perception of humans and their environment.

For this purpose we will present a comprehensive topic and propose several subprojects matching with the topic which can be dealt with by individual students or in small teams. We also encourage the students to suggest their own ideas / projects related to our topic. Each subproject team is to present their work and especially share their experience made with practical problems and in finding solutions.

As it is intended to develop practical systems in this course our focus will be on the realisation of real-time capable, interactive systems which are intended to be tested ideally in realistic environments. Since practical problems often occur in this context and usually cannot be covered in a lecture, the imparting of experience on how to handle practical problems is an important part of this course.

For more information please refer to: http://cvhci.anthropomatik.kit.edu/

Course: Public Management [2561127]

Coordinators: B. Wigger, Assistenten
Part of the modules: Strategic Decision Making and Organization (p. 39)[IW4BWLUO4], Collective Decision Making (p. 57)[IW4VWL16]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2	Winter term	de

Learning Control / Examinations
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.

Conditions
Basic knowledge of Public Finance is required.

Learning Outcomes
See German version.

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.

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

Course: Quality Control I [2550674]

Coordinators: K. Waldmann
Part of the modules: Stochastic Modelling and Optimization (p. 62)[IW4OR7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1/2	Winter / Summer Term	de

Learning Control / Examinations
The assessment consists of an 1h written exam following Section 4(2), 1 of the examination regulation. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by a 2/3 step of a full grade (according to Section 4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes
The participants will be enabled to apply modern methods of statistic quality management efficiently in the frame of total quality management. The discussion of practice-oriented case studies provides an overview of problem settings arising in each part of the production process and motivates the introduced statistic methods. The course provides profound knowledge in the areas of statistical process control utilizing modern control charts, acceptance sampling using multilayered sampling plans and the Design and Analysis of Experiments. The facultative computer exercise course comprises a practice-oriented case study in which the participants implements certain methods of quality management in order to analyze their performance.

Content
Introduction to TQM, Statistical Process Control (control charts), Acceptance Sampling (sampling plans), Design and Analysis of Experiments

Media
Blackboard, slides, flash-animations, java tools, simulation software.

Literature

- Lecture Notes
- Montgomery, D.C.: Introduction to Statistical Quality Control (5th ed), Wiley

Remarks
The lecture is offered irregularly. The curriculum of the next two years is available online.

Course: Quality Control II [2550659]

Coordinators: K. Waldmann
Part of the modules: Stochastic Modelling and Optimization (p. 62)[IW4OR7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1/2	Winter / Summer Term	de

Learning Control / Examinations
The assessment consists of an 1h written exam following Section 4(2), 1 of the examination regulation. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by a 2/3 step (according to Section 4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes
The participants will be enabled to apply modern methods of statistic quality management efficiently in the frame of total quality management. The discussion of practice-oriented case studies provides an overview of problem settings arising in each part of the production process and motivates the introduced statistic methods. The course focuses on the methodological background of the reliability of complex systems, the estimation of lifetime distributions and maintenance. The facultative computer exercise course comprises a practice-oriented case study in which the participants implement certain methods of quality management in order to analyze their performance.

Content
Reliability Theory (structure function, reliability of complex systems, modeling and estimating lifetime distributions, systems with repair), Maintenance.

Media
Blackboard, slides, flash-animations, java tools, simulation software.

Literature

- Lecture Notes

- Ross, S.M.: Introduction to Probability Models (5 ed). Academic Press, 1993.

- Kohlas, J.: Zuverlässigkeit und Verfügbarkeit. B.B. Teubner, Stuttgart 1987.

- Bironlini, A.: Qualität und Zuverlässigkeit technischer Systeme, Springer, Berlin, 1991.

Remarks
The lecture is offered irregularly. The curriculum of the next two years is available online.

Course: Quantitative Methods in Energy Economics [2581007]

Coordinators: D. Keles, P. Plötz
Part of the modules: Energy Economics and Energy Markets (p. 42)[IW4BWLIIP4]

ECTS Credits	Hours per week	Term	Instruction language
4	2/1	Winter term	en

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

Conditions
None.

Recommendations
None.

Learning Outcomes
The student

- knows and understands selected quantitative methods of energy economics

- is able to use selected quantitative methods of energy economics

- understands they range of usage, limits and is autonomously able to adress new problems by them.

Content
Energy economics makes use of many quantitative methods in exploration and analysis of data as well as in simulations and modelling. This lecture course aims at introducing students of energy economics into the application of quantitative methods and techniques as taught in elementary courses to real problems in energy economics. The focus is mainly on regression, simulation, time series analysis and related statistical methods as applied in energy economics.

Course: Randomized Algorithms [24171]

Coordinators: T. Worsch
Part of the modules: Advanced Algorithms: Engineering and Applications (p. 73)[IW4INAALGOB], Advanced Algorithms:
                         Design and Analysis (p. 72)[IW4INAADA]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
Students know the important approaches and techniques for the use of randomization in algorithms, as well as tools for their analysis.

Students are able to find weak points in deterministic algorithms, to develop randomized approaches to eliminate them, and to assess them using tools from probabilisty theory.

Content
Randomised algorithms are not deterministic. Their behavior depends on the outcome of random experiments. One of the first uses is Rabin's randomized test for primality. Meanwhile for a multitude of problems randomized algorithms have been described which are faster (at least in some sense) than deterministic algorithms. In addition sometimes randomized algorithms are easier to understand and/or implement then deterministic algorithms.

During the course not only different kinds of randomized algorithms (Las Vegas, Monte
Carlo, ...) are presented; the foundations from probability theory needed e.g. for the analysis of the time complexity are presented, too. Also, important concepts like Markov chains are treated. Since stochastic methods are gaining importance in more and more areas in computer science, the course will also be useful outside the area of randomized algorithms.

Topics: probabilistic complexity classes, routing in hypercubes, game theory, random walks, randomized graph algorithms, randomized hashing, randomized online algorithms

Media
lecture notes and slides in pdf format;

Literature

- J. Hromkovic : Randomisierte Algorithmen, Teubner, 2004
- M. Mitzenmacher, E. Upfal: Probability and Computing, Cambridge Univ. Press, 2005
- R. Motwani, P. Raghavan: Randomized Algorithms, Cambridge Univ. Press, 1995

Elective literature:

- E. Behrends: Introduction to Markov Chains, Vieweg, 2000
- A. Borodin, R. El-Yaniv: Online Computation and Competitive Analysis, Cambridge Univ. Press, 1998

Course: Rationale Splines [rsp]

Coordinators: H. Prautzsch
Part of the modules: Curves and Surfaces (p. 91)[IW4INKUF]

ECTS Credits	Hours per week	Term	Instruction language
3 oder 5	2 oder 2/1	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Prior attendance of the lecture "Curves and Surfaces in CAD I" is not mandatory but helpful.

Learning Outcomes
A deep fundamental geometric understanding for the construction of curves and surfaces used in CAD, CAGD, and Computer Vision

Content
Projective spaces, quadrics, rational curves, rational Bèzier and B-Spline representation, offset curves and surfaces, parametrization of quadries, triangular patches on quadries, cyclides.

Media
Blackboard and slides.

Literature
Elective literature:
• Boehm, Prautzsch: Geometric Concepts for Geometric Design, AK Peters 1994.
• Farin: NURBS for Curve and Surface Design, 2nd edition, AK Peters 1999.
• Piegl, Tiller: The NURBS book, Springer 1997.

Course: [RIO]

Coordinators: G. Sydow
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations

Conditions
None.

Recommendations
Parallel to the lectures tutoria are offered in which legal thinking and argumentation is practised. Their attendance is strongly recommended.
During the semester, test exams to each lecture are offered with extensive coaching. During the lecture-free time, a Q-and-A-lecture is offered.Details on the homepage of the ZAR (www.kit.edu/zar)

Learning Outcomes

Content

Media
extensive script with cases; content structure, further information in the lectures

Course: Recommender Systems [2540506]

Coordinators: A. Geyer-Schulz, A. Sonnenbichler
Part of the modules: Business & Service Engineering (p. 30)[IW4BWLISM4], Advanced CRM (p. 25)[IW4BWLISM1]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations

Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation.

The course is considered successfully taken, if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 10) from excersise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	95
1.3	90
1.7	85
2.0	80
2.3	75
2.7	70
3.0	65
3.3	60
3.7	55
4.0	50
5.0	0

Conditions
None.

Learning Outcomes
The student

- is proficient in different statistical, data-mining, and game theory methods of computing implicit and explicit recommendations
- evaluates recommender systems and compares these with related services

Content
At first, an overview of general aspects and concepts of recommender systems and its relevance for service providers and customers is given. Next, different categories of recommender systems are discussed. This includes explicit recommendations like customer reviews as well as implicit services based on behavioral data. Furthermore, the course gives a detailed view of the current research on recommender systems at the Chair of Information Services and Electronic Markets.

Media
Folien, Aufzeichnung der Vorlesung im Internet.

Literature
Rakesh Agrawal, Tomasz Imielinski, and Arun Swami. Mining association rules between sets of items in large databases. In Sushil Jajodia Peter Buneman, editor, Proceedings of the ACM SIGMOD International Conference on Management of Data, volume 22, Washington, D.C., USA, Jun 1993. ACM, ACM Press.

Rakesh Agrawal and Ramakrishnan Srikant. Fast algorithms for mining association rules. In Proceedings of the 20th Very Large Databases Conference, Santiago, Chile, pages 487 – 499, Sep 1994.

Asim Ansari, Skander Essegaier, and Rajeev Kohli. Internet recommendation systems. Journal of Marketing Research, 37:363 – 375, Aug 2000.

Christopher Avery, Paul Resnick, and Richard Zweckhauser. The market for evaluations. American Economic Review, 89(3):564 – 584, 1999.

Ibrahim Cingil, Asuman Dogac, and Ayca Azgin. A Broader Approach to Personalization. Communications of the ACM, 43(8):136 – 141, Aug 2000.

Richard O. Duda, Peter E. Hart, and David G. Stork. Pattern Classification. Wiley-Interscience, New York, 2 edition, 2001.

Andreas Geyer-Schulz, Michael Hahsler, and Maximilian Jahn. A customer purchase incidence model applied to recommender services. In R. Kohavi et al., editor, Proceedings of the WebKDD 2001 – Mining log data across all customer touchpoints, volume 2356 of Lecture Notes in Artificial Intelligence LNAI, pages 25–47, Berlin, 2002. ACM, Springer-Verlag.

Jon M. Kleinberg. Authoritative sources in a hyperlinked environment. JACM, 46(5):604–632, sep 1999.

Joseph Konstan, Bradley Miller, David Maltz, Jonathan Herlocker, Lee Gordon, and John Riedl. Grouplens: Applying Collaborative Filtering to Usernet News. Communications of the ACM, 40(3):77 – 87, Mar 1997.

Paul Resnick, Neophytos Iacovou, Peter Bergstrom, and John Riedl. Grouplens: An open architecture for collaborative filtering of netnews. In Proceedings of the conference on Computer supported cooperative work, pages 175 – 186. ACM Press, 1994.

Elective literature:

Antoinette Alexander. The return of hardware: A necessary evil? Accounting Technology, 15(8):46 – 49, Sep 1999.

Christopher Avery and Richard Zeckhauser. Recommender systems for evaluating computer messages. Communications of the ACM, 40(3):88 – 89, Mar 1997.

Steven Bellman, Gerald Lohse, and Eric Johnson. Predictors of Online Buying Behavior. Communications of the ACM, 42(12):32 – 38, Dec 1999.

Thomas J. Blischok. Every transaction tells a story. Chain Store Age Executive with Shopping Center Age, 71(3):50–56, Mar 1995.

Hans Hermann Bock. Automatische Klassifikation. Vandenhoeck und Ruprecht, Göttingen, 1974.

Andrew S.C. Ehrenberg. Repeat-Buying: Facts, Theory and Applications. Charles Griffin & Company Ltd, London, 2 edition, 1988.

Wolfgang Gaul, Andreas Geyer-Schulz, Michael Hahsler, and Lars Schmidt-Thieme. eMarketing mittels Recommendersystemen. Marketing ZFP, 24:47 – 55, 2002.

Andreas Geyer-Schulz, Michael Hahsler, and Maximilian Jahn. myvu: a next generation recommender system based on observed consumer behavior and interactive evolutionary algorithms. In W. Gaul, O. Opitz, and M. Schader, editors, Data Analysis – Scientific Modeling and Practical Applications, volume 18 of Studies in Classification, Data Analysis and Knowledge Organization, pages 447 – 457, Heidelberg, Germany, 2000. Springer.

Andreas Geyer-Schulz, Michael Hahsler, and Maximillian Jahn. Educational and scientific recommender systems: Designing the information channels of the virtual university. International Journal of Engineering Education, 17(2):153 – 163, 2001.

Mark-Edward Grey. Recommendersysteme auf Basis linearer Regression, 2004.

John A. Hartigan. Clustering Algorithms. John Wiley and Sons, New York, 1975.

Kevin Kelly. New Rules for the New Economy: 10 Radical Strategies for a Connected World. Viking, 1998.

Taek-Hun Kim, Young-Suk Ryu, Seok-In Park, and Sung-Bong Yang. An improved recommendation algorithm in collaborative filtering. In K. Bauknecht, A. Min Tjoa, and G. Quirchmayr, editors, E-Commerce and Web Technologies, Third International Conference, Aix-en-Provence, France, volume 2455 of Lecture Notes in Computer Science, pages 254–261, Berlin, Sep 2002. Springer-Verlag.

Ron Kohavi, Brij Masand, Myra Spiliopoulou, and Jaideep Srivastava. Web mining. Data Mining and Knowledge Discovery, 6:5 – 8, 2002.

G. S. Maddala. Introduction to Econometrics. John Wiley, Chichester, 3 edition, 2001.

Andreas Mild and Martin Natter. Collaborative filtering or regression models for Internet recommendation systems? Journal of Targeting, Measurement and Analysis for Marketing, 10(4):304 – 313, Jan 2002.

Andreas Mild and Thomas Reutterer. An improved collaborative filtering approach for predicting cross-category purchases based on binary market basket data. Journal of Retailing & Consumer Services, 10(3):123–133, may 2003.

Paul Resnick and Hal R. Varian. Recommender Systems. Communications of the ACM, 40(3):56 – 58, Mar 1997.

Badrul M. Sarwar, Joseph A. Konstan, Al Borchers, Jon Herlocker, Brad Miller, and John Riedl. Using filtering agents to improve prediction quality in the grouplens research collaborative filtering system. In Proceedings of ACM Conference on Computer-Supported Cooperative Work, Social Filtering, Social Influences, pages 345 – 354, New York, 1998. ACM Press.

J. Ben Schafer, Joseph Konstan, and Jon Riedl. Recommender Systems in E-commerce. In Proceedings of the 1st ACM conference on Electronic commerce, pages 158 – 166, Denver, Colorado, USA, Nov 1999. ACM.

Upendra Shardanand and Patti Maes. Social information filtering: Algorithms for automating "word of mouth". In Proceedings of ACM SIGCHI, volume 1 of Papers: Using the Information of Others, pages 210 – 217. ACM, 1995.

Remarks

As of summer term 2014 this lecture is hold in alternation with the lecture "2540533 - Personalization and Services". The current schedule can be seen on the chair's website (http://www.em.uni-karlsruhe.de/studies/).

Course: Corporate Complince [2400087]

Coordinators: T. Dreier, N.N.
Part of the modules: Governance, Risk & Compliance (p. 117)[IW4JURGRC]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam according to Section 4, (2), 1 of the examination regulation.

Conditions
None.

Learning Outcomes

Content

Media
slides

Literature
Tba at the beginning of he course.

Course: Regulatory Management and Grid Management - Economic Efficiency of Network Operation [2540494]

Coordinators: S. Rogat
Part of the modules: Market Engineering (p. 29)[IW4BWLISM3]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations
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.

Conditions
None.

Learning Outcomes
The Student

- understands the business model of a Network Operator, his fundamental tasks and related processes,
- learns to overlook the whole complexity of network operation,
- understands the respective economic and regulatory interdependencies,
- is able to perform network relevant calculations and to prepare business decisions by well-founded analyses,
- in particular, has a sound understanding of the prevailing model of the current Incentive Regulation systems,
- understands its essential components and their impact on management decisions and economic success,
- is able to analyze controversial topics from the perspective of different stakeholders.

Content
The lecture focuses on the network operation context and the regulatory situation in Germany. Their involvement in the context of European energy politics and regulation is taken into account. The focus lies on electricity and gas networks, at all levels of voltage or pressure. The particularities of transmission grids and transmission system operators (TSOs), as opposed to distribution grids and distribution system operators (DSOs), are also taken into consideration. The selection of contents in detail – given the time restraints of lecture - follows the principle of relevance.

Media
Slides

Literature
Pérez-Arriaga, I.J.(Editor): Regulation of the Power Sector, chapters 4,5,6,14, Springer Verlag, 2013.
Bundesnetzagentur: Evaluierungsbericht nach § 33 Anreizregulierungsverordnung, Januar 2015,http://www.bmwi.de/BMWi/Redaktion/PDF/
evaluierungsbericht,property=pdf,bereich=bmwi2012,sprache=de,rwb=true.pdf
Bundesnetzagentur: Bericht der Bundesnetzagentur nach § 112a EnWG zur Einführung der Anreizregulierung nach § 21a EnWG, Juni 2006,
http://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Energie/Unternehmen_Institutionen/Netzentgelte/Anreizregulie

Remarks
New course starting winter term 2015/2016

Course: Regulation Theory and Practice [2560234]

Coordinators: K. Mitusch
Part of the modules: Energy Economics and Energy Markets (p. 42)[IW4BWLIIP4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
Result of success is made by a 60 minutes written examination during the semester break (according to §4(2), 1 ERSC). Examination is offered every semester and can be retried at any regular examination date.

Conditions
May not be examined, when te examination of *Regulation* [26026] was already taken.

Recommendations
Basic knowledge and skills of microeconomics from undergraduate studies (bachelor's degree) are expected.
Particularly helpful but not necessary: Industrial Economics and Principal-Agent- or Contract theories. Prior attendance of the lecture *Competition in Networks* [26240] is helpful in any case but not considered a formal precondition.

Learning Outcomes
Students

- will learn the basic aims and possibilities as well as the problems and limits of regulation
- will achieve an understanding of regulation as an incentive system under severe problems of asymmetric information and corporate governance
- will be able to apply general formal methods to the practice of regulation.

The lecture is suited for all students who want to work in companies of the network sectors – or who would like to become active on the side of regulators or in the respective political areas

Content
In network industries – like transport, utilities or communication – the forces of competition often fail in certain critical areas, so that monopolies will arise. In these cases the usual competition laws often turn out to be insufficient. Then they are complemented by special regulation laws. Accordingly, the regulation authority (in Germany the federal network agency, Bundesnetzagentur) is in charge for network industries side by side with the Federal Cartel Office as another supervisory authority. The lecture begins with a short description about the history of regulation and its relation to competition policies. Then it turns to the aims, the possibilities and the practice of regulation which are presented and analyzed critically. This happens from both a theoretical (microeconomic modelling) perspective as well as from a practical perspective with the help of various examples.

Literature
Literature and lecture notes are handed out during the course.

Course: Requirements Engineering [2400050]

Coordinators: A. Koziolek
Part of the modules: Software Systems (p. 75)[IW4INSWS], Software Methods (p. 76)[IW4INSWM]

ECTS Credits	Hours per week	Term	Instruction language
3		Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
methods, languages, processes, and practices in Requirements Engineering (RE). In particular, they acquired the following skills
They can

- name and describe the terms and concepts of RE
- identify stakeholders of the RE process and system boundaries
- analyse the context of a system
- differentiate between analysis activities and design activities
- evaluate risk and value of RE efforts
- classify types of requirements
- elicit requirements and document then in different forms (natural language, static models, behaviour models, user inter-action models, goal moadels)
- select and instantiate RE processes for a given software project

In addition, they know and understand

- the methods to validate requirements
- the method to manage requirements

Content

Course: Risk Communication [2530395]

Coordinators: U. Werner
Part of the modules: Insurance Management II (p. 37)[IW4BWLFBV7], Insurance Management I (p. 36)[IW4BWLFBV6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	Winter / Summer Term	de

Learning Control / Examinations
The assessment consists of oral presentations (incl. papers) within the lecture (according to Section 4 (2), 3 of the examination regulation) and a final oral exam (according to Section 4 (2), 2 of the examination regulation).
The overall grade consists of the assessment of the oral presentations incl. papers (50 percent) and the assessment of the oral exam (50 percent).

Conditions
None.

Learning Outcomes
See German version.

Content
See German version.

Literature
Elective literature:
R. Löfstedt, L. Frewer (Hrsg.). The Earthscan Reader in Risk & Modern Society. London 1998.
B.-M. Drottz-Sjöberg. Current Trends in Risk Communication - Theory and Practice. Hrsg. v. Directorate for Civil Defence and Emergency Planning. Norway 2003.
Munich Re. Risikokommunikation. Was passiert, wenn was passiert? www.munichre.com
O.-P. Obermeier. Die Kunst der Risikokommunikation - Über Risiko, Kommunikation und Themenmanagement. München 1999.
Fallstudien unter www.krisennavigator.de

Course: Risk Management in Industrial Supply Networks [2581992]

Coordinators: M. Wiens
Part of the modules: Industrial Production III (p. 41)[IW4BWLIIP6]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Winter term	en

Learning Control / Examinations
The assessment consists of an oral (30 minutes) or a written (60 minutes) exam (following § 4(2), 1 of the examination regulation). The exam takes place in every semester. Reexaminations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
Students shall learn methods and tools to manage risks in complex and dynamically evolving supply chain networks. Students learn the characteristics of modern logistics and supply chain management including trends such as globalization, lean production and e-business and learn to identify and analyze the arising risks. On the basis of this overview on supply chain management, the students gain knowledge about approaches and methods of industrial risk management. These approaches will be adapted to answer the specific questions arising in supply chain management. Key aspects include the identification of major risks, which provide the basis for the development of robust networks, and the design of strategic and tactic risk prevention and mitigation measures. In this manner, students will gain knowledge in designing and steering of robust internal and external value-creating networks.

Content

- supply chain management: introduction, aims and trends
- industrial risk management
- definition und characterization of risks: sourcing and procurement, demand, production and infrastructure
- identification of risks
- risk controlling
- risk assessment and decision support tools
- risk prevention and mitigation strategies
- robust design of supply chain networks
- supplier selection
- capacity management
- business continuity management

Media
Media will be provided on the e-learning plattform.

Literature
will be announced in the course

Course: Roadmapping [2545016]

Coordinators: D. Koch
Part of the modules: Innovation   Management   (p.   45)[IW4BWLENT2],   Entrepreneurship   (EnTechnon)
(p. 44)[IW4BWLENT1]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Recommendations
Prior attendance of the course *Innovation Management* [2545015] is recommended.

Learning Outcomes
Students develop a differentiated understanding of Roadmapping by working on different thematic aspects linked with the roadmapping method and by actively participating.

Content
Roadmapping is a method used to support innovation decisions in the early phase of innovation management. The roadmapping process addresses the procedure of constructing roadmaps which can then be assessed. Roadmapping provides structured and graphical visualizations of preferably future-oriented topics which have innovation potentials. The benefits of the roadmapping method lie in the structured bundling of both technology- and market-driven individual topics and the joint setting of priorities and processes to achieve predetermined corporate targets. As a rule, roadmaps represent a consensus reached by the people involved in their compilation. For this reason, roadmaps are suited to the designation and initial prioritization of emerging technologies and corresponding development projects.

Media
Slides.

Course: Robotics I – Introduction to robotics [24152]

Coordinators: R. Dillmann, S. Schmidt-Rohr
Part of the modules: Autonomous Robotics (p. 98)[IN4INAR]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
It is recommended to visit LV "Robotik II" and LV „Robotik III" in conjunction with „Robotik I".

Learning Outcomes
Students master
- the essential principles of sensors that are common in robotics
- the data flow, starting from the physical measurement, over digitization, application of the sensor model to image processing, feature extraction and the integration of the information in an environment model.
In particular, students understand the functional principles of internal and external sensors in robotics. They understand distance measuring via time off light and triangulation. Furthermore, they understand the function of visual sensors like CCD/CMOS. Students master proposing of suitable sensor concepts for simple tasks and justifying their choice.
Related to data flow, five different core topics are mastered by students:
In sensor modeling, students master defining a specific model in order to describe the characteristics of a sensor in data acquisition.
Students understand calibration of visual sensors, in particular automatic color adjustment und calculation of hdr images. They understand the basic principles of signal processing like sampling, quantization, Fourier transform and sampling theorem.
In machine vision, students master methods for color segmentation, edge extraction, Hough transform and feature extraction.
Students understand different environment models, like geometric, topologic and semantic models.
In multisensor data fusion, students master architectures of multisensor systems, Kalman filter, Dempster-Shafer methods and fuzzy set theory.

Content
The lecture gives an overview of the research field of robotics. Robotic systems in industrial manufacturing as well as service robots are covered. The key aspects consist in modelling of robots as well as methods for robot control.
First, the different system and control components of a robotic platform are discussed. Methods for robot modelling such as kinematics and dynamics modelling are covered. Based on these models, approaches for control, planning and collision avoidance are discussed. Finally, robot architectures are introduced which comprise the previously studied approaches and models.

Media
Slides

Literature
Elective literature:
Fu, Gonzalez,Lee: Robotics - Control, Sensing, Vision, and Intelligence
Russel, Norvig: Artificial Intelligenz - A Modern Approach, 2nd. Ed.

Course: Robotics II - Learning and planning robots [24712]

Coordinators: R. Dillmann
Part of the modules: Autonomous Robotics (p. 98)[IN4INAR]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
A prior attendance of the lecture „Robotik I" is recommended, but not mandatory.

Learning Outcomes
The student has mastered the understanding of the main principles and methods for acquisition and execution of task knowledge by flexible industrial robots on the one hand and (semi-)autonomous, industrial service robots on the other hand. The student is able to present and describe applicable concepts for realistic robotic application scenarios.
The following concepts are to be mastered and have to be applied to realistic assignments:
- Programming methods for industrial robots
- Geometric environment models
- Workspace analyses
- Force-controlled robot tasks
- Offline motion planning for industrial robot tasks
- Sensor-based online motion planning for industrial robot tasks
- Learning of task models by industrial robots
- Mobile, industrial robotic manipulation
- Automatic, symbolic assembly planning
Students have to be able to analyze, structure and describe methods of solving with an industrial robot system specific challenges e.g. from the domains of production, intralogistics or medical laboratory automation.
Students have mastered the selection and comparison of suitable programming techniques for classical and advanced industrial robots and industrial service robots. They can justify in detail the selection of the optimal environment model for a certain, real robot task problem. They are able to select a suitable approach for a workspace analysis and describe the method for a certain advanced industrial robot task. They can select suitable force-control approaches for different, real industrial robot tasks and are able to analyze simple parameterization thereof. They are proficient in the selection of suitable motion planning algorithms in the scope of challenges for industrial robots and industrial service robots and are able to analyze the characteristics and limitations of these algorithms in the practical context. They can analyze and adapt advanced, intuitive methods for programming of industrial robots and industrial service robots for use in real robot applications. They have mastered modeling industrial assembly tasks for symbolic planning.

Content
Complementary to the lectures „Robotik I" and „Robotik III", the task modeling and execution aspects of industrial production and service robotics are presented more closely. Different methods like manual, textual and graphic programming of robots as well as the necessary tools are discussed. Furthermore, the internal modeling of environment and task knowledge in the robot as well as suitable planning methods are presented. Finally, learning and planning approaches for (semi-)autonomous service robots are discussed with a focus on dynamic, real world settings and the latest state of the art.

Media
Slides, videos, exercises, practical demonstration in the laboratory

Course: Robotik III - Sensors in Robotics [24635]

Coordinators: R. Dillmann, Meißner, Gonzalez, Aguirre
Part of the modules: Autonomous Robotics (p. 98)[IN4INAR]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Previous attendance of the lecture „Robotik I" is helpful, but not mandatory.

Learning Outcomes
The student has to understand the principles of sensors that are essential and common in
robotics. The student has to understand the data flow, starting from the physical measurement, over digitization, application of the sensor model to image processing, feature extraction and the integration of the information in an environment model. The student has to be able to propose suitable sensor concepts for simple tasks and to justify them.

Content
The lecture Robotics III complements the lecture Robotics I with a broad overview over sensors used in robotics and the interpretation of their data. One focus of the lecture is on the topic of computer vision, which is being dealt with from data aquisition, over calibration to object recognition and localization.
Sensors are important subcomponents of control circuits and enable robots to perform their tasks safely. Furthermore sensors serve to capture the environment as well as dynamical processes and actions in the surroundings of the robots. The topics that are addressed in the lecture, are as follows: Sensor technology for a whole taxonomy of sensor systems (including image and 3D sensors), sensor modeling (including color calibration and hdr imaging), theory and practice of digital signal processing, machine vision, multi-sensor integration and fusion.
Among others, sensor systems such as relative position sensors (optical encoders,
potentiometer), velocity sensors (encoder, tachometer), acceleration sensors (piezo-resistive, piezo-electric, optical and others), inertial sensors (gyroscope, gravitometer and others), tactile sensors (foil sensors, pressure sensitive materials and others), proximity sensors, distance sensors (ultrasonic, laser, time-of-flight, interferometry, structured light, stereo camera systems and others), image sensors (photodiode, CCD and others), absolute position sensors (GPS, fiducial markers). Laser sensors as well as image sensors are dealt with priority.

Media
Slides, script.

Course: Sales Management and Retailing [2572156]

Coordinators: M. Klarmann
Part of the modules: Sales Management (p. 48)[IW4BWLMAR6]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	en

Learning Control / Examinations
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

Conditions
This course is compulsory within the module "Sales Management" and must be passed. This rule only applies to students who take the first examination within the module "Sales Management" after 01.12.2015.

Learning Outcomes
Students
- know challenges regarding the organization of distribution systems
- have knowledge in the field of forecasting and are able to predict the expected sales with the help of different approaches (e.g. exponential smoothing and moving averages)
- are able to plan and to put into practice customer satisfaction measurements
- know the main goals of customer relationship management and are able to implement them with the suitable instruments (e.g. loyalty programs, cross selling and customers-recruit-customers programs)
- are capable to put customer prioritization into place and to calculate the customer lifetime value
- know and have mastered the processes to generate recommendations (e.g. collaborative filtering process and affinity analysis)
- have well-founded knowledge of complaint management and customer recovery)
- understand the transaction cost theory and know its meaning in practice
- know different kinds of sales channels and can analyze their success
- are aware of power sources and conflicts between producer and retailer and can use this knowledge for a successful vertical marketing
- know the particularities of trade marketing regarding the components of the extended marketing mix
- have well-founded knowledge of quantitative determining of retail prices

Content
The aim of the course "Sales Management and Retailing" is on the one hand to give insights into the challenging realization of a successful sales management and on the other hand to discuss peculiarities of retailing contexts. The contents are below others:

- Customer relationship management (word-of-mouth-analysis, key account management, loyalty programs, complain management etc.)
- Retail marketing (trends, point of sale design etc.)
- Retailer-producer relationships

Remarks
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).
This course is held in English.

Course: Side-Channel Attacks in Cryptography [24165]

Coordinators: J. Müller-Quade, Antonio Almeida
Part of the modules: Advanced Topics in Cryptography (p. 69)[IW4INFKRYP]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
The student
• will be familiar with the theoretical foundations and the basic mechanisms of IT-security and cryptography.
• can understand and explain the methods of IT-security and cryptography,
• can understand and explain attacks ofsystems via side-channels,
• will be able to read and understand the latest scientific papers,
• will be able to critically assess the vulnerability of systems to side-channels attacks
• can evaluate different countermeasures to side-channel attacks

Content
Many cryptographic schemes are based on simple assumptions whose validity is rarely questioned. Nevertheless, a wide variety of attacks against real implementations of these algorithms is known. These attacks take advantage of implementation details. Some Examples are:

- Simple Power Analysis

- Differential Power Analysis

- Timing attacks

- Fault Induction

- TEMPEST

- Stack-overflow attacks

- QKD side channels

Course: Semantic Web Technologies [2511310]

Coordinators: R. Studer, A. Harth
Part of the modules: Web Data Management (p. 99)[IW4INAIFB4], Semantic Technologies (p. 101)[IW4INAIFB6]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	de

Learning Control / Examinations
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.

Conditions
Lectures on Informatics of the Bachelor on Information Management (Semester 1-4) or equivalent are required.

Recommendations
None.

Learning Outcomes
The student

- understands the motivation and foundational ideas behind Semantic Web and Linked Data technologies, and is able to analyse and realise systems

- demonstrates basic competency in the areas of data and system integration on the web

- masters advanced knowledge representation scenarios involving ontologies

Content
"Semantic Web" denotes an extension of the World Wide Web with meta data and applications 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 and processing of knowledge in form of ontologies and the access via Linked Data. This lecture provides the foundations of knowledge representation and processing for the corresponding technologies and presents example applications.
The following topics are covered:

- Resource Description Framework (RDF) and RDF Schema (RDFS)

- Web Architecture and Linked Data

- Web Ontology Language (OWL)

- Rule languages

- Applications

Media
Lecture notes.

Literature
See German version.

Remarks
The lecture supersedes the existing SWT-1 and SWT-2 lectures beginning from SS 2014. The exams SWT-1 and SWT-2 will be offered latest until winter term 2014/15.

Course: Algorithm Design Seminar [2400047]

Coordinators: D. Wagner
Part of the modules: Advanced Algorithms: Engineering and Applications (p. 73)[IW4INAALGOB], Introduction to Algorithmics (p. 71)[IW4INEAT], Advanced Algorithms: Design and Analysis (p. 72)[IW4INAADA]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
Students shall
• conduct literature research starting from a given topic, identify, locate, evaluate and summarize relevant literature.
• compose their written elaboration (and later their bachelor/masters thesis) with a minimum of introductory effort, and thereby respect given templates similar to those enforced in standard scientific publication processes.
• devise a presentation in the context of the scientific topic. To this end, the students employ techniques processing presenting the content in a way suitable for the audience.
• present their research results in a written form similar to standard scientific dissemination.
• review the written elaborations of two other students and give constructive feedback.

Content
Various current topics that build upon the contents of the associated lectures.

Remarks
This lecture is offered irregularly.

Course: Seminar in Applied Informatics [25070s]

Coordinators: A. Oberweis, H. Schmeck, R. Studer
Part of the modules: Semantic Technologies (p. 101)[IW4INAIFB6]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	

Learning Control / Examinations
The assessment is done according to §4(2), 3 of the examination regulation in form of an evaluation of the seminar presentation and a written seminar report. The weighting of the individual marks (presentation and report) is announced at the beginning of the seminar.

Conditions
None.

Learning Outcomes
Students

- do literature search based on a given topic, identify relevant literature and evaluate this literature,

- give presentations in a scientific context in front of an auditorium to present the results of the research,

- present results of the research in a seminar thesis as a scientific publication using format requirements such as those recommended by well-known publishers.

Content
The seminar intensifies and extends specific topics which are discussed within corresponding lectures. The actual topics are changing each semester. Knowledge of these lecture topics is an advantage but not a precondition.

Media
Slides, Access to internet resources

Literature
Literature will be given individually.

Remarks
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 http://www.aifb.uni-karlsruhe.de/Lehre

Course: Seminar in Cryptography [SemiKryp3]

Coordinators: J. Müller-Quade
Part of the modules: Networking Security - Theory and Praxis (p. 82)[IW4INNTP]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
The student

- deals with a restricted problem in the field of cryptography,
- analyzes and discusses the problems associated to cryptography in the final seminar paper,
- discusses, presents and defends subject-specific arguments within a given task,
- organizes the preparation of the final paper largely independent.

Content
The seminar deals with current topics in the research field of cryptography. These are e.g.

- provable security
- side channel attacks;
- new Public-Key systems;
- quantum cryptography

Course: Seminar in Cryptography [SemiKryp2]

Coordinators: J. Müller-Quade
Part of the modules: Foundations and Application of IT-Security (p. 95)[IW4INGAS]

ECTS Credits	Hours per week	Term	Instruction language
2	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
The student

- deals with a restricted problem in the field of cryptography,
- analyzes and discusses the problems associated to cryptography in the final seminar paper,
- discusses, presents and defends subject-specific arguments within a given task,
- organizes the preparation of the final paper largely independent.

Content
The seminar deals with current topics in the research field of cryptography. These are e.g.

- provable security
- side channel attacks;
- new Public-Key systems;
- quantum cryptography

Course: Seminar in Law [rechtsem]

Coordinators: T. Dreier
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations

Conditions
None.

Recommendations
Parallel to the lectures tutoria are offered in which legal thinking and argumentation is practised. Their attendance is strongly recommended.
During the semester, test exams to each lecture are offered with extensive coaching. During the lecture-free time, a Q-and-A-lecture is offered.Details on the homepage of the ZAR (www.kit.edu/zar)

Learning Outcomes
The student is able to independent scientific research regarding legal issues in the area of information management and engineering. The seminar covers legal issues of information law and commercial law, from internet law, the law of intellectual property, competition law and data protection law to contract law. The subjects to be discussed comprise issues of national, European and international law. Written papers shall also discuss the information technology issues and economic questions related to the legal problem at issue.

Content
The seminar covers legal issues of information law, from internet law, the law of intellectual property, competition law and data protection law to contract law. The subjects to be discussed comprise issues of national, European and international law. Each seminar focuses on a different set of issues. Written papers shall also discuss the information technology issues and economic questions related to the legal problem at issue. The current topics will be announced before start of term.
Students can participate in all seminars offered by the ZAR/IIR (however, students can participate in seminars of the master study cours, seminars in cooperation with the University of Freiburg and other specially marked seminars if special permission has been granted).

Media
extensive script with cases; content structure, further information in the lectures

Literature
Tba in the lecture.

Course: Seminar in Security [SemSich]

Coordinators: J. Müller-Quade
Part of the modules: Computer Security (p. 68)[IW4INSICH]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment consists of a written seminar thesis and a presentation thereof according to sec. 4 subsec. 2 no. 3 study and examination regulations. The grade is the average of the weighted single grades (generally 50% seminar thesis, 50% presentation).

Conditions
None.

Learning Outcomes
The student

- deals with a restricted problem in the field of computer security,
- analyzes and discusses the problems associated to a distinct discipline in the final seminar paper,
- discusses, presents and defends subject-specific arguments within a given task,
- organizes the preparation of the final paper largely independent.

Content
The seminar deals with current topics in the research field of computer security. These are e.g.

- Side channel attacks;
- Network security;
- Communication protocols;

Course: Seminar in Enterprise Information Systems [SemAIFB1]

Coordinators: R. Studer, A. Oberweis, T. Wolf, R. Kneuper
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment of this course is according to §4(2), 3 SPO in form of an examination of the written seminar thesis and a presentation.
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.
The seminar is for bachelor as well as master students. The differentiation will be made by selection of different topics and different standards of evaluation.

Conditions
See corresponding module information.

Learning Outcomes
Students

- do literature search based on a given topic, identify relevant literature and evaluate this literature,

- give presentations in a scientific context in front of an auditorium to present the results of the research,

- present results of the research in a seminar thesis as a scientific publication using format requirements such as those recommended by well-known publishers.

Content
The seminar intensifies and extends specific topis which are discussed within corresponding lectures. Knowledge of these lecture topics is an advantage but not a precondition.
Specific titles and the topics of offered seminars will be announced before the start of a semester in the internet at http://www.aifb.uni-karlsruhe.de/Lehre

Literature
Literature will be given individually in the specific seminar.

Course: Seminar Image Analysis and Fusion [2400035]

Coordinators: J. Beyerer
Part of the modules: Automated visual inspection (p. 107)[IW4INAS], Automated Planning and Decision-making
                           (p. 109)[IW4INAPE], Image-based detection and classification (p. 110)[IW4INBDK]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations

- Knowlegde of the fundamental principles of stochastics and signal and image processing is helpful.

- Knowledge of the lectures "Introduction to Information Fusion", "Automated Visual Inspection and Image Processing", "Pattern Recognition" and "Probabilistische Planung" is helpful.

Learning Outcomes
Students have a good grasp of state-of-the-art methods and applications in the field of image exploitation and fusion. Students expand their theoretical knowledge in the fields of information fusion, image and signal processing, pattern recognition and probabilistic planning that has been gained in the lectures and in individual studies. Additionally, students are able to apply their knowledge and skills in practical projects. Students are proficient in working scientifically which includes creating presentations in a scientific context. Students master techniques to process the material in a suitable way for the intended audience and to give talks. Additionally, students know how to present their results also in written form according to the standards of scientific publications.

Content
The seminar is closely connected to the lectures of the Vision and Fusion Laboratory (Lehrstuhl für Interaktive Echtzeitsysteme): Automated Visual Inspection and Image Processing, Pattern Recognition, Introduction to Information Fusion and Probabilistic Planning. The topics change every year. They are closely connected to the current research topics of the lab and may stem e.g. from the following research fields:

- variable image acquisition and processing

- information fusion

- deflectometry – reconstruction of specular surfaces

- image processing for driver assistance systems

- knowledge-based character recognition with smart cameras

- localization and map generation for mobile robots

- environment modeling and situation analysys

- systems theory of security for danger analysis

- multimodal man-machine interaction

Each participant will be required to individually complete a literature review on the topic of his/her choice and present his/her findings in the form of a paper (15-20 pages) and a talk (20 min). Participants will be offered hints concerning the preparation of the paper and the talk in the form of two introductory workshops. The first workshop, "Introduction into scientific writing" will take place right after the preliminary meeting, the second workshop, "Introduction to an effective presentation" will take place approx. two weeks previous to the presentation day.
Current topics and further updates can be found at the Vision and Fusion Laboratory homepage at http://ies.anthropomatik.kit.edu/lehre_lehre
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Media
Slides, work sheets including solutions, evaluation sheet.

Literature
Elective literature:
Dependent on topics, will be announced in the lecture.

Course: Seminar Data Mining I [2521388]

Coordinators: G. Nakhaeizadeh
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	

Learning Control / Examinations
Alternative exam assessment according to § 4(2), 3 SPO.

Conditions
None.

Learning Outcomes

Content

Course: Seminar Data Mining II [2520375]

Coordinators: G. Nakhaeizadeh
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	

Learning Control / Examinations
Alternative exam assessment according to § 4(2), 3 SPO.

Conditions
None.

Learning Outcomes

Content

Course: Seminar Efficient Algorithms [SemAIFB2]

Coordinators: H. Schmeck
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment consists of a talk (presentation of 45-60 minutes) about the research topic of the seminar together with discussion, a written summary about the major issues of the topic (approx. 15 pages) and attending the discussions of the seminar (according Section 4(2), 3 of the examination regulation).
The grade of this course is achieved by the weighted sum of the grades (talk 50%, written summary 30% and discussion 20%). This seminar is for bachelor as well as master students. The difference between them is calculated according to different evaluation mechanisms for the written summary work and the talk.

Conditions
See corresponding module information.

Learning Outcomes
The students should learn to work on research papers by searching for new topics in computer science and by presenting the major issues of the papers.
The master students should deepen their ability to develop independent insight into new scientific topics and to communicate them through oral presentation and written summary to others.
The students will learn to deal with critical discussions on scientific presentations and written summaries through active participation in the seminar.

Content
Topics include the new research issues of the research group "applied Informatics". The new topics are in the area Organic Computing, Nature-inspired optimization and service oriented architectures.
The topics of the seminars are introduced around the end of the former semester on the board A12 of the institute AIFB (building 11.40) and in Internet http://www.aifb.kit.edu/web/SeminarePraktika

Literature
Will be announced at the beginning of the semester.

Remarks
There is a limited number of participants. The students have to register for the seminar.

Course: Seminar Energy Economics [SemEW]

Coordinators: W. Fichtner, P. Jochem, D. Keles, R. McKenna, V. Bertsch
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes
Students shall gain insights into selected research in energy economics.
• Students search for, identify, review and evaluate relevant literature.
• Students prepare their seminar thesis (and later on bachelor/master thesis) with a minimum expense in becoming acquainted with their topic and general layout.
• Students produce an oral presentation in a scientific context by using the outlined techniques of scientific presentation.
• Students learn to present their written results in an adequate form for scientific publishing.
Students in M.Sc. studies will have to put special emphasis on a critical discussion and evaluation of their topic, since they will have to look into actual scientific results in the field of energy economics.

Content

Course: Entrepreneurship Seminar [SemTuE1]

Coordinators: O. Terzidis
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3			

Learning Control / Examinations
See German version.

Conditions
None.

Learning Outcomes
The scope is depending on the seminars summarised hereunder.

Content

Course: Seminar Innovation management [SemTuE2]

Coordinators: M. Weissenberger-Eibl
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3			

Learning Control / Examinations
See German version.

Conditions
None.

Learning Outcomes
Students develop a differentiated understanding of a specific method of innovation management and its application by actively participating in the block seminar.

Content
The objective of the seminar is to master selected concepts and methods of innovation management and then to apply these practically. Working in groups, the students apply the described concepts and methods of innovation management to a case study to answer specific questions. Accordingly, the block seminar involves a switch from input to the application of this input. At the end, the results of the group work are presented in the form of a seminar paper and discussed by the whole course. A short introduction to presentation techniques is planned to help students prepare the seminar papers.

Course: Seminar in Behavioral and Experimental Economics [n.n.]

Coordinators: P. Reiss
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	

Learning Control / Examinations
Students write (according to Section 4 (2), 3 SPO) a seminar paper on an assigned topic (15-20 pages), present it in class and discuss results during seminar sessions. These three elements are graded individually. The seminar grade is the weighted average of these individual grades where the weighting is announced on the course syllabus.

Conditions
None.

Recommendations
Basic knowledge of mathematics, statistics, microeconomics, and game theory is assumed.

Learning Outcomes
The student

- works independently on a topic in Experimental Economics and/or Behavioral Economics,

- writes a seminar paper according to scientific standards,

- gives a presentation on the results of the paper,

- cultivates the discussion of research approaches.

Content
Seminar topics are announced online at http://io.econ.kit.edu (-> Studium und Forschung).

Media
Slides.

Literature
A selection of published papers is compulsory reading for the course.

Remarks
Language: german or english.

Course: Seminar in Finance [2530280]

Coordinators: M. Uhrig-Homburg, M. Ruckes
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations

Conditions
None.

Recommendations
Knowledge of the content of the module *F1 (Finance)* [IW4BWLFBV1] is assumed.

Learning Outcomes
The student gets in touch with scientific work. Through profound working on a specific scientific topic the student is meant to learn the foundations of scientific research and reasoning in particular in finance.
Through the presentations in this seminar the student becomes familiar with the fundamental techniques for presentations and foundations of scientific reasoning. In addition, the student earns rhetorical skills.

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.

Literature
Will be announced at the end of the foregoing semester.

Course: Seminar Financial Economics and Risk Management [2530353]

Coordinators: M. Ulrich
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	

Learning Control / Examinations
See German version.

Conditions
None.

Learning Outcomes
The students

- look critically into current research topics .
- train their presentation skills.
- learn to get their ideas across in a focused and concise way, both in oral and written form.
- cultivate the economic discussion of research approaches.

Content

Course: Seminar in Industrial Production [SemIIP2]

Coordinators: F. Schultmann, M. Fröhling
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
Assessment acc. to §4 (2), No.3 ER by assessing the written seminar thesis (approx. 20 pages), the oral presentation and active participation in public discussions. The final grade will be formed by weighing the individual assessment grades.

Conditions
Students should have completed the modules „Industrial Production I" [WW3BWLIIP], „Industrial Production II" [IW4BWLIIP2] or "Industrial Production III" [WW3BWLIIP6].

Learning Outcomes
Students shall gain insights into selected research of the Institute of Industrial Production (IIP).

- Students search for, identify, review and evaluate relevant literature.
- Students prepare their seminar thesis (and later on bachelor/master thesis) with a minimum expense in becoming acquainted with their topic and general layout.
- Students produce an oral presentation in a scientific context by using the outlined techniques of scientific presentation.
- Students learn to present their written results in an adequate form for scientific publishing.

Students in M.Sc. studies will have to put special emphasis on a critical discussion and evaluation of their topic, since they will have to look into actual scientific results in the field of industrial production.

Content
This seminar covers actual topics of industrial production, logistics, environmental science, project management and similar fields. We recommend a successful attendance of previous IIP modules (not compulsory!).
Actual topics covered in this seminar will be published before the start of semester.

Course: Seminar Information Engineering and Management [SemIW]

Coordinators: C. Weinhardt
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment consists of a seminar paper, a presentation of the results and the contribution to the discussion (according to §4(2), 3 of the examination regulation). The final grade is based on the evaluation of each component (seminar paper, oral presentation, and active participation).

Conditions
See corresponding module information.

Learning Outcomes
Students are able to

- do literature search based on a given topic: identify relevant literature, find, assess and evaluate this literature.
- write the seminar thesis (and later the Bachelor-/Masterthesis) with a minimal learning curve by using format requirements such as those recommended by well-known publishers.
- give presentations in a scientific context in front of an auditorium. These techniques are presented and learned during the seminar.
- present results of the research in written form generally found in scientific publications.

Content
In the seminar the student should learn to apply the research methods to a predefined topic area. The topics are based on research questions in Information Engineering and Management across different industry sectors. This problem analysis requires a interdisciplinary examination.

Media

- PowerPoint
- E-learning platform ILIAS
- Software Tools, if necessary

Literature
The student will receive the necessary literature for his research topic.

Remarks

- Students from Bachelor and Master Course can visit the seminar. The research topic as well as the evaluation of the work and the presentation will have a different focus between Bachelor and Master Course.
- All the seminars offered at the chair of Prof. Dr. Weinhardt can be chosen. The current topics of the seminars are available at the following homepage: www.iism.kit.edu/im/lehre .

Course: Seminar Management Accounting [2579904]

Coordinators: M. Wouters
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	en

Learning Control / Examinations
The final grade of the course is the grade awarded to the paper.

Conditions
The LV "Betriebswirtschaftslehre: Finanzwirtschaft und Rechnungswesen" (2610026) must have been completed before starting this seminar.

Learning Outcomes
Students
• are largely independently able to identify a distinct topic in Management Accounting,
• are capable to research the topic, analyze the information, to conceptualize and deduct fundamental principles and relationships from relatively unstructured information,
• can afterwards logically and systematically present the results in writing and as an oral presentation, following a scientific approach (structuring, terminology, sources.

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.

Literature
Will be announced in the course.

Remarks
Maximum of 24 students.

Course: Seminar Mobility Services [2595475]

Coordinators: G. Satzger, C. Stryja
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	

Learning Control / Examinations
A final written exam will be conducted.

Conditions
See module description.

Learning Outcomes
The student should be able to do a literature review based on a predefined topic in the context of mobility services. The approach comprises the identification of relevant literature according to the topic and an analysis as well as an evaluation of the methods presented in the literature. The student learns to present his results in a paper and in front of an audience on an academic level.

Content
The seminar gives an insight in different aspects of services in the context of mobility. Changes in business models in the mobility sector as well as the adaptation of new demand patterns for mobility play a crucial role in this context. These shifts are accompanied by a technological evolution including new mobile devices that enable dynamic and flexible access to information. In the seminar, the student should learn to apply the research methods to predefined research questions; in this context, e.g. literature reviews, structured interviews, and the comparison of business models are employed.

Remarks
The credits for the course have been changed from 4 to 3 from summer term 2015 on.

Course: Seminar on Morals and Social Behavior [SemPÖ1]

Coordinators: N. Szech
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	en

Learning Control / Examinations
Students write a seminar paper on an assigned topic (10 pages), present it in class and discuss results during seminar sessions. These three elements are graded individually. The seminar grade is the weighted average of these individual grades where the weighting is announced on the course syllabus.

Conditions
None.

Recommendations
None.

Learning Outcomes
The students

- look critically into current research topics in the field of morals and social behavior in relevant economic contexts.
- train their presentation skills.
- learn to get their ideas across in a focused and concise way, both in oral and written form.
- cultivate the economic discussion of research approaches.

Content
Seminar topics are announced online at http://polit.econ.kit.edu.

Literature
A selection of published papers and books.

Remarks
The seminar will be held in English.

Course: Seminar on Topics in Experimental Economics [n.n.]

Coordinators: P. Reiss
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	

Learning Control / Examinations
Students write (according to Section 4 (2), 3 SPO) a seminar paper on an assigned topic (15-20 pages), present it in class and discuss results during seminar sessions. These three elements are graded individually. The seminar grade is the weighted average of these individual grades where the weighting is announced on the course syllabus.

Conditions
None.

Recommendations
Basic knowledge of mathematics, statistics, microeconomics, and game theory is assumed.

Learning Outcomes
The student works independently on a topic in Experimental Economics, writes a seminar paper according to scientific standards, gives a presentation on the results of the paper, cultivates the discussion of research approaches.

Content
Seminar topics are announced online at http://io.econ.kit.edu (-> Studium und Forschung).

Media
Presentation Slides.

Literature
A selection of published papers is compulsory reading for the course.

Remarks
Language: German or English.

Course: Seminar on Topics in Political Economics [SemPÖ2]

Coordinators: N. Szech
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	en

Learning Control / Examinations
Students write a seminar paper (about 10 pages), present it in class and discuss results during seminar sessions. These three elements are graded individually. The seminar grade is the weighted average of these individual grades where the weighting is announced on the course syllabus.

Conditions
None.

Recommendations
None.

Learning Outcomes
The students

- look critically into current research topics in Political Economics.

- train their presentation skills.

- learn to get their ideas across in a focused and concise way, both in oral and written form.

- cultivate the economic discussion of research approaches.

Content
Seminar topics are announced online at http://polit.econ.kit.edu

Literature
A selection of published papers and books.

Remarks
The seminar will be held in English.

Course: Seminar Pricing [2540445]

Coordinators: J. Kim
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	**Hours per week**	**Term**	**Instruction language**
3	2	Summer term	de

Learning Control / Examinations

Conditions
None.

Recommendations
This course is for master students only.

Learning Outcomes

Content

Remarks
New master-course starting summer term 2015.

Course: Seminar Risk and Insurance Management [SemFBV1]

Coordinators: U. Werner
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
At least one oral presentation and one term paper have to be deliverd, either as individual work or as team work. Active participation in class and working groups is expected (according to §4(2), 3 SPO).
The grading consists of the weighted performance of the tasks delivered.

Conditions
See corresponding module information.
The seminar is held within the courses of *Risk and Insurance Management and Insurance Management* ([WW3BWLFBV3], [WW3BWLFBV4] and [WW4BWLFBV6/7], respectively.
A course taken as a seminar cannot be chosen as a part of a course module (and vice versa).

Recommendations
The seminar fits well with the bachelor modules *Risk and Insurance Management* [WW3BWLFBV3] as well as with the master modules *Insurance Management I* [IW4BWLFBV6] and *Insurance Management* II [IW4BWLFBV7]. These modules, though, are not required to be taken.

Learning Outcomes
See German version.

Content
The seminar is offered within the following courses:

- Principles of Insurance Management
- Insurance Marketing
- Insurance Production
- Risk Communication
- Insurance Risk Management
- Enterprise Risk Management
- Modeling, Measuring and Management of Extreme Risks
- Current Issues in the Insurance Industry

For their contents refer to the information given for these courses.

Literature
Will be announced at the beginning of the lecture period.

Remarks
Some of the courses mentioned above are offered on demand. For further information, see:http://insurance.fbv.kit.edu.
To attend the course please register with the secretary of the chair: thomas.mueller3@kit.edu

Course: Seminar Service Science, Management & Engineering [2595470]

Coordinators: C. Weinhardt, R. Studer, S. Nickel, H. Fromm, W. Fichtner, G. Satzger
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Winter / Summer Term	de

Learning Control / Examinations
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.

Conditions
See corresponding module information.

Recommendations
Lecture *eServices* [2595466] is recommended.

Learning Outcomes
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.

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

Literature
The student will receive the necessary literature for his research topic.

Course: Seminar Statistics [SemSTAT]

Coordinators: N.N.
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2		

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes

Content

Course: Seminar Stochastic Models [SemWIOR1]

Coordinators: K. Waldmann
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	

Learning Control / Examinations
The assessment of this course is in form of an examination of the written seminar thesis and a presentation. The final mark is the result of both the paper and its presentation.

Conditions
None.

Learning Outcomes
The participants will posses profound knowledge of modelling, evaluation and optimization of stochastic systems .They are familiar with basic principles of scientific argumentation and can cope with modern presentation techniques.

Content
The actual topic as well as the contemporary issues are available online.

Media
Power Point and related presentation techniques.

Literature
Will be presented with the actual topic.

Course: Seminar Knowledge Management [SemAIFB4]

Coordinators: R. Studer
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The success monitoring is done through a presentation about a research topic from the current topic of the seminar (45-60 minutes) followed by a discussion, a written summary of the main points (approx. 15 pages) and of active participation in discussions (in accordance with §4(2),3 SPO).
The total mark is composed of the graded and weighted success controls (50% lecture, 30% written paper, and 20% participation and discussion.
The seminar can be attended by both bachelor and master students. A differentiation is made by different topic assignment and evaluation standards for seminar paper and presentation.

Conditions
See module description.

Learning Outcomes
The students will learn to perform literature searches on current topics in computer science and holistic knowledge management as well as preparing and presenting the contents of scientific publications.

During the work on the seminar topics the master students will deepen their skills to autonomously comprehend current scientific knowledge and to convey it to others through oral presentations and written summaries.

Through active participation in the seminar, students acquire skills in critical appraisal of research topics and in oral and written presentation of independently developed research content.

Content
Each year, the seminar will cover topics from a different selected subfield of knowledge management, e.g.:

- Ontology-based knowledge management,
- Information Retrieval and Text Mining,
- Data Mining,
- Personal Knowledge Management,
- Case Based Reasoning (CBR),
- Collaboration and Scoial Computing,
- Business-process Oriented Knowledge Management.

Media
Slides.

Literature

- I. Nonaka, H. Takeuchi: The Knowledge Creating Company. Oxford University Press 1995
- G. Probst et al.: Wissen managen - Wie Unternehmen ihre wertvollste Ressource optimal nutzen. Gabler Verlag, Frankfurt am Main/ Wiesbaden, 1999
- Pascal Hitzler, Markus Krötzsch, Sebastian Rudolf, York Sure: Semantic Web - Grundlagen, Springer, 2008 (ISBN 978-3-540-33993-9)
- S. Staab, R. Studer: Handbook on Ontologies, ISBN 3-540-40834-7, Springer Verlag, 2004
- Modern Information Retrieval, Ricardo Baeza-Yates & Berthier Ribeiro-Neto. New York, NY: ACM Press; 1999; 513 pp. (ISBN: 0-201-39829-X.)

Remarks
The number of students is limited. Students have to observe the designated registration process.

Course: Seminar in strategic and behavioral marketing [2572197]

Coordinators: B. Neibecker
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The student is evaluated based on the written work, a presentation of the results in front of an audience and his contribution to the discussion

Conditions
None.

Learning Outcomes
Students

- do literature search based on a given topic, identify relevant literature and evaluate this literature,

- give presentations in a scientific context in front of an auditorium to present the results oft he research,

- present results of the research in a seminar thesis as a scientific publication using format requirements such as those recommended by well-known publishers.

Content
In the seminar the student should learn to apply the research methods to a predefined topic area. The topics are based on research questions in marketing. This problem analysis requires a interdisciplinary examination. As a special option, the implementation of methodological solutions for market research can be accomplished and discussed with respect to its application.

Literature
Will be allocated according the individual topics.

Remarks
Students from Bachelor and Master Course can visit the seminar. The research topic as well as the evaluation of the work and the presentation will have a different focus between Bachelor and Master Course.

Course: Seminar in Discrete Optimization [2550491]

Coordinators: S. Nickel
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment consists of a written seminar thesis of 20-25 pages and a presentation of 35-40 minutes (according to §4(2), 3 of the examination regulation).
The final mark for the seminar consists of the seminar thesis, the seminar presentation, the handout, and if applicable further material such as programming code.
The seminar can be attended both by Bachelor and Master students. A differentiation will be achieved by different valuation standards for the seminar thesis and presentation.

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

Learning Outcomes
The student

- illustrates and evaluates classic and current research questions in discrete optimization,
- applies optimization models and algorithms in discrete optimization, also with regard to their applicability in practical cases (especially in Supply Chain and Health Care Management),
- 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.

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.

Literature
Literature and relevant sources will be announced at the beginning of the seminar.

Remarks
The seminar is offered in each term.

Course: Seminar in Experimental Economics [SemWIOR3]

Coordinators: N. N.
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
Term paper and presentation

Conditions
See corresponding module information.
A course in the field of Game Theory should be attended beforehand.

Learning Outcomes
The seminar wants to deepen the methods of scientific work. Students shall learn to discuss critical the latest research results in Experimental Economics.
Students learn the technical basics of presentation and to argument scientifically. Also rethoric skills shall be amplified.

Content
The seminar's topic will be announced before the beginning of each semester on the internet (http://www.wior.uni-karlsruhe.de/LS_Berninghaus/Studium/).

Media
Slides.

Literature
Will be announced at the end of the recess period.

Course: Seminar in Continous Optimization [2550131]

Coordinators: O. Stein
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment is composed of a 15-20 page paper as well as a 40-60 minute oral presentation according to §4(2), 3 of the examination regulation.
The total grade is composed of the equally weighted grades of the written and oral assessments.
The seminar is appropriate for bachelor as well as for master students. Their differentiation results from different assessment criteria for the seminar paper and the seminar presentation.

Conditions
See corresponding module information.
Attendance is compulsory.
Preferably at least one module offered by the institute should have been chosen before attending this seminar.

Learning Outcomes
The seminar aims at describing, evaluating, and discussing recent as well as classical topics in continuous optimization. The focus is on the treatment of optimization models and algorithms, also with respect to their practical application.
The student is introduced to the style of scientific work. By focussed treatment of a scientific topic the student learns the basics of scientific investigation and reasoning.
For further development of a scientific work style, master students are particularly expected to critically question the seminar topics.
With regard to the oral presentations the students become acquainted with presentation techniques and basics of scientifc reasoning. Also rethoric abilities may be improved.

Content
The current seminar topics are announced under http://kop.ior.kit.edu at the end of the preceding semester.

Literature
References and relevant sources are announced at the beginning of the seminar.

Course: Seminar: Multilingual Speech Recognition [2400080]

Coordinators: A. Waibel, S. Stüker, M. Müller
Part of the modules: Speech Processing (p. 90)[IW4INSV]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

- The students learn to independently acquaint themselves with a novel, scientific topic and to process it for presentation.

- From the other presentations the students acquire deeper knowledge of sub-areas of multilingual speech recognition.

- By assessing their fellow students presentations the participants enhance their social skills.

Content
There are 4,000-7,000 languages in the world. In order to create speech recognition systems for as many as possible, multilingual speech recognition technologies have proven to be helpful. Multilingual speech recognition is concerned with the creation of speech recognition systems that work for multiple languages, or in the ideal case for all languages in the world.
In this seminar students will acquaint themselves with topics from multilingual speech recognition and will present their results as a talk supported by slides to the other participants of the seminar.

Course: Seminar: Neural Networks and Artificial Intelligence [2400078]

Coordinators: A. Waibel, T. Asfour, J. Gehring, S. Stüker
Part of the modules: Speech Processing (p. 90)[IW4INSV]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content
In many tasks that appear natural to us, the fastest computers are unable to match the performance of the human brain. Neural networks attempt to simulate the parallel and distributed architecture of the brain in order to master these skills with learning algorithms. In this context, focus is being put on neural network approaches to computer vision and speech recognition, robotics and other areas.

In this seminar students will acquaint themselves with literature from provided topics and will present their results as a talk supported by slides to the other participants of the seminar.

Course: Seminar: Ubiquitous Systems [24844]

Coordinators: M. Beigl
Part of the modules: Human-Machine-Interaction (p. 93)[IW4INMMI], Context Sensitive Systems (p. 92)[IN4INKUS]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Winter / Summer Term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes

Content
In this seminar, different topics are in focus every semester which are given to the participants with the task of creating an according article. The objective is to present the state of the art with respect to technologies and their applications in the field of ubiquitous computing. Topics will be announced at the kickoff-event and on the institute's web page.

Literature
Introduction: John Krumm, Ubiquitous Computing Fundamentals.
Further litertaure will be announced.

Course: Seminar: Management and Organization [2577915]

Coordinators: H. Lindstädt
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / Examinations
Learning control is based on a written paper and a presentation of the results in a seminar session (according to §4(2), 3 SPO). Final grade is composed of both elements.

Conditions
Preferably, at least one of the institute's offered modules should be passed before participation in the seminar.

Learning Outcomes
After passing this course students are able to

- describe corporate and organizational management approaches and to clarify them using practical examples.
- critically assess these approaches building on the latest state of research.
- apply the principles of scientific research and argumentation to a specific issue.
- present and discuss selected topics to a group.

Content
The subjects are redefined each semester on the basis of current issues.

Media
Slides.

Literature
The relevant sources are made known during the course.

Course: Practical Seminar Service Innovation [2595477]

Coordinators: G. Satzger
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM], Business & Service Engineering (p. 30)[IW4BWLISM4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3		de

Learning Control / Examinations
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 pracitical components and an active participation in class.
Please take into account that, beside the written documentation, also a practical component (such as a survey or an implementation of an application) is part of the course. Please examine the course description for the particular tasks.
The final mark is based on the graded and weighted attainments (such as the written documentation, presentation, practical work and an active participation in class).

Conditions
None.

Recommendations
Knowledge of Service Innovation Methods is assumed. Therefore it is recommended to attend the course Service Innovation [2540468] beforehand.

Learning Outcomes
The student should be able to do a literature review based on a given topic in the context of service innovation. The approach comprises the identification of relevant literature according to the topic and an analysis as well as the evaluation of the methods presented in the literature. The practical work components should enable the student to learn about and independently use scientific methods employed e.g. in case studies or experiments. The student learns to present his results in a paper and in front of an audience on an academic level. This process is helpful for further scientific work like the master or doctoral thesis.

Content
The Practical Seminar Service Innovation conveys both a theoretical foundation and practical methods. Using a case example of real-world challenges in the area of Service Innovation, application and adaptation of innovation methods are taught and the results are presented. This project work applies conceptual, analytical and creative methods.

Literature
The foundational literature will be announced together with the individual topics.

Remarks
The credits have been changed from 5 to 4,5.
Due to the project work, the number of participants is limited and participation requires knowledge about models, concepts and approaches that are taught in the Service Innovation lecture. Having taken the Service Innovation lecture or demonstrating equivalent knowledge is a prerequisite for participating in this Practical Seminar. Details for registration will be announced on the web pages for this course.

Course: Service Analytics [2595501]

Coordinators: T. Setzer, H. Fromm
Part of the modules: Advanced CRM (p. 25)[IW4BWLISM1], Service Analytics (p. 32)[IW4BWLKSR1], Service Management (p. 31)[IW4BWLISM6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation). By successful completion of the exercises (according to §4(2), 3 of the examination regulation) 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.

Conditions
None.

Recommendations
The lecture is addresed to students with interests and basic knowledge in the topics of Operations Research, decritptive and inductive statistics.

Learning Outcomes
Participants are able to structure large sets of available data and to use that data for planning, operation, personalization of complex services, in particular for IT services. They learn a step-by-step approach starting with analyzing possibly incomplete data, techniques of multivariate statistics to filter data and to extract data features, forecast techniques, and robust planning and control procedures for enterprise decision support.

Content
Today's service-oriented companies are starting to optimize the way services are planned, operated, and personalized by analyzing vast amounts of data from customers, IT-systems, or sensors. As the statistical learning and business optimization world continues to progress, skills and expertise in advanced data analytics and data and fact-based optimization become vital for companies to be competitive. In this lecture, relevant methods and tools will be considered as a package, with a strong focus on their inter-relations. Students will learn to analyze and structure large amounts of potentially incomplete and unreliable data, to apply multivariate statistics to filter data and to extract key features, to predict future behavior and system dynamics, and finally to formulate data and fact-based service planning and decision models.
More specifically, the lessons of this lecture will include:

- Co-Creation of Value Across Enterprises
- Instrumentation, Measurement, Monitoring of Service Systems
- Descriptive, predictive, and prescriptive Analytics
- Usage Characteristics and Customer Dynamics
- Big Data, Dimensionality Reduction, and Real-Time Analytics
- System Models and What-If-Analysis
- Robust Mechanisms for Service Management
- Industry Applications of Service Analytics

Tutorials
Students will conduct lecture accompanying, guided exercises throughout the semester.

Media

- PowerPoint
- E-learning platform ILIAS

Literature

- Business Forecasting, Wilson, J. H., Keating, B., McGraw-Hill, 2002
- Multivariate Data Analysis, Hair, J. F., Black, B., Babin, B., Anderson, R. E., 2008
- Analytics at Work, Davenport, T. H., Harris, J. G., Morion, R., Harward Business Press, 2010
- Business Analytics for Managers, Jank, W., Springer, 2011

Online Sources:

- The data deluge, The Economist, Feb. 2010
- Competing on Analytics, T. Davenport in Harward Business Review, Feb. 2007
- Mit Advanced Analytics können Händler Kundendaten optimal nutzen, McKinsey Handelsmarketing, Feb. 2011

Further readings will be provided in the lecture.

Course: Service Analytics II – Enterprise Data Reduction and Prediction [2540498]

Coordinators: T. Setzer, C. Weinhardt
Part of the modules: Service Analytics (p. 32)[IW4BWLKSR1]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation). By successful completion of the exercises (according to §4(2), 3 of the examination regulation) 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.

Conditions
None.

Learning Outcomes
The students

- learn to assess and improve (pre-process) the quality of vast amounts of high-dimensional enterprise data
- learn to select and combine optimal features for forecasting and planning tasks,
- and learn how to (non-linearly) predict scenarios with causal/probabilistic network models including complex diagnostics, de-biasing, aanomaly-detection temporal reasoning.

In total, the students understand data-driven analytical techniques and structured procedures to support forecasting and planning processes in today's corporations.

Content
Analytical Processes for enterprise planning and decision making are increasingly based on (semi-) automated statistical/mathematical techniques to analyze large amounts of high-dimensional, heterogeneous, and often noisy enterprise data. The students learn techniques together with structured procedures to

1. preprocess and reduce large amounts of high-dimensional enterprise data,
2. select and combine data features such as elastic nets or empirical-orthogonal configurations, as well as blending and de-biasing techniques,
3. and to consider and reduce uncertainty and biases in daten-based enterprise forecasting and planning tasks.

The students understand and know how and when to apply a techique, how to orchestrate, evaluate, and ajdust the methods, and can have the means to provide a better and more robust basis for data-driven enterprise forecasting and planning.

Media
Lecture notes

Literature
Will be announced via WWW and in the first session of this lecture.

Remarks
The course has beed added summer term 2015.
Limited number of slots

Course: Service Design Thinking [2595600]

Coordinators: C. Weinhardt
Part of the modules: Service Design Thinking (p. 33)[IW4BWLKSR2]

ECTS Credits	Hours per week	Term	Instruction language
9	6	Winter / Summer Term	en

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
The course is compulsory and must be examined.

Learning Outcomes

- Deep knowledge of the innovation method "Design Thinking", as introduced and promoted by Stanford University
- Development of new, creative solutions through extensive observation of oneself and one's environment, in particular with regard to the relevant service users
- Know how to use prototyping and experimentation to visualize one's ideas, to test and iteratively develop them, and to converge on a solution
- Communicate, work and present in an interdisciplinary and international project setting

Content

- Paper Bike: Learning about the basic method elements by building a paper bike that has to fulfill a given set of challenges.
- Design Space Exploration: Exploring the problem space through customer and user observation.
- Critical Function Prototype: Identification of critical features from the customer's perspective that can contribute to the solution of the overarching problem. Building and testing prototypes that integrate these functionalities.
- Dark Horse Prototype: Inverting earlier assumptions and experiences, which leads to the inclusion of new features and solutions.
- Funky Prototype: Integration of the individually tested and successful functions to a complete solution, which is further tested and developed.
- Functional Prototype: Further selection and convergence of existing ideas. Building a higher resolution prototype that can be tested by customers.
- Final Prototype: Preparing and presenting the final solution to the customer.

Remarks
Due to the project nature of the course, the number of participants is limited. For further information see german version.

Course: Service Innovation [2595468]

Coordinators: G. Satzger, M. Kohler, N. Feldmann
Part of the modules: Business & Service Engineering (p. 30)[IW4BWLISM4], Service Management
(p. 31)[IW4BWLISM6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	en

Learning Control / Examinations
The assessment consists of an 1h written exam following §4(2), 3 SPO and of assignments during the course as a non exam assessment (following §4(3) of the examination regulation).

Conditions
None.

Learning Outcomes
Understand the difference between innovation and invention, and how disruptive effects can be fast and wide-reaching.
Know examples for innovation in processes, organization and business models; understand how service and product innovation differ.
Understand the link between risk and innovation; be aware of obstacles to innovation and know how to overcome them.

Content
While innovation in manufacturing or agriculture can leverage a considerable body of research, experience and best practice, innovation in services has not reached the same level of maturity. In practice, while many organizations have a well-understood process for innovating in the product business, innovating in services is often still a fuzzy and complex undertaking. In this lecture we will discuss the state of research, compare product and service innovation, understand how innovation diffusion works, examine case studies on service innovation, compare open vs. closed innovation, learn how to leverage user communities to drive innovation and understand obstacles as well as enablersand how to manage, incentivize and foster service innovation.

Literature

- Barras, Richard (1986) Towards a theory of innovation in services. Research Policy 15, 161-173

- Hauschildt, Jürgen und Salomo, Sören (2007) Innovationsmanagement. 4. Auflage, München: Vahlen.

- von Hippel, Erich (2007) Horizontal innovation networks - by and for users. Industrial and Corporate Change, 16:2

- Sundbo, Jon (1997) Management of Innovation in Services. The Service Industries Journal, Vo. 17, No. 3, pp. 432-455

Elective literature:

- Benkler, Yochai (2006) The Wealth of Networks: How Social Production Transforms Markets and Freedom. Yale University Press. (Online: http://www.benkler.org)

- Christensen, Clayton M. (2003) The Innovator's Dilemma, Harper Collins.

- Kanerva, M.; Hollanders, H. & Arundel, A. (2006) TrendChart Report: Can we Measure and Compare Innovation in Services?

- von Hippel, Erich (2005) Democratizing Innovation. The MIT Press, Cambridge, MA. (Online: http://web.mit.edu/evhippel/www/books/D

- Howells, Jeremy & Tether, Bruce (2004) Innovation in Services: Issues at Stake and Trends. Commission of the European Communities, Brussels/Luxembourg. (Online: http://www.isi.fhg.de/publ/downloads/isi04b25/inno-3.pdf)

- Miles, I. (2008) Patterns of innovation in service industries. IBM Systems Journal, Vol. 47, No 1

- Morison, Eltling E. (1966) Gunfire at Sea: A Case Study of Innovation. In: Men, Machines and Modern Times. The MIT Press, pp. 17-44.

Remarks
The credits have been changed from 5 to 4,5.

Course: Service Oriented Computing 2 [2511308]

Coordinators: R. Studer, S. Agarwal, B. Norton
Part of the modules: Intelligent Systems and Services (p. 100)[IW4INAIFB5]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	de

Learning Control / Examinations
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.

Conditions
None.

Recommendations
It is recommended to attend the course *Service-oriented Computing 1* [2511500] beforehand.

Learning Outcomes
Students will extend their knowledge and proficiency in the area of modern service-oriented technologies. Thereby, they acquire the capability to understand, apply and assess concepts and methods that are of innovative and scientific nature.

Content
Building upon basic Web service technologies the lecture introduces select topics of advanced service computing and service engineering. In particular, focus will be placed on new Web-based architectures and applications leveraging Web 2.0, Cloud Computing, Semantic Web and other emerging technologies.

Literature
Literature will be announced in the lecture.

Course: Services Marketing [2572202]

Coordinators: J. Kim
Part of the modules: Services Marketing (p. 51)[IW4BWLMAR9]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (60 min) (according to §4(2)

Conditions
None.

Learning Outcomes
Students

- understand the importance of a customer relationship management
- learn the standards of service design
- learn about the 4ps in the service context
- gain knowledge about content and strategies of services marketing
- learn about methods and models to measure service quality

Content
The aim of this lecture is to provide an overview of marketing management in the service context. The lecture starts with foundations for service marketing such as consumer behavior and expectations in services. Then students learn about the importance of the customer relationship for services. They also learn about the 4ps in the service context and gain knowledge about content and strategies of services marketing. They further learn about methods and models for services marketing.

Media
Lecture slides will be provided in ILIAS

Literature
Fitzsimmons, J. A., & Fitzsimmons, M. J. (2010). Service management: operations, strategy, and information technology. Singapore: McGraw-Hill.
Zeithaml, V. A., Bitner, M. J., & Gremler, D. D. (2006). Services marketing: Integrating customer focus across the firm.
See lecture slides for further recommendations on literature

Remarks
new course starting summer term 2016

Course: Security [24941]

Coordinators: J. Müller-Quade
Part of the modules: Computer Security (p. 68)[IW4INSICH], Foundations and Application of IT-Security (p. 95)[IW4INGAS], Networking Security - Theory and Praxis (p. 82)[IW4INNTP]

ECTS Credits	Hours per week	Term	Instruction language
6	3/1	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
The student

- knows the theoretic background and the basic mechanisms of computer security and cryptography

- understands the mechanisms of computer security and can explain them,

- can read and understand the current scientific papers,

- can evaluate the safety procedures and can recognize hazards,

- can adapt mechanisms of computer security to new environment.

Content

- Theoretical and practical aspects of computer security

- Development of safety goals and classification of threats

- Presentation and comparison of different formal access control models

- Formal description of authentication systems, presentation and comparison of different authentication methods (passwords, biometrics, challenge-response protocols)

- Analysis of typical vulnerabilities in programs and web applications and development of appropriate protective protection methods / avoidance strategies

- Introduction to key management and Public Key Infrastructure

- Presentation and comparison of current safety certifications

- Block ciphers, hash functions, digital signature, public key encryption and digital signatures (RSA, ElGamal), and various methods of key exchange (e.g., Diffie-Hellman)

- Furthermore, an introduction to provable security is provided, which presents some of the key security concepts (e.g. IND-CCA).

- Presentation of combinations of cryptographic modules using currently used protocols such as Secure Shell (SSH) and Transport Layer Security (TLS).

Media
Presentation slides (available online)
Blackboard presentation

Literature
Lecture notes (available online)

Course: Signals and Codes [24137]

Coordinators: J. Müller-Quade
Part of the modules: Computer Security (p. 68)[IW4INSICH], Advanced Topics in Cryptography (p. 69)[IW4INFKRYP]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None

Recommendations
Basic knowledge of linear algebra is helpful.

Learning Outcomes
The student

- knows and understands methods of signal- and coding theory,

- assesses different properties and parameters of codes,

- assesses the relevance of theoretical bounds to practical applications of codes,

- analyzes given systems and adapts them to different environments.

Content
The course covers essentially the question of how the exchange of information can be realized reliably and efficiently. The lecture gives an overview of how to secure signals against random errors. In signal theory, source coding and the Theorem of Shannon will be covered. In the coding theory part, bounds for codes (Hamming, Gilbert-Varshamov, Singleton) are presented. Coding and decoding for classical algebraic codes (linear, cyclic, Reed Solomon-, Goppa- und Reed Muller-codes) will be presented as well as concatanated codes.

Literature
Introduction to coding theory, J.H. van Lint, Springer

Course: Simulation I [2550662]

Coordinators: K. Waldmann
Part of the modules: Stochastic Modelling and Optimization (p. 62)[IW4OR7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1/2	Winter / Summer Term	de

Learning Control / Examinations
The assessment consists of an 1h written exam according to Section 4(2), 1 of the examination regulation. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.6 (according to Section 4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes
The participants will be enabled to model discrete event systems that underlie stochastic influences and to analyze them using simulation. The discussion of practice-oriented case studies pursues two goals. On the one hand, the participants will be sensitized for different criteria to evaluate the performance of a stochastic discrete-event system. On the other hand, an overview of application areas of stochastic simulation is provided. In the context of the course, the basic elements of discrete-event simulation are introduced and a procedure model for the execution of simulation studies is developed. Properties of existing mathematical methods for the generation of random variables are discussed and are assigned to concrete application cases. Statistical methods for the description of simulation input data and for the interpretation of simulation results will be exemplified. The facultative computer exercise course using a simulation software comprises a practice-oriented case study that illustrates the opportunities and limitations of stochastic simulation.

Content
Generation of random numbers, Monte Carlo Integration, discrete event simulation, discrete random variables, continuous random variables, statistical analysis of simulated data.

Media
Blackboard, slides, flash-animations, java tools, simulation software.

Literature

- Lecture Notes
- K.-H. Waldmann/U. M. Stocker: Stochastische Modelle - Eine anwendungsorientierte Einführung, Springer (2012), 2. Auflage
- Elective literature: A. M. Law/W.D. Kelton: Simulation Modeling and Analysis (3rd ed), McGraw Hill (2000)

Remarks
The course will be offered in the summer term 2015 and the summer term 2016.

Course: Simulation II [2550665]

Coordinators: K. Waldmann
Part of the modules: Stochastic Modelling and Optimization (p. 62)[IW4OR7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1/2	Winter / Summer Term	de

Learning Control / Examinations
The assessment consists of an 1h written exam following Section 4(2), 1 of the examination regulation. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by a 2/3 step of a full grade (according to Section 4(2), 3 of the examination regulation).

Conditions
Foundations in the field of *Simulation I* [2550662] are desired.

Learning Outcomes
The participants will be enabled to model and analyze discrete event systems that underlie stochastic influences with efficient simulation techniques. The discussion of practice-oriented case studies illustrates the limits of standard simulation techniques for stochastic discrete event systems regarding the simulation effort to obtain statistical significant results. Variance reducing techniques will be introduced in theory as modern and efficient techniques and will be exemplified by examples from quality management, financial engineering and insurance. The main scope of the applications discussed in the course is the efficient simulation of stochastic processes. The facultative computer exercise course under utilization of the programming language Java comprises a practice-oriented case study, in which the participants implement certain variance reducing techniques in order to analyze the reduction in computer effort in comparison to standard techniques.

Content
Variance reducing techniques, simulation of sochastic processes, case studies.

Media
Blackboard, slides, flash-animations, java tools, simulation software.

Literature

- Lecture Notes
- K.-H. Waldmann/U. M. Stocker: Stochastische Modelle - Eine anwendungsorientierte Einführung, Springer (2012), 2. Auflage
- Elective literature: A. M. Law/W.D. Kelton: Simulation Modeling and Analysis (3rd ed), McGraw Hill (2000)

Remarks
The course will be offered in the winter term 2015/2016.

Course: Smart Energy Distribution [2511108]

Coordinators: H. Schmeck
Part of the modules: Ubiquitous Computing (p. 102)[IW4INAIFB7]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Summer term	en

Learning Control / Examinations
written exam, unless the number of registered students is too small.

Conditions
The students should have an understanding of informatics, they would benefit from some previous knowledge of self-organisation and methods for optimisation, but this is not mandatory

Learning Outcomes
The students will develop an understanding for the major challenges of the Energiewende and for the necessity and potential of information and communication technology for addressing basic problems that arise from decentralisation and an increased share of renewables in the power mix, They will know how to deal with these problems by using concepts like virtualisation and self-organisation in intelligent energy management systems. They will know how to design and apply adequate methods for smart energy distribution in various related problem settings and they will be capable to explain the appropriate use of these methods. In this way the students will get to know the scope of topics in the emerging discipline of Energy Informatics and its relevance for the design of tomorrow's energy system..

Content
The course addresses the challenges of the Energiewende with respect to the role of information and communication technologies for shaping tomorrow's engery systems. The increasing share of power generation from renewable sources and the decentralisation of power generation lead to an increasing need for local balancing of power supply and demand. While traditional power management was based on the assumption that power consumption is not controllable and that electric power cannot be stored effectively, future power management will depend significantly on much more flexibility in demand and in innovative ways of storing energy.
The course will present concepts for smart energy management that have been developed in projects on "e-energy" and "ICT for Electric Mobility", like virtual power plants, local agent-based power management, concepts of load shifting, autonomic and organic approaches to power management in smart homes, utilization of mobile and stationary batteries for stabilization of the power grid. Furthermore, it addresses aspects of security and privacy due to the pervasive use of ICT in energy systems.
The concepts presented in this course are essential topics of the emerging discipline of Energy Informatics.

Media
slides, on screen annotations , lecture recording using camtasia

Remarks
This course is offered to students of the (KIC) MSc program EnTech but may also be taken by students of the Master programs Industrial Engineering, Economics Engineering, Information Engineering and Management, and Mathematics in Economics.

Course: Social Choice Theory [2520537]

Coordinators: C. Puppe
Part of the modules: Collective Decision Making (p. 57)[IW4VWL16], Microeconomic Theory (p. 56)[IW4VWL15]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	en

Learning Control / Examinations
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.

Conditions
None.

Recommendations
None.

Learning Outcomes
The student should acquire knowledge of formal theories of collective decision making and learn to apply them to real life situations.

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. An introduction into tournament theory concludes the course.

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

Course: Software-Evolution [24164]

Coordinators: K. Krogmann, K. Krogmann
Part of the modules: Software Systems (p. 75)[IW4INSWS], Software Methods (p. 76)[IW4INSWM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment consists of an oral exam (approx. 20 minutes) according to section 4 subsection 2 no. 2 study and examination regulations.

Conditions
None.

Recommendations
Knowledge on software engineering and software architectures is recommended.

Learning Outcomes
Students which participate in the lecture will learn the special challenges of long-living software systems. Furthermore, they will know the advantages of target-oriented software evolution in order to impact future development of a software system. The students will learn which means and concepts of software evolution are suitable for a certain scenario and which factors impact the software development process. To complement the theoretical foundations, the students will gain insights into practical examples and suitable tools which ease the handling of software-evolution. Participants of the lectures will get to know a cross section of implementation aspect, techniques, management, and concepts. The student will be able to analyse, evaluate, and improve software systems.

Content
The lecture software evolution covers the following topics: software development processes, specifics of long-living software systems, evolution scenarios of software systems, software architecture development, re-engineering, implementation techniques, architecture patterns, traceability, software evaluation approaches, maintainability analysis, and tools supporting software evolution.

Media
Slides.

Literature

- Ian Sommerville, Software Engineering (8th Edition), Addison Wesley (June 4, 2006)

- Roger Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill Science/Engineering/Math (January 20, 2009)

- Penny Grubb and Armstrong A. Takang, Software Maintenance: Concepts and Practice (2nd Edition), World Scientific Publishing Company (September 2003)

- Michele Lanza and Radu Marinescu, Object-Oriented Metrics in Practice: Using Software, Metrics to Characterize, Evaluate, and Improve the Design of Object-Oriented Systems (1st Edition), Springer, Berlin (30. Oktober 2006)

- Robert C. Martin, Clean Code: A Handbook of Agile Software Craftsmanship (1st Edition), Prentice Hall (August 11, 2008)

- Oscar Nierstrasz, Stephane Ducasse and Serge Demeyer, Object-Oriented Reengineering Patterns, Square Bracket Associates (October 7, 2009)

Course: Software Laboratory: OR Models II [2550497]

Coordinators: S. Nickel
Part of the modules: Operations Research in Supply Chain Management and Health Care Management (p. 59)[IW4OR4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
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.

Conditions
Successful completion of the course *Software Laboratory: OR-Models I* [2550490].
Basic knowledge as conveyed in the module *Introduction to Operations Research* [WI1OR] is assumed.

Learning Outcomes
The student

- is an expert in using computer systems to model and solve industry-related optimization problems,

- conducts an advanced approach to modeling and implementation software for OR models and is able to use them in practice,

- knows and explains the practical application possibilities of OR software in complex combinatorial and nonlinear optimization problems.

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.

Remarks
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.

Course: Software Quality Management [2511208]

Coordinators: A. Oberweis
Part of the modules: Development of Business Information Systems (p. 104)[IW4INAIFB11]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	de

Learning Control / Examinations
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.

Conditions
Programming knowledge in Java and basic knowledge of computer science are expected.

Learning Outcomes
Students

- explain the relevant quality models,
- apply methods to evaluate the software quality and evaluate the results,
- know the mail models of sofware certification, compare and evaluate these models,
- write scientific theses in the area of software quality management and find own solutions for given problems.

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.

Media
Slides, access to internet resources.

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

Elective literature:
Further literature is given in lectures.

Remarks
This course was formely named "Software Technology: Quality Management".

Course: Software Development for Modern, Parallel Platforms [24660]

Coordinators: W. Tichy
Part of the modules: Software Systems (p. 75)[IW4INSWS], Parallel Processing (p. 96)[IW4INPV]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
Basic knowledge in the fields of software engineering and programming languages.
Basic knowledge of the lecture *Multicore Computers and Computer Clusters* [24112] in the winter term is helpful.

Recommendations
The course requires basic knowledge of C/C++, Java, operating systems, computer architecture.
The course is self-contained, but can be taken in conjuction with the winter course „Multicore
Computers and Computer Clusters".

Learning Outcomes
The student

- can reproduce fundamental terms of software engineering for parallel systems, apply metrics to parallel software and classify parallel systems by their control and data flow as well as the organization of the physical memory.
- can utilize strategies to find parallelism and select fitting architecture-patterns (pipeline, master-worker, work pool, work stealing, producer-consumer).
- can employ implementation-patterns (array-access patterns, reduction, leader-followers, mutex wrapper facade, scoped locking, thread-safe interface, resource ordering).
- can explain the .NET-Framework and list the details of the runtime support, in particular the just-in-time compilation.
- is proficient in parallel programming with Java and C++. The student can create threads, protect critical segments and employ constructs for waiting and communication between threads.
- can distinguish between the different approaches of parallelization libraries (STL, pThreads, TBB, OpenMP).
- can explain general-purpose computing on graphics processing units (GPGPU) and evaluate its application in given situations.
- knows of typical errors and the effects of measuring in parallel programs. The student knows about race conditions and methods of resolving them. The student has a understanding of happens-before relations and can derive them from logical clocks.
- can explain the requirements for deadlocks. He can find the cause of deadlocks and select methods to prevent or resolve deadlocks.
- has the ability to explain current research topics in the field of multi-core computation.

Content
Multicore processors make parallelism available for everyone. This course introduces the students to the basics of software development for parallel shared-memory architectures. In particular, it discusses parallel design patterns, parallelism in modern programming languages, parallel libraries, internals of OpenMP, and debugging techniques for shared memory parallel programs. The course also shows how to use graphics cards (GPGPU) for general-purpose data parallel computations. This course can be taken by Master's students in Computer Science and „Informationswirtschaft".

Literature
Will be announced in the lecture.
Elective literature:
Will be announced in the lecture.

Course: Social Network Analysis in CRM [2540518]

Coordinators: A. Geyer-Schulz
Part of the modules: Advanced CRM (p. 25)[IW4BWLISM1]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation.
The course is considered successfully taken, if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 10) from excersise work will be added. The grades of this lecture are assigned following the table below:
\begin{tabular}{cc}
Grade & Minimum points \\
\hline
1.0 & 95 \\
1.3 & 90 \\
1.7 & 85 \\
2.0 & 80 \\
2.3 & 75 \\
2.7 & 70 \\
3.0 & 65 \\
3.3 & 60 \\
3.7 & 55 \\
4.0 & 50 \\
\hline
5.0 & 0 \\
\end{tabular}

Conditions
None.

Learning Outcomes
The objectives of this course are to give students an introduction to and overview of social network analysis as a methodological approach for analysis in different areas of business administration, especially customer relationship management. Theory as well as application of social network analysis will be discussed. Students will learn how to perform and interpret analysis results.

Content
The trend to view economic and social structures as networks allows to anlysze these networks by well established and new methods from mathematics, business administration, sociology and phyiscs. The goal of these analyses are to understand different aspects of these networks: In organizations (internal Marketing): Here networks analysis kann help to detect whether hierarchies and official structures are 'alive' or if so called 'hidden organizations' have evolved. In addition such results can reveal ineffient procedures or structures within an organization. In CRM: Within analytical CRM the concept of customer value can be enriched by enclosing the network value that customer offers to the company (Customer Network Value). In Marketing: To successfully implement a virale marketing strategy the knowledge of the structure of customer networks is essential. The dynamics on these networks are relevant if one wants to use these networks for marketing purposes. Internetstructure: For information services, such as e.g. search engines, ithe identification of relevant nodes and clusters is a the major service profided and thus relevant for business success.
The analysis should identify the relevant (central) nodes in a network, find cliques, describe their connections and, if relevant, describe alos the direction of information flow within the network. To achieve this different methods will be discussed during the course.

Media
Folien

Literature
Christian Grönroos. Service Management and Marketing : A Customer Relationship Management Approach. Wiley, Chicester, 2 edition, 2000.
Sabrina Helm. Viral marketing: Establishing customer relationships by word-of-mouse. Electronic Markets, 10(3):158–161, Jul 2000.
Dieter Jungnickel. Graphs, Networks and Algorithms. Number 5 in Algorithms and Computation in Mathematics. Springer Verlag, Berlin, 1999.
Leo Katz. A new status index derived from sociometric analysis. Psychometrika, 18(1):39–43, Mar 1953.
Jon M. Kleinberg. Authoritative sources in a hyperlinked environment. JACM, 46(5):604–632, sep 1999.

Barry Wellman Laura Garton. Social impacts of electronic mail in organizations: A review of research literature. Communication Yearbook, 18:434–453, 1995.

Carl D. Meyer. Matrix Analysis and Applied Linear Algebra. Society for Industrial and Applied Mathematics, Philadelphia, 2000.

Andrew Richards, William ; Seary. Eigen analysis of networks. Journal of Social Structure, 1(2), Feb 2000.

Pacey C. Foster Stepehen P. Borgatti. The network paradigm in organizational research: A review and typology. Journal of Management, 29(6):991–1013, 2003.

Mani R. Subramani and Balaji Rajagopalan. Knowledge-sharing and influence in online social networks via viral marketing. Communications of the ACM, 46(12):300–307, Dec 2003.

Stanley Wasserman and Katherine Faust. Social Network Analysis: Methods and Applications, volume 8 of Structural Analysis in the Social Sciences. Cambridge University Press, Cambridge, 1 edition, 1999.

Barry Wellman. Computer networks as social networks. Science, 293:2031–2034, Sep 2001.

Remarks

The course is currently not offered.

Course: Special Topics in Management Accounting [2579905]

Coordinators: M. Wouters, F. Stadtherr
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2		en

Learning Control / Examinations
The final grade of the course is the grade awarded to the paper.

Conditions
The LV "Betriebswirtschaftslehre: Finanzwirtschaft und Rechnungswesen" (2610026) must have been completed before starting this seminar.

Learning Outcomes
Students
• are largely independently able to identify a distinct topic in Management Accounting,
• are capable to research the topic, analyze the information, to conceptualize and deduct fundamental principles and relationships from relatively unstructured information,
• can afterwards logically and systematically present the results in writing and as an oral presentation, following a scientific approach (structuring, terminology, sources.

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.

Literature
Will be announced in the course.

Remarks
Maximum of 24 students.

Course: Special Topics in Information Engineering & Management [2540498]

Coordinators: C. Weinhardt
Part of the modules: Business & Service Engineering (p. 30)[IW4BWLISM4], Service Analytics (p. 32)[IW4BWLKSR1]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3	Winter / Summer Term	de

Learning Control / Examinations
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 pracitical components and an active participation in class.
Please take into account that, beside the written documentation, also a practical component (such as a survey or an implementation of an application) is part of the course. Please examine the course description for the particular tasks.
The final mark is based on the graded and weighted attainments (such as the written documentation, presentation, practical work and an active participation in class)

Conditions
None.

Learning Outcomes
Students are able to

- do literature search based on a given topic: identify relevant literature, find, assess and evaluate this literature.

- do additional practical components in order to apply scientific methods (e.g., case studies, software implementations, surveys, or experiments).

- write the seminar thesis (and later the Bachelor-/Masterthesis) with a minimal learning curve by using format requirements such as those recommended by well-known publishers.

- give presentations in a scientific context in front of an auditorium. These techniques are presented and learned during the seminar.

- present results of the research in written form generally found in scientific publications.

Content
In this course the student should learn to apply the search methods to a predefined topic area. The topics are based on research questions in Information Engineering and Management across different industry sectors. This problem analysis requires an interdisciplinary examination. Experiments, case studies or software development can be part of the practical work that offers the students an opportunity to get a deeper insight into the field of Information Engineering and Management. The course also encompases a documentation of the implemented work.

Media

- PowerPoint

- E-learning platform ILIAS

- Software tools for development, if needed

Literature
The basic literature will be made available to the student according to the respecitive topic.

Remarks
All the practical seminars offered at the chair of Prof. Dr. Weinhardt can be chosen in the Special Topics in Information Engineering & Management course. The current topics of the practical seminars are available at the following homepage: www.iism.kit.edu/im/lehre
The Special Topics Information Engineering and Management is equivalent to the practical seminar, as it was only offered for the major in "Information Management and Engineering" so far. With this course students majoring in "Industrial Engineering and Management" and "Economics Engineering" also have the chance of getting practical experience and enhance their scientific capabilities.
The Special Topics Information Engineering and Managementcan be chosen instead of a regular lecture (see module description). Please take into account, that this course can only be accounted once per module.

Course: Special Topics of Enterprise Information Systems [SBI]

Coordinators: A. Oberweis
Part of the modules: Development of Business Information Systems (p. 104)[IW4INAIFB11]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter / Summer Term	de

Learning Control / Examinations
The assessment of this course is a written or (if necessary) oral examination according to §4(2) of the examination regulation.

Conditions
None.

Learning Outcomes
Students

- explain basic knowledge and concepts in a subarea of "Enterprise Information Systems",
- apply methods and instruments in a subarea of "Enterprise Information Systems",
- choose the appropriate methods to solve given problems and apply them,
- find and discuss arguments for solution approaches.

Content
This course is a placeholder for special courses that are offered in an irregular sequence and cover selected topics in the field of enterprise information systems. These topics include in particular the design and the management of database systems, the computer-support of business processes and strategic planning of information systems and their organization.

Literature
Will be announced at the beginning of the course.

Course: Special Topics of Efficient Algorithms [25700sp]

Coordinators: H. Schmeck
Part of the modules: Organic Computing (p. 103)[IW4INAIFB8]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter / Summer Term	de

Learning Control / Examinations
The assessment consists of assignments or of a bonus exam (wrt §4 (2), 3 SPO), and a written exam (60 min.) in the week after the end of the lecturing periodwrt (§4 (2), 1 SPO). The exam will be offered in every semester and can be repeated on regular examination dates.
If the mark obtained in the written exam is in between 1.3 and 4.0, a successful completion of the assignments or the bonus exam will improve the mark by one level (i.e. by 0.3 or 0.4).

Conditions
None.

Learning Outcomes
The student will learn how to use methods and concepts of efficient algorithms and how to demonstrate adequate innovative capabilities with respect to the used methods.
This course emphasizes the teaching of advanced concepts in relation to their applicability in the real world. Based on a fundamental understanding of the covered concepts and methods, students should know how to select appropriate concepts and methods for problem settings in their professional life, and, if necessary, to extend and apply them in an adequate form. The students should be enabled to find adequate arguments for justifying their chosen problem solutions.

Content
This course emphasizes the new topics in the area of algorithms, data structures, and computer infrastructures. The exact topics can vary according to the audiences and the time it is held.

Literature
Elective literature:
Will be announced in the lecture.

Remarks
This course can be particularly used for recognising the external courses with the topics in the area of algorithms, data-structures and computer infrastructures but are not associated in other courses in this subject area.

Course: Special Topics of Knowledge Management [25860sem]

Coordinators: R. Studer
Part of the modules: Intelligent Systems and Services (p. 100)[IW4INAIFB5]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter / Summer Term	de

Learning Control / Examinations
Assesment is provided by a written exam of 60 minutes or an oral exam during the first few weeks after the lecturing period (acc. to §4(2), 1 or 2 SPO). The exam is offered each semester and may be repeated at the regular examination day.

Conditions
None.

Learning Outcomes
The lecture serves as placeholder for course achievements abroad.
The students acquire the skills, methods and tools in one specialized topic of "knowledge management" to demonstrate their mastery and innovativeness.
The lecture aims at providing principles and methods in the context of the practical application of KM. On the basis of a fundamental understanding of concepts, methods, and tools, students will be able to work on advanced problems. The students will be able to find and argue for solutions of KM problems.

Content
The lecture serves as placeholder for course achievements abroad.
The lecture deals with special topics in the area of knowledge management (incl. Knowledge Discovery and Semantic Web). The lecture deepens one of the following topics:

- Dynamic and Interoperable Systems in Knowledge Management
- Personal and Process-oriented Knowledge Management
- Formal Concept Analysis
- Semantic Search and Text Mining
- Combination of Social Software and Semantic Web

Literature
Elective literature:
Depends on the actual content.

Course: Special Topics in Optimization I [2550128]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 61)[IW4OR6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter / Summer Term	de

Learning Control / Examinations
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 *Special Topics in Optimization II* [25126]. In this case, the duration of the written examination takes 120 minutes.

Conditions
None.

Recommendations
It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Learning Outcomes
The student

- knows and understands the fundamentals of a special topic in continuous optimization,
- is able to choose, design and apply modern techniques of this special topic in continuous optimization in practice.

Content

Remarks
The lecture is offered irregularly. The curriculum of the next three years is available online (www.ior.kit.edu).

Course: Special Topics in Optimization II [2550126]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 61)[IW4OR6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter / Summer Term	de

Learning Control / Examinations
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 *Special Topics in Optimization I* [25128]. In this case, the duration of the written examination takes 120 minutes.

Conditions
None.

Recommendations
It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Learning Outcomes
The student

- knows and understands the fundamentals of a special topic in continuous optimization,
- is able to choose, design and apply modern techniques of this special topic in continuous optimization in practice.

Content

Remarks
The lecture is offered irregularly. The curriculum of the next three years is available online (www.ior.kit.edu).

Course: Specification and Verification of Software [SpezVer]

Coordinators: B. Beckert
Part of the modules: Software Systems (p. 75)[IW4INSWS]

ECTS Credits	Hours per week	Term	Instruction language
5	3	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes

Content

Media
Lecture notes and slides in english are available from the course website

Literature
Lecture Notes: Formal Specification and Verification http://i12www.ira.uka.de/ pschmitt/FormSpez/skript.ps
Elective literature:
Verification of Object-Oriented Software: The KeY Approach
Bernhard Beckert, Reiner Hähnle, Peter H. Schmitt (Eds.)
Springer-Verlag, LNCS 4334.

Course: Language Technology and Compiler [24661]

Coordinators: G. Snelting
Part of the modules: Language Technology and Compiler (p. 74)[IW4INCOMP1]

ECTS Credits	Hours per week	Term	Instruction language
8	4/2	Summer term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
The student

- knows the importance of language and compiler technologies in other areas of computer science
- learns the theoretical foundations and practical methods which form the foundation for the compiler passes: lexical analysis, syntactic analysis, semantic analysis, code generation and code optimization
- has received an overview over the state of the art in compiler construction
- is able to apply his knowledge in practice when constructing a compiler (e.g. In the compiler lab)

Content

- Structure of a compiler
- Lexical analysis
- Syntactic analysis
- Semantic analysis
- Code generation
- Code optimization
- Specific technologies: LL-Parser, LR/LALR-Parser, attributed grammars, instruction selection, register allocation, runtime mechanisms, memory management, static single assignment form and its usage in optimization

Course: Natural Language Processing and Software Engineering [24187]

Coordinators: W. Tichy
Part of the modules: Software Systems (p. 75)[IW4INSWS], Software Methods (p. 76)[IW4INSWM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
Students are being introduced to the fundamental concepts of natural language processing. Students should be able to explain and use the covered methods. Students should know use cases of NLP in the field of software engineering and should be able to describe possible fields of application of text analysis systems in this context.

Content
This course covers the basics of natural language processing.

Natural language processing is becoming more and more important. Potential applications include responding to textual commands, answering questions for online help systems, or searching the internet. Furthermore, the automatic analysis and transformation of software requirements documents is a new field of research. Thus, computational linguistics is of importance not only for application development but also for software engineering itself.

This course is for M.S. students of Informatics and Informationswirtschaft. It introduces the basics of natural language processing and application areas in software development. It covers the topics of parsing natural language, the inherent ambiguity of natural language, the concept of thematic roles and semantics, the automatic translation of texts into software models, and the creation and use of ontologies for text analysis, plus recent research advances.

Media
Lecture presentations (pdf), references

Literature

- Jurafsky, D. & Martin, J. H. : Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition. Prentice Hall, Pearson Education International, 2009.

Additional literature will be announced in class.

Course: Facility Location and Strategic Supply Chain Management [2550486]

Coordinators: S. Nickel
Part of the modules: Operations Research in Supply Chain Management and Health Care Management (p. 59)[IW4OR4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam (120 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.

Conditions
Basic knowledge as conveyed in the module *Introduction to Operations Research* [WW1OR] is assumed.

Learning Outcomes
The student

- knows and describes basic quantitative methods in location planning in the context of strategic Supply Chain Planning,

- applies several criteria for the evaluation of the locations of facilities in the context of 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),

- implements the considered models in practical problems.

Content
Since the classical work "Theory of the Location of Industries" of Weber from 1909, the determination of an optimal location of a new facility with respect to existing customers is strongly connected to 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.

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

Remarks
The lecture is held in every winter term. The planned lectures and courses for the next three years are announced online.

Course: [2521391]

Coordinators: M. Höchstötter
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
Alternative exam assessment according to § 4(2), 3 SPO.

Conditions
None.

Learning Outcomes

Content

Course: Statistical Methods in Financial Risk Management [2521353]

Coordinators: A. Nazemi
Part of the modules: Statistical Methods in Risk Management (p. 64)[IW4STAT2], Mathematical and Empirical Finance (p. 63)[IW4STAT1]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1		en

Learning Control / Examinations
The assessment of this course consists of a written examination (following §4(2), 1 SPO) and of possible additional assignments during the course (following §4(2), 3 SPO).

Conditions
None.

Learning Outcomes
The student

- is familiar with probability distributions and stable distributions
- knows the estimation methodologies and Copulas,
- is able to model time series data,
- learns Value-at-Risk (VAR) and Asset-Liability Management, Stress testing and Risk Metrics,
- is familiar with portfolio optimization,
- knows Market risk, Credit risk and Operational risk,
- is familiar with Basel Regulations,
- Works with real financial data in R and Matlab.

Content
Part 1: Financial Risk Management: Risk Indicators at Instrumental Level; (Single Fixed Flow, Fixed Rate Bond, FRA, Interest Rate Futures, Interest Rate Swaps, FX Spot, FX Forward, Plain Vanilla Options), Credit Risk, Risk Indicators at the Portfolio Level (Pricing Environment, Interest Rate Factors, FX Factors), Value-at-Risk (VAR) and Asset-Liability Management, Risk Metrics - Market Risk in a Single Position, Measures of Market Risk: (Linear and Non-linear Positions), Market Risk Limits, Calibrating Valuation and Risk Models Performance Evaluation, Probability Distributions and Statistical Assumptions Forecasting Volatilities and Correlations (Basic Design, Ex-post Estimation, Ex-ante Estimation - Forecasting, Defining the Optimal Decay Factor), Assessing Performance (Univariate and Multivariate Tail Probabilities), Mathematics of Structures Monte Carlo (Generating Statistics, Properties of the Correlation Matrix), Mapping Algorithms (Fixed Income, Foreign Exchange, Commodities, Options). Models for Credit Risk. Introduction to Operational Risk
Part 2: Optimal portfolio management: portfolio construction, long/short investing, transaction costs and turnover, performance analysis, asset allocation, benchmark timing. Integrating the equity portfolio management process, active versus passive portfolio management, tracking error (backward-looking versus forward looking tracking error, the impact of portfolio size, benchmark volatility and portfolio betas on tracking error), equity style management (types of equity styles, style classification system), passive strategies(constructing an index portfolio, index tracking and cointegration), active investing (top-down and bottom-up approaches to active investing, fundamental law of active management, strategies based on technical analysis, technical analysis and statistical pattern recognition, market-neutral strategies and statistical arbitrage), Application of Multifactor Risk Models(Risk Decomposition, Portfolio construction and Risk Control, Assessing the exposure of a portfolio, Risk control against a stock-market index, Tilting a portfolio).

Media
transparencies, exercises.

Literature

- Fat-Tailed and Skewed Asset Return Distributions: Implications for Risk Management, Portfolio selection, and Option Pricing, Rachev, S., Menn C. and Fabozzi F. , John Wiley, Finance, 2005
- Financial Optimization, by Stavros A. Zenios, 1993, Cambridge University Press.
- The Mathematics of Financial Modeling and Investment Management, by Sergio Focardi and Frank Fabozzi, 2004, Wiley

Remarks
URL: http://statistik.econ.kit.edu/

Course: Statistics and Econometrics in Business and Economics [2521325/2521326]

Coordinators: W. Heller
Part of the modules: Statistical Methods in Risk Management (p. 64)[IW4STAT2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/2	Winter term	de

Learning Control / Examinations
See German version.

Conditions
Basic knowledge in statistics is required.

Learning Outcomes
statistically accurate use of financial market data, particularly time series analysis
Evaluation of various time series models and their applicability

Content
In Part 1 we will provide a thorough description of the quantitative part of investment theory paying attention to the mathematical, probabilistic and statistical methods now widely used in financial practice.
In Part 2 we shall study the methods of construction, identification and verification of te time-series models, which are among most powerful instruments of the financial econometrics. The emphasis will be on the financial and economic indicators forecasting the financial time-series.

Media
transparencies lecture

Literature
e.g.

- Franke/Härdle/Hafner : Einführung in die Statistik der Finanzmärkte.

- Ruppert: Statistics and Finance

- Cochran J.H. : Time Series for Macroeconomics and Finance

Elective literature:
See reading list

Course: Advanced Statistics [2550552]

Coordinators: O. Grothe
Part of the modules: Analytics and Statistics (p. 65)[IW4STAT4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/2	Winter term	de

Learning Control / Examinations
The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation. The exam is offered every semester. Re-examinations are offered only for repeaters.

Conditions
None.

Learning Outcomes
Students

- cope with advanced fundamentals of statistics as well as simulation methods
- know the fundamentals of point and interval estimation as well as testing of hypotheses,
- perform special parametric and nonparametric estimations and tests,
- analyse stochastic processes.

Content

- Moment generating and characteristic function
- Types of convergence and limit theorems
- Simulation techniques
- Estimation and testing
- Stochastic processes

Remarks
New course starting winter term 2015/2016

Course: Statistical Modeling of generalized regression models [2521350]

Coordinators: W. Heller
Part of the modules: Econometrics and Statistics I (p. 66)[IW4STAT5], Econometrics and Statistics II (p. 67)[IW4STAT6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/2	Winter term	de

Learning Control / Examinations
The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation.

Conditions
None.

Recommendations
Knowledge of the contents covered by the course "Economics III: Introduction in Econometrics" [2520016]

Learning Outcomes
The student

- shows comprehensive knowledge of regression techniques

Content

Media
Slides

Literature
Provided in the lecture

Course: Tax Law I [24168]

Coordinators: D. Dietrich
Part of the modules: Private Business Law (p. 115)[IW4JURA5], Governance, Risk & Compliance (p. 117)[IW4JURGRC]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam (approx. 45 minutes) according to section 4 subsection 2 no. 1 study and examination regulations.

Conditions
None.

Learning Outcomes
The target of the lecture is an introduction to national business tax law. The legal norms, spread on several individual tax laws, which are decisive for the taxation of the companies and their owners, will be treated. The focus is on basic fiscal knowledge realizable in practice as a component of modern business economics.

Content
Except for a basic knowledge of the existing German company types and the annual financial statements (balance sheet, statement of earnings), no fiscal previous knowledge is required. The lecture intends to give a current global overview about the most important elements of law. The focus is on trade or business companies in the most common forms such like sole traders, partnerships and corporations.

Media
transparancies

Literature

- Grashoff Steuerrecht, Verlag C. H. Beck, last edition
- Tipke/Lang Steuerrecht, Verlag C. H. Beck, last edition

Course: Tax Law II [24646]

Coordinators: D. Dietrich
Part of the modules: Private Business Law (p. 115)[IW4JURA5]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam following §4, Abs. 2, 1 of the SPO.

Conditions
None.

Learning Outcomes
It is the target of the lecture to provide extended knowledge in business administration related theory of taxation in the field of economics and law, based on the general lecture "introduction to corporate tax law". The students obtain the basis for an economic examination of the fiscal prescriptions and are able to assess the impact on business decisions. The emphasis is on such tax law regulations which allow possibilities for action and decision to the taxpayer.

Content
The lecture requires basic knowledge of commercial law and company law as well as of earnings tax law. Basic and current questions of German corporate taxation are systematically prepared in topic blocs; foils, leaflets and supplementary references are distributed in the individual sessions. There is room for discussion. A recent text collection of the tax laws will be necessary.

Media
transparancies

Literature

- Grashoff, Steuerrecht, Verlag C.H. Beck, latest edition.
- Spangemacher, Gewerbesteuer, Band 5, Grüne Reihe, Erich Fleischer Verlag
- Falterbaum/Bolk/Reiß/Eberhart, Buchführung und Bilanz, Band 10, Grüne Reihe, Erich Fleischer Verlag
- Tipke, K./Lang, J., Steuerrecht, Köln, in der neuesten Auflage.
- Jäger/Lang Körperschaftsteuer, Band 6, Grüne Reihe, Erich Fleischer Verlag
- Lippross Umsatzsteuer, Band 11, Grüne Reihe, Erich Fleischer Verlag
- Plückebaum/Wendt/ Niemeier/Schlierenkämper Einkommensteuer, Band 3, Grüne Reihe, Erich Fleischer Verlag

Course: Stochastic Calculus and Finance [2521331]

Coordinators: M. Safarian
Part of the modules: Mathematical and Empirical Finance (p. 63)[IW4STAT1], Econometrics and Statistics II (p. 67)[IW4STAT6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations
The assessment of this course consists of a written examination (following §4(2), 1 SPO) and of possibble additional assignments during the course (following §4(2), 3 SPO).

Conditions
None.

Learning Outcomes
After successful completion of the course students will be familiar with many common methods of pricing and portfolio models in finance. Emphasis we be put on both finance and the theory behind it.

Content
The course will provide rigorous yet focused training in stochastic calculus and 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.

Media
transparencies, exercises.

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).

Course: Markov Decision Models I [2550679]

Coordinators: K. Waldmann
Part of the modules: Stochastic Models in Information Engineering and Management (p. 21)[IW4WWOR], Stochastic Modelling and Optimization (p. 62)[IW4OR7]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1/2	Winter term	de

Learning Control / Examinations
The assessment consists of an 1h written exam following Section 4(2), 1 of the examination regulation. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by a 2/3 step of a full grade (according to Section 4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes
The participants will be enabled to model and analyze stochastic systems with modern techniques. The discussion of practice-oriented case studies pursues two goals. On the one hand, typical problem settings are illustrated and on the other hand, criteria for the evaluation of the performance of stochastic systems are motivated. Properties and characteristics for the evaluation of the performance of Markov Chains, Poisson Processes and queuing systems are developed.

Content
Markov Chains, Poisson Processes, Markov Chains in Continuous Time, Queuing Systems

Media
Blackboard, Slides, Flash Animations, Simulation Software

Literature

- Waldmann, K.H., Stocker, U.M. (2012): Stochastische Modelle - eine anwendungsorientierte Einführung, Springer, 2. Auflage

- Elective literature:

    - Norris, J.R. (1997): Markov Chains; Cambridge University Press
    - Bremaud, P. (1999): Markov Chains, Gibbs Fields, Monte Carlo Simulation and Queues, Springer

Course: Markov Decision Models II [2550682]

Coordinators: K. Waldmann
Part of the modules: Stochastic Modelling and Optimization (p. 62)[IW4OR7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1/2	Summer term	de

Learning Control / Examinations
The assessment consists of an 1h written exam following §4(2), 1 SPO. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.6.

Conditions
Foundations in the field of the Markov Decision Models I [2550679] are desired.

Learning Outcomes
The participants will be enabled to utilize Markov Decision Processes as a method for analyzing, controlling and optimizing dynamic stochastic systems. The discussion of practice-oriented case studies in the area of the management of energy systems, revenue management and logistics illustrates the application fields of Markov Decision Processes. Necessary mathematical concepts like theoretical foundations, optimality criteria and the solution of the optimality equation are presented.
Particularly the development of simple structured decision rules, that are desired by practitioners on the one hand, and that permit the efficient solutions of the optimality equation on the other hand, are discussed. The facultative computer exercise course using the programming language Java comprises a practice-oriented case study that illustrates the opportunities of the optimization of stochastic systems.

Content
Queuing Systems, Stochastic Decision Processes

Media
Blackboard, Slides, Flash Animations, Simulation Software

Literature

- Waldmann, K.H., Stocker, U.M. (2012): Stochastische Modelle - eine anwendungsorientierte Einführung, Springer, 2. Auflage
- Elective literature: Puterman, M.L. (1994): Markov Decision Processes: Discrete Stochastic Dynamic Programming; John Wiley

Remarks
The lecture is offered irregularly. The curriculum of the next two years is available online.

Course: Strategic Brand Management [2571185]

Coordinators: M. Klarmann, J. Blickhäuser
Part of the modules: Marketing Management (p. 46)[IW4BWLMAR5]

ECTS Credits	Hours per week	Term	Instruction language
1,5	1/0	Summer term	de

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes
See German version.

Content

Remarks
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).
Please note: The number of participants for this course is limited. The Marketing & 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.

Course: Strategical Aspects of Energy Economy [2581958]

Coordinators: A. Ardone
Part of the modules: Energy Economics and Technology (p. 43)[IW4BWLIIP5]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam according to Section 4 (2),1 of the examination regulation.

Conditions
None.

Learning Outcomes
Students

- have in-depth knowledge of current and future technologies for power generation,
- know methods and approaches regarding short- to long-term electricity system planning and market modeling - in particular the cost of generating electricity.

Content
1) Energy supply
1.1 Basic concepts
1.2 Global supply & demand (oil, coal, gas, electricity)
2) Power plant types
2.1 Thermal power plants
2.2 Renewables
3) Cost of electricity generation
3.1 Cost depending on the investment (CAPEX)
3.2 Operational fixed cost (OPEX)
3.3 Variable cost
3.4 Full cost of power generation
4) Electricity markets
4.1 Development of power markets
5) Energy system planning
5.1 basic concepts
5.2 Drivers
5.3 Stages of power planning
5.4 Short-term optimization: dispatch decisions
5.5 Mid-term optimization: fuel procurement and overhaul planning
5.6 Long-term optimization: additions & Retirements
5.7 Mathematical tools for system planning and market modeling

Literature
Will be anounced in the lecture.

Course: Strategic and Innovative Decision Making in Marketing [2571165]

Coordinators: B. Neibecker
Part of the modules: Marketing Management (p. 46)[IW4BWLMAR5], Strategy, Communication, and Data Analysis (p. 49)[IW4BWLMAR7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).
The examination is offered every semester. Re-examinations are offered at every ordinary examination date.

Conditions
See corresponding module information.

Learning Outcomes
Students have learned the following outcomes and competences:
- To specify the key terms in strategic management and innovation research, based on methodological and behavioral approaches
- To apply statistical tools to analyze and interpret strategic problems in marketing
- To indentify the main research trends
- To analyze and interpret high level academic articles
- To learn interactive skills to work in teams and to follow a goal-oriented approach
- To gain understanding of methodological research to develop concrete plans for marketing decision-making

Content
The course places emphasis on the role of marketing in strategic planning. The planning and implementation stages are discussed using a case study in business portfolio analysis, talking about experience effects, approaches in defining strategic business units. A critical view on market orientation as a source of sustainable competitive advantage is given. Further topics are innovation and diffusion models, behavioral approaches to innovative decision processes and a discussion on Porter's single diamond theory and globalization.

Literature

- Backhaus, K. und M. Voeth: Industriegütermarketing. München: Vahlen 2010.

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- Cestre, G. und R. Y. Darmon: Assessing consumer preferences in the context of new product diffusion. In: International Journal of Research in Marketing 15, 1998, 123-135.

- Dunning, J. H.: Internationalizing Porter's Diamond. In: mir Management International Review, Special Issue 1993/2, 7-15.

- Gatignon, H. und T. S. Robertson: Innovative Decision Processes. In: Robertson T. S. und H. H. Kassarjian (Hrsg.), Handbook of Consumer Behavior, Englewood Cliffs: Prentice-Hall 1991.

- Homburg, C. und H. Krohmer: Marketingmanagement. Wiesbaden: Gabler 2009 (4. Aufl. 2012).

- Kuhfeld, W.: Multinomial Logit – Discrete Choice Modeling. SAS Institute, TS-650E (http://support.sas.com4.10.2004)

- Kumar, V., E. Jones, R. Venkatesan und R. P. Leone: Is Market Orientation a Source of Sustainable Competitive Advantage or Simply the Cost of Competing? In: Journal of Marketing 75, 2011, 16-30.

- Lilien, G. L., P. Kotler und K. S. Moorthy: Marketing Models. Englewood Cliffs: Prentice Hall 1992.

- Porter, M. E.: Der Wettbewerb auf globalen Märkten. In: Porter, M. E. (Hrsg.), Globaler Wettbewerb, Gabler 1989, 17-63.

- Porter, M. E.: The Competitive Advantage of Nations. New York: Free Press 1990 (zur Ergänzung).

- Prahalad, C. K.: Weak Signals versus Strong Paradigms. In: Journal of Marketing Research 32, 1995, III-VIII..

- Rugman, A. M. und D'Cruz J. R.: The „Double Diamond" Model of International Competitiveness: The Canadian Experience. In: mir Management International Review, Special Issue 1993/2, 17-39.

- Walker, R.: Analysing the business portfolio in Black & Decker Europe. In: Taylor, B. und J. Harrison (Hrsg.), The Manager's Casebook of Business Strategy, Butterworth-Heinemann: Oxford 1991, 19-36.

Course: Strategic Management of Information Technology [2511602]

Coordinators: T. Wolf
Part of the modules: Development of Business Information Systems (p. 104)[IW4INAIFB11]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Summer term	de

Learning Control / Examinations
The assessment of this course is a written or (if necessary) oral examination according to §4(2) of the examination regulation.

Conditions
None.

Learning Outcomes
Students know the outer frame of IT in an enterprise and know which functions IT has within an enterprise. They unterstand the organization and the content of these functions.

Content
The following topics will be covered: strategic planing of ICT, architecture of ICT, overall planning of ICT, outsourcing, operation and controlling of ICT.

Media
Slides, internet resources

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

- Österle, H. et al.: Unternehmensführung und Informationssystem. Teubner, Stuttgart 1992

- Thome, R.: Wirtschaftliche Informationsverarbeitung. Verlag Franz Vahlen, München 1990

Course: Supply Chain Management in the automotive industry [2581957]

Coordinators: T. Heupel, H. Lang
Part of the modules: Industrial Production III (p. 41)[IW4BWLIIP6]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Winter term	de

Learning Control / Examinations
The examination will be in form of a written exam acc. to §4(2), 1 ER. Exams are offered in every semester and can be re-examined at every ordinary examination date.

Conditions
None.

Recommendations
None.

Learning Outcomes
Students are taught knowledge, methods and tools in the field of automotive supply chain management. With the help of concrete examples of a global automotive company, they acquire a basic understanding of challenges in the implementation of those solutions. Students learn about theoretic concepts and their transfer to practice in designing value-added structures, procurement logistics, risk management, quality engineering, cost engineering, and purchasing. They are able to identify, analyze and assess problems and to design adequate solutions within those aspects. In the end of the lecture, students can integrate the aspects into the general context of automotive supply chain management and development process.

Content

- Automotive industry significance
- The automotive supply chain
- Adding value structures of the automotive supply chain and mastering of the production systems as factors of success in the SCM
- Strategic procurement logistics
- Risk management
- Quality engineering and management in the automotive supply chain
- Cost engineering and management in the automotive supply chain
- Purchasing (Supplier selection, contract management)
- Performance measurement of the supply chain / organization

Media
Media will be provided on the e-learning platform.

Literature
Will be announced in the course.

Remarks
None.

Course: Supply Chain Management in the Process Industry [2550494]

Coordinators: S. Nickel
Part of the modules: Operations Research in Supply Chain Management and Health Care Management (p. 59)[IW4OR4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	en

Learning Control / Examinations
The assessment is a 60 minutes written examination (according to §4(2), 1 of the examination regulation) (individual grading), case study presentation by student teams (team grading) and classroom participation (individual grading). The examination is held in the term of the lecture.

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

Recommendations
Advanced knowledge of Operations Research (e.g., as conveyed in the lectures Facility Location and Strategic SCM, Tactical and operational SCM) is recommended.

Learning Outcomes
The student

- knows and classifies state-of-the art approaches for designing, planning and managing global supply chains in the process industry
- distingusihes quality in supply chains and identifies important building blocks, repeating patterns and concepts crucial to supply chain strategy, design and planning,
- explains specific challenges and approaches towards supply chain operations within the process industry with regards to transportation and warehousing, and describes the interdisciplinary linkage of SCM with information systems, performance management, project management, risk management and sustainability management,
- transfers gained knowledge into practice by using SCM case studies and SCM real life project documentations.

Content
The course "Supply Chain Management in the Process Industry" covers fundamental concepts in the field of supply chain management with special focus on process industry. Strategic, planning and operational topics within the end-to-end supply chain are examined, covering relevant approaches in design, processes and performance measurement. Additional focus within the course is on showing the interdisciplinary linkages SCM has with information systems, performance management, project management, risk management and sustainability management. The course is enriched by various insights from the world´s leading chemical company BASF, provided by executive management as real life examples and cases.

Literature

- Chopra, S./Meindl, P.: Supply Chain Management – Strategy, Planning, & Operations, 4th edition, Upper Saddle River, 2009.
- Various case studies, which will be provided during the course

Remarks
The number of participants is restricted due to the execution of interactive case studies and the resulting examination effort. Due to these capacity restrictions, registration before course start is required according to the information on the course website. The course is planned to be held every winter term. The planned lectures and courses for the next three years are announced online.

Course: Supply Chain Management with Advanced Planning Systems [2581961]

Coordinators: M. Göbelt, C. Sürie
Part of the modules: Industrial Production III (p. 41)[IW4BWLIIP6]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2	Summer term	en

Learning Control / Examinations
The assessment consists of an oral (30 minutes) or a written (60 minutes) exam (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
This lecture deals with supply chain management from a practitioner's perspective with a special emphasis on the software solution SAP SCM and the planning domain. First, the term supply chain management is defined and its scope is determined. Methods to analyze supply chains as well as indicators to measure supply chains are derived. Second, the structure of an APS (advanced planning system) is discussed in a generic way. Later in the lecture, the software solution SAP SCM is mapped to this generic structure. The individual planning tasks and software modules (demand planning, supply network planning, production planning / detailed scheduling, transportation planning / vehicle scheduling, global available-to-promise) are presented by discussing the relevant business processes, providing academic background, describing planning processes for a fictive company and showing the user interface and user-related processes in the software solution.
The lecture is supported by a self-explanatory tutorial, in which students can explore the software solution for the fictive company offline on their own.

Content
1. **Introduction to Supply Chain Management**
1.1. Supply Chain Management Fundamentals
1.2. Supply Chain Management Analytics
2. Structure of Advanced Planning Systems
3. SAP SCM
3.1. Introduction / SCM Solution Map
3.2. Demand Planning
3.3. Supply Network Planning
3.4. Production Planning and Detailed Scheduling
3.5. Deployment
3.6. Transportation Planning and Vehicle Scheduling
3.7. [Optional] Global Available to Promise
4. SAP SCM in Practice
4.1. Success Stories
4.2. SAP Implementation Methodology

Remarks
This lecture has 3,5 Credits since summer term 2014.

Course: Symmetric Encryption [24629]

Coordinators: J. Müller-Quade
Part of the modules: Computer Security (p. 68)[IW4INSICH], Advanced Topics in Cryptography (p. 69)[IW4INFKRYP],
                       Networking Security - Theory and Praxis (p. 82)[IW4INNTP]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination regulations.

Conditions
None.

Learning Outcomes
The student

- knows the most important algorithms and primitives of symmetric encryption,

- knows and understands the most important attacks on symmetric encryption schemes,

- evaluates the security of given algorithms and recognizes security problems.

Content
This lecture provides the theoretical and practical aspects of symmetric cryptography. The most important topics are:

- Historical ciphers, if they are useful for assessing the security of current ciphers,

- block ciphers and the most important types of attacks (differential and linear cryptanalysis, meet-in-the-middle attacks, slide attacks),

- hash functions - the focus is on attacks and techniques to forge meaningful messages through the use of "meaningless collisions",

- security definitions for symmetric encryption schemes and their modes of operation.

Course: Tactical and Operational Supply Chain Management [2550488]

Coordinators: S. Nickel
Part of the modules: Operations Research in Supply Chain Management and Health Care Management (p. 59)[IW4OR4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (120 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.

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

Learning Outcomes
The student

- gathers expertise in fundamental techniques from procurement and distribution logistics, methods from inventory management and lot sizing,

- acquires the ability to efficiently utilize quantitative models from transportation planning (long-distance and distribution planning), inventory management and lot sizing in production,

- applies the introduced methods in more detail and in industry-relevant case-studies.

Content
The planning of material transport is an essential element of Supply Chain Management. By linking transport connections across different facilities, the material source (production plant) is connected with the material sink (customer).
The general supply task can be formulated as follows (cf. Gudehus): For given material flows or shipments, 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. The main goal of the inventory management is the optimal determination of order quantities in terms of minimization of fixed and variable costs subject to resource constraints, supply availability and service level requirements. Similarly, the problem of lot sizing in production considers the determination of the optimal amount of products to be produced in a time slot.
The course includes an introduction to basic terms and definitions of Supply Chain Management and a presentation of fundamental quantitative planning models for distribution, vehicle routing, inventory management and lot sizing. Furthermore, case studies from practice will be discussed in detail.

Literature
Elective literature:

- Domschke: Logistik: Transporte, 5. Auflage, Oldenbourg, 2005

- Domschke: Logistik: Rundreisen und Touren, 4. Auflage, Oldenbourg, 1997

- Ghiani, Laporte, Musmanno: Introduction to Logistics Systems Planning and Control, Wiley, 2004

- Gudehus: Logistik, 3. Auflage, Springer, 2005

- Simchi-Levi, Kaminsky, Simchi-Levi: Designing and Managing the Supply Chain, 3rd edition, McGraw-Hill, 2008

- Silver, Pyke, Peterson: Inventory management and production planning and scheduling, 3rd edition, Wiley, 1998

Remarks
The lecture is held in every summer term. The planned lectures and courses for the next three years are announced online.

Course: Technology Assessment [2545017]

Coordinators: D. Koch
Part of the modules: Innovation Management (p. 45)[IW4BWLENT2]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Recommendations
Prior attendance of the course *Innovation Management* [2545015] is recommended.

Learning Outcomes
The students

- look critically into current research topics in the field of technology evaluation,
- cultivate the economic discussion of research approaches,
- do literature search based on a given topic, identify relevant literature and evaluate this literature,
- give presentations in a scientific context in front of an auditorium to present the results of the research,
- present results of the research in a seminar thesis as a scientific publication

Content
Technology Assessment can play a role at different points in the innovation process and support decisions for or against specific technology options. The seminar "Technology Assessment" focuses on the early phase or fuzzy front end of innovation management. Technology assessment is done here with a certain degree of uncertainty concerning future technology developments. Technology assessment can be connected to the use of methods such as scenario analysis or roadmapping but also to the classical generation of ideas. Different methods and approaches are discussed in the seminar, for example, market-technology portfolios etc. The early assessment of technologies is assigned particular importance given the limited resources in companies and uncertainty about future developments.

Media
Slides.

Course: Technologies for Innovation Management [2545018]

Coordinators: D. Koch
Part of the modules: Innovation Management (p. 45)[IW4BWLENT2]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Recommendations
Prior attendance of the course *Innovation Management* [2545015] is recommended.

Learning Outcomes
The students

- look critically into current research topics in the field of using Technologies in Innovation Management,
- cultivate the economic discussion of research approaches,
- do literature search based on a given topic, identify relevant literature and evaluate this literature,
- give presentations in a scientific context in front of an auditorium to present the results of the research,
- present results of the research in a seminar thesis as a scientific publication.

Content
Technologies in innovation management can play a role at different points in the innovation process and support experts working in R&D contexts. The seminar "Technologies for Innovation Management" focuses on the early phase or fuzzy front end of innovation management. Technologies can be very important here, above all regarding the supply of information. In globally distributed R&D organizations, it is necessary to compile as much information about emerging technology developments as possible in the early phase of the innovation process. Information and communication technologies can be useful here. In this seminar, different technologies will be analyzed in terms of their usefulness for the early phase of innovation management from email through web 2.0 and social networks up to text mining and big data technologies etc.

Media
Slides.

Course: Technological Change in Energy Economics [2581000]

Coordinators: M. Wietschel
Part of the modules: Energy Economics and Technology (p. 43)[IW4BWLIIP5]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam.

Conditions
None.

Learning Outcomes
The student

- has an understanding of innovation theory, innovation economy, and innovation systems,
- has skills in different quantitative method for the forecast of technology change in the energy sector, such as technology cycle models, optimization and simulation models as well as indicators and is able to select the adequate approach depending from the task,
- is able to evaluate most important technological developments in the energy sector (energy supply, energy demand, alternative fuels and propulsion systems in the transport sector, and infrastructure (storage, grids)) from a techno-economic perspective.

Content

Course: Telecommunication and Internet Economics [2561232]

Coordinators: K. Mitusch
Part of the modules: Electronic Markets (p. 27)[IW4BWLISM2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations
Result of success is made by a 60 minutes written examination during the semester break (according to §4(2), 1 ERSC).
Examination is offered every semester and can be retried at any regular examination date.

Conditions
None.

Recommendations
Basic knowledge and skills of microeconomics from undergraduate studies (bachelor's degree) are expected.
Particularly helpful but not necessary: Industrial Economics. Prior attendance of the lecture „Competition in Networks" [26240] or "Industrial Organisation" is helpful in any case but not considered a formal precondition. The english taught course "Communications Economics" is complementary and recommendet for anyone interested in the sector.

Learning Outcomes
The students

- will know economically relevant technological and organization characteristics of telecommunication networks - fixed and mobile - as well as of the internet
- will understand the complex competition processes in the telecommunication and internet sector
- will be able to analyse these competitive processes by means of analytic instruments and to assess current debates on economic and regulation policies

The lecture is suited for all students who will deal with these sectors in their professional life.

Content
Among the network sectors the telecommunication and internet sector is the most dynamic one and the one with and highest variety of phenomena. Problems of natural monopoly still exist in some parts. But there is also competition, not only at the service level but also at the infrastructural level. Both levels are characterized by (vertical) quality differentiations and by high technology dynamics. What should the regulation of this sector look like? How should the mutual network access prices of two telecommunication providers be regulated and how can regulators set incentives for infrastructure investments?
The internet is a free market par excellence, because everybody can open internet businesses without high entry costs. Why then can a company like ebay dominate the market for internet-auction platforms so strongly? The causes of market concentration on the internet will be analyzed. So will be the economic implications of the Next Generations Networks.

Literature
J.-J. Laffont, J. Tirole (2000): Competition in Telecommunications, MIT Press.
Further literature will be provided during the lecture

Course: Telecommunications Law [24632]

Coordinators: G. Sydow
Part of the modules: Public Business Law (p. 116)[IW4JURA6]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Summer term	de

Learning Control / Examinations
The assessment consists of an written exam (approx. 60 min.) according to § 4(2), 1 SPO.

Conditions
None.

Recommendations
Parallel to the lectures tutoria are offered in which legal thinking and argumentation is practised. Their attendance is strongly recommended.
During the semester, test exams to each lecture are offered with extensive coaching. During the lecture-free time, a Q-and-A-lecture is offered.Details on the homepage of the ZAR (www.kit.edu/zar)

Learning Outcomes
Telecommunications is the technical basis of the Information Engineering and Management. In which way for example UMTS is regulated, is of relevant importance for the supply of services in the world of the mobile contents services. The central defaults of the telecommunications regulation are in the telecommunications law (TKG). This was completely amended due to community-legal defaults 2004. The lecture procures for apprehending the basics of legal framework of the information society the essential knowledge in telecommunication law.

Content
The lecture offers an overview of the new TKG. The whole range of the regulation is treated: Of the material-legal instruments of the competition-creative economic regulation (market -, entrance -, payment regulation as well as special supervision of abuse) and the non-economic regulation (customer protection; Broadcasting; Assignment of frequencies, numbers and rights of way; secrecy of telecommunications; Data security and public security) up to the institutional arrangement of the regulation. To assist in the understanding the technical and economic bases are clarified as well as community and constitutional default sat at the beginning of the lecture.

Media
extensive script with cases; content structure, further information in the lectures

Literature
Since the law material is to be partly compiled in the discourse with the studying, a current version of the TKG is to be bring along to the lecture.
Further literature will be announced in the lecture.
Elective literature:
tba

Course: Telematics [24128]

Coordinators: M. Zitterbart
Part of the modules: Networking (p. 81)[IW4INNW], Future Networking (p. 80)[IW4INFN], Wireless Networking (p. 78)[IW4INWN]

ECTS Credits	Hours per week	Term	Instruction language
6	3	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Recommendations
Knowledge of the lecture *Introduction in Computer Networks* [24519] or similar lectures is required.

Learning Outcomes
This course details selected protocols, architectures, techniques, and algorithms, which were already presented in the course *Introduction in Computer Networks*. Thus, overall knowledge and knowledge about problems that occur within a world-wide and dynamic network as well as solutions that are applied in order to avoid these problems is imparted in this course.

Content
This course addresses protocols, architectures, techniques, and algorithms that are used, e.g., for Internet routing and establishing of reliable end-to-end communication associations. In addition to different media access control mechanisms in local area networks further communication systems, e.g. line-switched ISDN, are detailed. It is intended that students additionally understand which possibilities for network management and administration currently exist.

Media
Slides.

Literature
S. Keshav. *An Engineering Approach to Computer Networking*. Addison-Wesley, 1997

J.F. Kurose, K.W. Ross. *Computer Networking: A Top-Down Approach Featuring the Internet*. 4rd Edition, Addison-Wesley, 2007

W. Stallings. *Data and Computer Communications*. 8th Edition, Prentice Hall, 2006
Elective literature:

- D. Bertsekas, R. Gallager. *Data Networks*. 2nd Edition, Prentice-Hall, 1991
- F. Halsall. *Data Communications, Computer Networks and Open Systems*. 4th Edition, Addison-Wesley Publishing Company, 1996
- W. Haaß. *Handbuch der Kommunikationsnetze*. Springer, 1997
- A.S. Tanenbaum. *Computer-Networks*. 4th Edition, Prentice-Hall, 2004
- Internet standards
- Selected journal arcticles

Course: Theory of Business Cycles [25549]

Coordinators: M. Hillebrand
Part of the modules: Macroeconomic Theory (p. 54)[IW4VWL8]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	en

Learning Control / Examinations
The assessment consists of 60 min. written exam (according to Section 4 (2), 1 of the examination regulation).
Exams are confined to the following dates: Beginning of the recess period (mid February) and beginning of the summer semester (early April).
Please note: There are no further examination dates for this course.

Conditions
None.

Recommendations
Basic knowledge in micro- and macroeconomics, as conveyed in the courses *Economics I: Microeconomics* [2600012] and *Economics II: Macroeconomics* [2600014], is assumed.
Participants are expected to bring a strong interest in mathematical economics and quantitative model building.

Learning Outcomes
See German version.

Content
Business Cycle research strives to analyze and explain short-run fluctuations in key macroeconomic variables such as production output, income, employment, and prices. The course develops mathematical models which unveil the structural reasons for these fluctuations and the underlying economic mechanisms. Starting with the class of so-called Real Business Cycle (RBC) models, particular emphasis is placed on models of the labor market including models with labor indivisibilities, search-and matching, and home production. Based on the findings obtained, policy implications and the general scope for fiscal and monetary policy to stabilize the economy and foster production output, employment, and price stability are investigated. Numerical simulations based on realistic (calibrated) parameter choices are employed to replicate the empirically observed patterns and to quantify the effects of different policies. Participants are provided with MATLAB scripts allowing them to replicate the simulation results presented in class.

Literature
Elective literature:
McCandless,G.(2008): 'The ABCs of RBCs: An Introduction to Dynamic Macroeconomic Models'
Heer, B. & A. Maussner (2009): 'Dynamic General Equilibrium Modeling: Computational Methods and Applications'

Remarks
All classes will be held in English.

Course: Theory of Economic Growth [2520543]

Coordinators: M. Hillebrand
Part of the modules: Macroeconomic Theory (p. 54)[IW4VWL8]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	en

Learning Control / Examinations
The assessment consists of a 60 min. written exam (according to Section 4 (2), 1 of the examination regulation).
Examinations are confined to the following dates: At the beginning of the recess period (mid July) and of the winter semester (early October).
Please note: There are no further examination dates for this course.

Conditions
None.

Recommendations
Basic knowledge in micro- and macroeconomics, as conveyed in the courses *Economics I: Microeconomics* [2600012] and *Economics II: Macroeconomics* [2600014], is assumed.
Participants are expected to bring a strong interest in mathematical economics and quantitative model building.

Learning Outcomes
See German version.

Content
The field of economic growth strives to analyze and explain the long-run evolution of economies. The aim of this course is to develop models which offer a mathematical description of the growth process and its structural determinants. Starting with the fundamental models by Solow, Kaldor, and Pasinetti, the main focus is on so-called overlapping generations (OLG) models. For this class of models, the theory of deterministic dynamical systems offers a rich set of mathematical tools to analyze the long-run behavior of the economy. In particular, conditions under which the growth path converges, diverges, or exhibits irregular (chaotic) fluctuations can be derived. Building on the insights obtained, a second set of questions deals with how economic policy can foster and stabilize the growth process. In this regard, the impact of governmental debt and intergenerational redistribution schemes such as Social Security on economic growth and welfare are investigated.

Literature
Acemoglu, D. (2008): 'Introduction to Modern Economic Growth'
de la Croix, D. and Michel, P. (2002): 'A Theory of Economic Growth: Dynamics and Policy in Overlapping Generations'

Remarks
All classes will be held in English.

Course: Topics in Econometrics [2520024]

Coordinators: M. Schienle
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	

Learning Control / Examinations
Alternative exam assessment according to § 4(2), 3 SPO.

Conditions
None.

Learning Outcomes

Content

Course: Topics in Experimental Economics [2520400]

Coordinators: P. Reiss
Part of the modules: Experimental Economics (p. 58)[IW4VWL17]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Summer term	en

Learning Control / Examinations
The assessment consists of a written exam (following §4(2), 1 of the examination regulation).

Conditions
None.

Recommendations
Basic knowledge of Experimental Economics is assumed. Therefore, it is strongly recommended to attend the course Experimental Economics beforehand.

Learning Outcomes
Students

- are familiar with current research in experimental economics;
- can evaluate the results of an economic experiment and are able to assess its significance in the context of relevant research;
- master advanced methodic issues regarding the experimental method.

Content
The course covers selected topics in experimental economics and deepens the understanding of the experimental method. In particular, topics of current research into experimental and behavioral economics are discussed, along with a treatment of advanced methodic issues.

Media
Slides, problem sets.

Literature
A selection of published papers is compulsory reading for the course. The course syllabus provides references and is announced at the beginning of the course.

Remarks
The course is offered in summer 2016 for the first time. The course is not offered in every academic year.

Course: Ubiquitous Computing [24146]

Coordinators: M. Beigl
Part of the modules: Context Sensitive Systems (p. 92)[IN4INKUS], Wireless Networking (p. 78)[IW4INWN], Ubiquitous
                         Computing (p. 102)[IW4INAIFB7], Dynamic IT-Infrastructures (p. 88)[IW4INDITI], Human-Machine-
                         Interaction (p. 93)[IW4INMMI]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter term	

Learning Control / Examinations
The assessment consists of an oral exam (approx. 20 minutes) according to sec. 4 subsec. 2 no. 2 study and examination
regulations.

Conditions
None.

Learning Outcomes
The goal of this course is to introduce the foundations, the methods and the techniques of ubiquitous computing. After this
course, students are able to

- reflect and discuss the acquired knowledge about existing ubiquitous computing systems.
- assess their general knowledge of ubiquitous systems and transfer statements and principles to special cases.
- evaluate and assess different design processes and types of user studies and select appropriate methods for the devel-
  opment of new solutions.
- invent, design, develop and evaluate new ubiquitous systems for the use in everyday life and industrial environments
  themselves and estimate expenses and technical implications.

Content
The course provides an overview of the history and teaches the concepts, theories and methods of Ubiquitous Computing.
Based on the Appliance concept, students then design, plan, and construct an appliance of their own in the exercise course.
The necessary technical and methodological bases such as hardware for ubiquitous systems, software for ubiquitous systems,
principles of context recognition for ubiquitous systems, networking of ubiquitous systems and design of ubiquitous systems
in general and information appliances in particular are discussed. Methods developed in Ubiquitous Computing to design and
test human-computer interaction and human-machine interfaces are explained in detail. The economic aspects of a ubiquitous
system are introduced as well.
In the practical exercise alongside the lecture, the understanding of Ubiquitous Systems is deepened through practical applica-
tion of the knowledge acquired in the lecture. Students will design and develop their own appliances and test them. The goal is
to have gone through the entire process of creating a prototype and eventually a marketable appliance.

Media
Slides

Literature
Mark Weiser, The Computer of the 21st Century Scientific American, 1991
John Krumm, Ubiquitous Computing Fundamentals, 2009
Elective literature:
Will be announced during the course of the lecture.

Course: Environmental Law [24140]

Coordinators: G. Sydow
Part of the modules: Public Business Law (p. 116)[IW4JURA6]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations
The assessment consists of an 1h written exam (approx. 60 min) following §4, Abs. 2, 1 of the SPO.
The assessment will be offered in every winter term and can be repeated at every regular examination date.

Conditions
None.

Recommendations
Knowledge of Law, esp. Public Law I or II are recommended.
Parallel to the lectures tutoria are offered in which legal thinking and argumentation is practised. Their attendance is strongly recommended.
During the semester, test exams to each lecture are offered with extensive coaching. During the lecture-free time, a Q-and-A-lecture is offered.Details on the homepage of the ZAR (www.kit.edu/zar)

Learning Outcomes
Environmental law is a field of law that influences management in many regards. Students shall develop a feeling for the many different aspects of environmental law and its instruments. Aside from so-called "classical" approaches such as law-and-order students will learn about other, economic influenced, instruments such as the gathering and the transfer of information or the market for certifiates. On this basis, the course will center around immissions and waste management law. Additionally, water law, protection of soil law and nature protection law will be covered. Students shall be enabled to deal with easy cases in regard to environmental law.

Content
The lecture begins with an introduction into the special problems faced by environmental law. Different instruments, according to common goods theory, will be presented. In the main part of the lecture, immissions law, waste management law, water law, protection of soil law and nature protection law will be analyzed.

Media
extensive script with cases; content structure, further information in the lectures

Literature
Will be announced in the course.
Elective literature:
Will be announced in the course.

Course: Management and Strategy [2577900]

Coordinators: H. Lindstädt
Part of the modules: Strategic Corporate Management and Organization (p. 38)[IW4BWLUO1]

ECTS Credits	Hours per week	Term	Instruction language
3.5	2/0	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (60 min) taking place at the beginn of the recess period (according to §4 (2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
After passing this course students are able to

- prepare strategic decisions along the ideal-typical strategy process in practice ("strategic analysis").
- assess strategic options.
- explain the portfolio management (Parental advantage and best owner of business entities).
- discuss price and capacity decisions in oligopolies and explain them in examples.

Content
The participants learn about central concepts of strategic management along the ideal-typical strategy process: internal and external strategic analysis, concept and sources of competitive advantages, their importance when establishing competitive and corporate strategies as well as strategy assessment and implementation. This aims in particular to provide a summary of the basic concepts and models of strategic management, i.e. to provide in particular an action-oriented integration. Thereby a focus is on imparting knowledge about how price developments in oligopolistic markets can be understood, modeled and forecasted based on game theory.

Media
Slides.

Literature

- Grant, R.M.: *Contemporary Strategy Analysis.* Blackwell, 5. Aufl. Massachusetts 2005.
- Lindstädt, H.; Hauser, R.: *Strategische Wirkungsbereiche von Unternehmen.* Gabler, Wiesbaden 2004.

The relevant excerpts and additional sources are made known during the course.

Remarks
The credits for the course "Management and Strategy" have been changed from 4 to 3,5 from summer term 2015 on.

Course: Subdivision algorithms []

Coordinators: H. Prautzsch
Part of the modules: Curves and Surfaces (p. 91)[IW4INKUF], Algorithms in Computer Graphics (p. 94)[IW4INACG]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes
Students should gain sound knowledge about subdivision techniques.

Content
Subdivision algorithms and methods to analyze them.

Media
Blackboard and slides

Literature
Elective literature:

- Peters, Reif. Subdivision surfaces. Springer 2008

- Prautzsch, Boehm, Paluszny: Bézier and B-spline techniques, Springer 2002.

- Warren, Weimer: Subdivision, Morgan Kaufmann 2001.

Remarks
The lecture is offered in the winter term alternating with other lectures in the field of computer graphics.   See
http://i33www.ira.uka.de/pages/Lehre/VertiefungsgebietComputergraphik.html.

Course: Copyright [24121]

Coordinators: T. Dreier
Part of the modules: Intellectual Property Law (p. 114)[IW4JURA4], Governance, Risk & Compliance (p. 117)[IW4JURGRC]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam according to section 4 subsection 2 no. 1 study and examination regulations.

Conditions
None.

Learning Outcomes
The students have competent knowledge in the area of national, European and international copyright law that builds upon, and goes beyond the knowledge the students have already acquired in the general lecture of "Industrial and intellectual property law". Students understand how the legal rules depend upon, and interact with, the economic background, legislative policy and information and communication technologies. They are able to apply these legal rules in practical cases.

Content
The course deals with the subject matter of copyright, the rights of authors, licensing, limitations and exceptions to copyright, term of protection, neighbouring rights, enforcement and collective administration of rights. The course does not merely focus on German copyright law, but likewise puts European and international copyright law into perspective. Students shall understand how the legal rules depend upon, and interact with, the economic background, legislative policy and information and communication technologies. Students shall learn about the rules of national, European and international copyright law and to apply these legal rules in practical cases.

Media
slides

Literature
Schulze, Gernot Meine Rechte als Urheber Verlag C.H.Beck, current edition
Elective literature:
Additional literature tba in class.

Remarks
It is possible that this course will be taught in the summer instead of the winter semester.

Course: Valuation [2530212]

Coordinators: M. Ruckes
Part of the modules: Finance 1 (p. 34)[IW4BWLFBV1], Finance 2 (p. 35)[IW4BWLFBV2]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	en

Learning Control / Examinations

Conditions
None.

Learning Outcomes
Students

- are in a position to evaluate corporate investment projects from a financial point of view,

- are able to value companies,

- are in a position to evaluate the financial consequences of mergers and acquisitions,

- are able to measure the value of flexibility.

Content
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.

Literature
Elective literature:
Titman/Martin (2015): Valuation – The Art and Science of Corporate Investment Decisions, 3rd edition, Prentice Hall.

Course: Natural Language Processing and Dialog Modeling [2400007]

Coordinators: J. Niehues, M. Schmidt, L. Zhang, A. Waibel
Part of the modules: Speech Processing (p. 90)[IW4INSV]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content
In order that we can communicate with a computer successfully, it has to be able to interpret sentences like "I don't understand what you mean by this!". For that it has to know what "to not understand" means and what "by this" refers to.
This lecture gives an overview of different subject areas and applied methods in Natural Language Processing (NLP) and dialog modeling.
Concerning NLP, the covered topics will vary in complexity such as Part-of-Speech Tagging, Sentiment Analysis, Word Sense Disambiguation (WSD) and Question Answering (QA).
At the same time, various techniques will be presented with which the corresponding components can be realized. Among those are Conditional Random Fields (CRFs) and Maximum Entropy Models (MaxEnt).
Furthermore, topics and methods of NLP will be emphasized which are especially relevant for realizing spoken dialog systems. In Dialog Modeling different areas like Social Dialog, Goal-Oriented Dialog, Multimodal Dialog and Error Handling will be addressed. These involve additional techniques like Partially Observable Markov Decision Processes (POMDPs).

Course: Behavioral Approaches in Marketing [2572167]

Coordinators: B. Neibecker
Part of the modules: Marketing Management (p. 46)[IW4BWLMAR5], Strategy, Communication, and Data Analysis (p. 49)[IW4BWLMAR7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).
The examination is offered every semester. Re-examinations are offered at every ordinary examination date.

Conditions
See module description.

Learning Outcomes
Students have learned the following outcomes and competences:

- To specify the key terms in marketing and communication management
- To identify and define theoretical constructs in marketing communication, based on behavioral theory
- To indentify the main research trends
- To analyze and interpret high level academic articles
- To learn interactive skills to work in teams and to follow a goal-oriented approach
- To gain understanding of methodological research to develop concrete plans for marketing decision-making

Content
This course gives an introduction to consumer behavior and the influence of cognitive and emotional information processing on consumer decision making. The contribution of advertising response models is considered and faced with social and environmental aspects (e.g. cross-cultural influences) on consumer behavior, mass communication and internet advertising. In addition, a scientific case study on the effectiveness of TV-commercials is discussed. Central issues of the course:
Case Studies in brand management and advertising response.
Psychological factors (research design and test marketing / arousal / effectiveness of TV-commercials as case studies).
Emotions in marketing.
Information processing and retention in memory (schema theory / visual information processing/grounded theory).
Complex advertising response models (attitude towads the ad / attitude towards the brand / persuasion / context effects in learning / decision making / Means-end-theory and strategic advertising).
Social processes (culture / subculture / cross cultural influence / product design).
Neuromarketing.

Literature
(Literature is in English and German, see German description)

Course: Distributed Computing [2400050]

Coordinators: A. Streit
Part of the modules: Dynamic IT-Infrastructures (p. 88)[IW4INDITI]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Civil Law for Advanced [24650]

Coordinators: Z. (ZAR)
Part of the modules: Private Business Law (p. 115)[IW4JURA5]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam following § 4, Abs. 2, 1 SP.

Conditions
None.

Recommendations
Knowledge in Civil Law is presumed as it is taught in the courses BGB for beginners [24012], *BGB for advanced learners* [24504] and *Commercial and Corporate Law* [24011]

Learning Outcomes
The students will have extensive knowledge in german corporate law, trade law and civil law especially in contract law, exceeding the knowledge the students have obtained in the courses *Civil Law for Beginners* [24012], *Advanced Civil Law* [24504], and *Commercial and Corporate Law* [24011/24509],. At the end students are able to think through complex legal and economic questions.

Content
The course will focus on corporate law, trade law and civil law, especially contract law. We will discuss legal problems on the basis of selected examples in a application orientated way.

Literature
Tba at the beginning of the course.

Course: Seminar: Governance, Risk & Compliance [2400041]

Coordinators: T. Dreier, N.N.
Part of the modules: Governance, Risk & Compliance (p. 117)[IW4JURGRC]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Summer term	de

Learning Control / Examinations

Conditions
The course *Corporate Compliance* [2400087] is required.

Learning Outcomes

Content

Media
slides

Literature
Tba at the beginning of the course.

Course: Law of Contracts [24671]

Coordinators: Z. (ZAR)
Part of the modules: Private Business Law (p. 115)[IW4JURA5], Governance, Risk & Compliance (p. 117)[IW4JURGRC]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam following § 4, Abs. 2, 1 SPO.

Conditions
None.

Learning Outcomes
The course will provide an overview of the forming of an contract. The purpose is to translate legal and economic aspects in a contract to secure the volitional position. The course will also consider international questions.

Content
The purpose of the course is to provide students with an understanding of the legal basics of forming a business contract. By means of special examples an overview of typical corporate contracts will be given. The course discusses the Limited (GmbH), ordinary partnership (OHG), limited partnership (KG), European Economic Interest Grouping (EWIV), club (Verein) and the pubilc limited company (Aktiengesellschaft). In addition it will also focus on international relations.

Literature
Tba at the beginning of the course.

Course: Computer Contract Law [VGE]

Coordinators: M. Bartsch
Part of the modules: Intellectual Property Law (p. 114)[IW4JURA4]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam following §4, Abs. 2, 1 of the SPO.

Conditions
None.

Learning Outcomes
It is the aim of this course to provide students with knowledge in the area of contract formation and formulation in practice that builds upon the knowledge the students have already acquired concerning the legal protection of computer programs. Students shall understand how the legal rules depend upon, and interact with, the economic background and the technical features of the subject. The contract drafts shall be prepared by the students and will be corporately completed during the lecture. It is the aim of the course that students will be able to formulate contracts by themselves.

Content
The course deals with contracts from the following areas:

- Contracts of programming, licencing and maintaining software
- Contracts in the field of IT employment law
- IT projects and IT Outsourcing
- Internet Contracts

From these areas single contracts will be chosen and discussed (e.g. software maintenance, employment contract with a software engineer). Concerning the respective contract the technical features, the economic background and the subsumption in the national law of obligation (BGB-Schuldrecht) will be discussed. As a result different contractual clauses will be developed by the students. Afterwards typical contracts and conditions will be analysed with regard to their legitimacy as standard business terms (AGB). It is the aim to show the effects of the german law of standard business terms (AGB-Recht) and to point out that contracts are a means of drafting business concepts and market appearance.

Media
transparancies

Literature

- Langenfeld, Gerrit Vertragsgestaltung Verlag C.H.Beck, III. Aufl. 2004
- Heussen, Benno Handbuch Vertragsverhandlung und Vertragsmanagement Verlag C.H.Beck, II. Aufl. 2002
- Schneider, Jochen Handbuch des EDV-Rechts Verlag Dr. Otto Schmidt KG, III. Aufl. 2002

Elective literature:
tba in the transparencies

Course: Heat Economy [2581001]

Coordinators: W. Fichtner
Part of the modules: Energy Economics and Technology (p. 43)[IW4BWLIIP5]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam according to Section 4(2), 1 of the examination regulation.

Conditions
None.

Learning Outcomes
The student gains detailed knowledge about heat generating technologies and their areas of application, in particular in the area of combined heat and power. The student is able to deal with technical and economic questions in this field.

Content
1. Introduction: Heat economy
2. CHP technologies (incl. calculation of profitability)
3. Heat systems (incl. calculation of profitability)
4. Distribution of heat
5. Demand for space heating and thermal insulation measures
6. Heat storage
7. Legal framework conditions
8. Laboratory experiment: compression heat pump

Media
Media will be provided on the e-learning platform ILIAS.

Course: Web Engineering [24124]

Coordinators: H. Hartenstein, M. Nußbaumer
Part of the modules: Applied Web Engineering (p. 77)[IW4INPWE]

ECTS Credits	Hours per week	Term	Instruction language
4	2/0	Winter term	de

Learning Control / Examinations
The assessment is explained in the module description.

Conditions
None.

Learning Outcomes

- Students know fundamentals as well as current methodologies and techniques in the field of Web Engineering

- Students have gained insight into existing Web-oriented application platforms and development frameworks, and have the basic knowledge for system design close to current practices.

- Students can apply methods for analyzing current standards and technologies of the Web. Students are able to understand and interpret scientific papers and standard specifications and are confident in using the domain-specific terminology.

- Students are able to analyze, structure and describe problems in the field of Web Engineering as well as to design Web-based system architectures.

Content

This lecture will discuss the systematic construction of Web-based applications and systems by focusing on the different phases and aspects of the Web application lifecycle. It helps students to look at the Web phenomenon from different perspectives - e.g. as a Web designer, analyst, architect, component engineer, program manager, product manager or CIO. Students learn how to engineer Web applications and agile systems from requirements engineering, planning, design, development, testing, deployment and up to operation, maintenance and evolution. Many examples are shown and discussed, demonstrating the need for expecting change and staying agile. As this is not a programming course, students will be introduced to the core technology aspects and are encouraged to consolidate the details.

Media
Slides

Literature
Will be announced in the lecture.

Course: Web Science [2511312]

Coordinators: Y. Sure-Vetter
Part of the modules: Web Data Management (p. 99)[IW4INAIFB4], Semantic Technologies (p. 101)[IW4INAIFB6]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	Winter term	de

Learning Control / Examinations
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.

Conditions
None.

Learning Outcomes
The students

- are familiar with 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.
- are able to apply interdisciplinary thinking.
- are able to apply technological approaches to social science problems.

Content

Media
Lecture slides.

Literature

- Networks, Crowds, and Markets: Reasoning About a Highly Connected World, by David Easley and Jon Kleinberg, 2010 (free online book: http://www.cs.cornell.edu/home/kleinber/networks-book/)
- Thelwall, M. (2009). Social network sites: Users and uses. In: M. Zelkowitz (Ed.), Advances in Computers 76. Amsterdam: Elsevier (pp. 19-73)

Remarks
New course starting winter term 2015/2016.

Course: [24522]

Coordinators: K. Böhm
Part of the modules: Innovative Concepts of Data and Information Management (p. 84)[IW4INIKDI], Entrepreneurship for
                          Computer Scientists (p. 111)[IW4INUKI]

ECTS Credits	**Hours per week**	**Term**	**Instruction language**
1	0/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Remarks
The course is currently not lectured.

Course: How Statistics Begins to Understand the Difference Between Cause and Effect [WSUW]

Coordinators: D. Janzing
Part of the modules: Advanced Topics in Cryptography (p. 69)[IW4INFKRYP]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter term	de

Learning Control / Examinations

Conditions

- Basic knowledge in stochastic is helpful.
- The participants should be open for learning new mathematical terminology.

Learning Outcomes

- The students should understand why inferring causal structure from statistical data is a hard problem.
- They should understand current approaches and be able to judge them.

Content

- Formalization of causal structure via directed acyclic graphs (DAGs)
- Inferring causal relations using conditional statistical dependences
- Selection of potential causal hypotheses via the causal Markov condition
- Further restriction of potential hypotheses via the causal faithfulness condition
- Novel approaches to distinguishing between causal DAGs that induce the same conditional dependences
- Probability-free versions of statistical methods: learning causality from single observations.

Media
lecture notes

Literature
Elective literature:
J. Pearl: Causality, 2000.
Spirtes, Glymour and Scheines: Prediction, Causation and Search, 1993

Course: Seminar Economic Theory [SemWIOR2]

Coordinators: C. Puppe
Part of the modules: Interdisciplinary Seminar Module (p. 22)[IW4IWSEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	Winter / Summer Term	de

Learning Control / **Examinations**

Conditions
See corresponding module information.
At least one of the courses *Game Theory I* [2520525] and *Welfare Economics* [2520517] should have been attended beforehand.

Learning Outcomes
See German version.

Content

Literature
Will be announced at the end of the recess period.

Remarks
see German version.

7   Appendix: Qualification objectives of the Master's program in Information Engineering and Management

Graduates of the interdisciplinary, four-semester Master's program in Information Engineering and Management have an advanced and in-depth research-based knowledge in the fields of informatics, economics and law as well as subject-independent competences that can be applied across multiple disciplines.

By combining their knowledge and competences, they are in a position to independently acknowledge economic and IT opportunities and development potentials for innovative change of structures and processes and implement them within the applicable legal framework. They are able to analyze, structure and describe complex, field-related problems and challenges.

They know how to identify advantages and disadvantages of existing procedures, models, technologies and approaches, compare alternatives, evaluate critically and apply the findings to new application areas.

If necessary, they are also in a position to combine different approaches, adapt them accordingly or even independently develop and apply new and innovative solutions.

They know how to critically interpret, validate and illustrate the achieved results.

Their decisions are made independently based on scientific facts under consideration of social and ethical aspects.

The graduates can communicate with expert representatives on a scientific level and even assume prominent responsibility in a team. Karlsruhe's Infonomics experts are characterized by their interdisciplinary methodological skills and innovative abilities.

Their qualifications are perfectly ideal particularly for interdisciplinary occupations in the fields of Information and Communication Technology (ICT), controlling, consulting, management and organization, for starting and management of firms as well as a downstream scientific career (PhD).

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