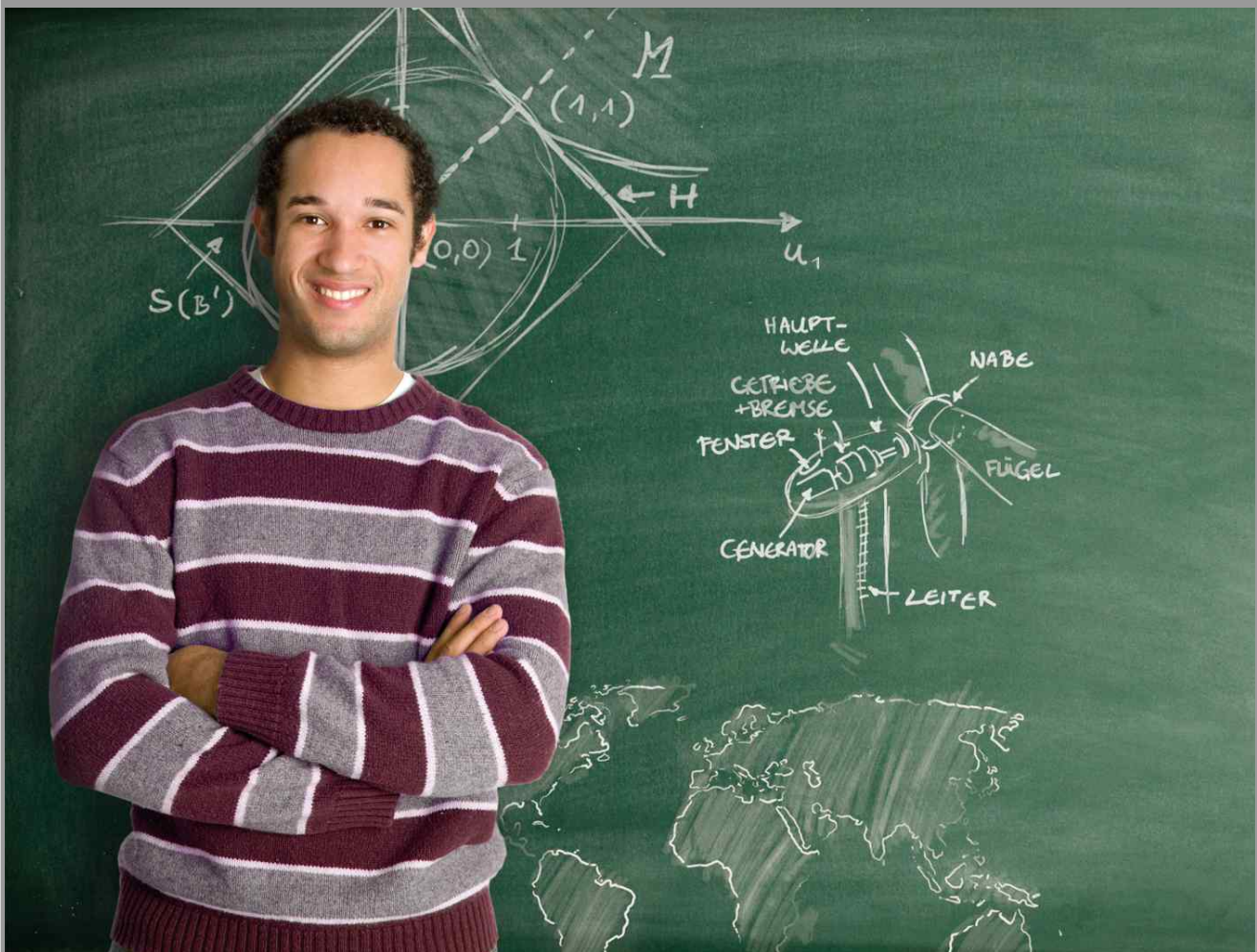# Economics Engineering (B.Sc.)

Winter Term 2015/2016
SPO 2015
Date: 04.08.2015

Department of Economics and Management

Contents

1   Structure of the Bachelor's degree program in Economics Engineering

The Bachelor's degree program in Economics Engineering entails a six-semester standard study period. The basic program is structured systematically and provides one with the fundamental knowledge in Economics Engineering. From the fourth semester, a more advanced, specialization program that can be structured depending on one's personal interests and goals is offered.

The following figure 1 shows the course and module structure with the respective credit points as well as an example of a possible distribution of modules and courses in the basic program over the semesters which has proven to be useful.

Term	Credits	Business Administration	Economics	Informatics	Operations Research	Law	Physics ODER Chemistry		Statistics	Mathematics	Electives		Internship Bachelor Thesis
1 (WT)	32	BUS FA 4 CP / BUS SMIEM 3 CP	ECON 1 5 CP	PROG 1 5 CP		Civil Law 5 CP / Public Law 1 3 CP				MATH 1 7 CP			
2 (ST)	33	BUS PEM 4 CP	ECON 2 5 CP	INFO 1 5 CP	OR1 4,5 CP	Public Law 2 3 CP			STAT 1 5 CP	MATH 2 7 CP			
3 (WT)	33	ACC 4 CP		INFO 2 5 CP	OR2 4,5 CP		Physics 1 7 CP	Gen./Inorg. Chemistry 7 CP	STAT 2 5 CP	MATH 3 7 CP			
4 (ST)	29,5		ECON 3 5 CP				Physics 2 7 CP	Gen./Inorg. Prac. 7 CP			Seminar Module 3 CP		Internship 10 CP
5 (WT)	27	BUS 9 CP	ECON 9 CP	ECON 9 CP							Elect. Module 9 CP	Elect. Module 9 CP	
6 (ST)	25,5												Bachelor Thesis 12 CP
	180												

Figure 1: Structure of the Bachelor's degree course in Engineering Economics SPO2015 (recommended)

In the **basic program** (blue), the shown modules under business administration, economics, informatics, law, physics/chemistry, mathematics and statistics are compulsory. One can choose between physics and chemistry.

In the **specialization program** (green), two modules from economics and one module from business administration must be selected. As part of the mandatory courses, one seminar module (independent of the course) and two optional modules must be completed. The two modules can be selected from informatics, operations research, business administration, economics, engineering, science, operations research, engineering, statistics, law or sociology. Basically, both optional modules can also be integrated in one course. Only one module should be omitted from law and sociology.

The **internship** can be completed before or during the Bachelor's program. The performance record of the completed internship is required for registration for the last module examination in the course.

One is free to structure his/her individual course plan as he/she wishes (taking into account the respective provisions of the study and examination regulations as well as applicable module regulations) and choose the semester he/she wishes to start and/or complete the selected modules. It is however strongly recommended to adhere to the proposal for the basic program. The content of the courses is interdisciplinary and coordinated accordingly; the intersection freedom of lectures and examination dates is guaranteed for the recommended study semester.

All modules of the basic and advanced program, including the various alternatives within the module, can be found in this module handbook. Seminars that can be taken up as part of the seminar module are published at the WiWi portal at https://portal.wiwi.kit.edu/Seminare.

2   Key Skills

The bachelor programme *Economics Engineering (B.Sc.)* at the Department of Economics and Management distinguishes itself by an exceptionally high level of interdisciplinarity. With the combination of business science, economics, informatics, operations research, mathematics as well as engineering and natural science, the integration of knowledge of different disciplines is an inherent element of the programme. As a result, interdisciplinary and connected thinking is encouraged in a natural way. Furthermore, tutor programs with more than 20 semester periods per week contribute significantly to the development of key skills in the bachelor programme. The integrative taught key skills, which are acquired throughout the entire programme, can be classified into the following fields:

Soft skills
1. Team work, social communication and creativity techniques
2. Presentations and presentation techniques
3. Logical and systematical arguing and writing
4. Structured problem solving and communication

Enabling skills
1. Decision making in business context
2. Project management competences
3. Fundamentals of business science
4. English as a foreign language

Orientational knowledge
1. Acquisition of interdisciplinary knowledge
2. Institutional knowledge about economic and legal systems
3. Knowledge about international organisations
4. Media, technology and innovation

The integrative acquisition of key skills especially takes place in several compulsory courses during the bachelor programme, namely
1. Basic program in economics and business science
2. Seminar module
3. Mentoring of the bachelor thesis
4. Internship
5. Business science, economics and informatics modules

3 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. alternative 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 (in the appendix).

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

4   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`.

TVWL3STAT1 - Statistics and Econometrics (S. 63)
Anmerkungen

New module starting winter term 2015/2016. It replaces the old module "Statistical Applications of Financial Risk Management" [WW3STAT].

2595466 - Foundations of Digital Services (S. 173)
Anmerkungen

This course was formerly named "eServices".
The credits have been changed from 5 to 4,5.

2560550 - Auction & Mechanism Design (S. 110)
Erfolgskontrolle

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.
Students can earn a bonus to the final grade by successfully participating in the exercises.

2550491 - Seminar in Discrete Optimization (S. 297)
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.

SemPÖ1 - Seminar on Morals and Social Behavior (S. 287)
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.

2550550 - Analysis of multivariate Data (S. 97)
Anmerkungen

New course starting winter term 2015/2016.
The lecture is offered irregularly. The curriculum of the next three years is available online.

5   Modules of the Basic Program

5.1   All Subjects

Module: Economics [TVWL1VWL]

Coordination: C. Puppe
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

ECTS Credits	Cycle	Duration
15	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2610012	Economics I: Microeconomics (p. 341)	3/0/2	W	5	C. Puppe, P. Reiss
2600014	Economics II: Macroeconomics (p. 342)	3/0/2	S	5	B. Wigger
2520016	Economics III: Introduction in Econometrics (p. 343)	2/2	S	5	M. Schienle

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 of the course.
Notice: The lecture *Economics I*: *Microeconomics* [2610012] is part of the preliminary examination concerning § 8(1) of the examination regulation. This examination must be passed until the end of the examination period of the second semester. Any Re-examinations has to be passed until the end of the examination period of the third semester. Otherwise the examination claim will be lost.

Conditions
None.

Recommendations
It is recommended to attend the lectures in the following order: Economics I: Microeconomics [2610012], Economics II: Macroeconomics [2600014], Economics III: Introduction in Econometrics [2520016].

Qualification Goals
The student

- knows and understands the basics of economic problems

- understands current economic policy problems which occur in a globalized world

- is able to find a solution strategies using an economical approach

The methodical framework of the three lectures is different. Economics I [2610012] and Economics II [2600014] are dealing with the theoretical modelling of economical interrelation, while Economics III [2600014] treats the basics of quantitative measuring of economical interrelations.

Content
Essential concepts, methods and models of the micro and macroeconomic theory are discussed.
The lecture Economics I [2610012] discusses basics of game theory in addition to microeconomic decision theory, questions of market theory and problems of imperfect competition. Economics II [2600014] handles the economical organizational model, national accounts as well as international trade and monetary policy. Furthermore, complex growth, boom and economic speculations are discussed.
In Economics III [2520016] the students learn about quantitative economic relations. The basic problems of econometrics are applied to simple economic studies.

Workload
The total workload for this module is approximately 450 hours. For further information see German version.

Module: Fundamentals of Business Administration 1 [TVWL1BWL2]

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

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2610026	Business Administration: Finance and Accounting (p. 125)	2/0/2	W	4	M. Ruckes, M. Uhrig-Homburg
2600023	Business Administration: Strategic Management and Information Engineering and Management (p. 127)	2	W	3	M. Ruckes, P. Nieken, H. Lindstädt, Ch. Weinhardt

Learning Control / Examinations
The assessment is carried out as partial written exams (according to Section 4(2), 1 of the examination regulation) of the individual courses of this module. The examinations take place at the beginning of the recess period. Re-examinations are offered at every ordinary examination date. The assessment procedure of each course of this module is defined for each course 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.

Recommendations
It is strongly recommended to take the courses in the first semester of study.

Qualification Goals
The student

- has core skills in business administration in particular with respect to decision making and the model based view of business corporations
- masters the fundamentals of business and information management as well as the fundamentals business finance and the principles of business accounting
- is able to analyze and assess central tasks, functions and decisions in modern corporations

The knowledge of the two fundamentals modules in business administration forms the basis for the successful completion of advanced courses in the field of business administration and management.

Content
This module provides the fundamentals of business administration and management. Further, the module focuses on the fields of management and organization, information engineering and management, investment and financing as well as of the principles of management and financial accounting.

Workload
The total workload of the module is about 210 hours. The workload is proportional to the credit points of the individual courses.

Module: Fundamentals of Business Administration 2 [TVWL1BWL3]

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

ECTS Credits	Cycle	Duration
8	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2600024	Business Administration: Production Economics and Marketing (p. 126)	2/0/2	S	4	M. Ruckes, W. Fichtner, M. Klarmann, Th. Lützkendorf, F. Schultmann
2600002	Financial Accounting and Cost Accounting (p. 266)	2/2	W	4	J. Strych

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. The examinations take place at the beginning of the recess period. Re-examinations are offered at every ordinary examination date. The assessment procedures of each course of this module is defined for each course 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.

Recommendations
It is strongly recommended to take the courses in the second semester (Betriebswirtschaftslehre: Produktionswirtschaft und Marketing) and third semester (Rechnungswesen) of study.

Qualification Goals
The student

- has core skills in business administration in particular with respect to decision making and the model based view of business corporations
- masters the fundamentals of production and operations management and marketing as well as the fundamentals of management and financial accounting
- is able to analyze and assess central tasks, functions and decisions in modern corporations

The knowledge of the two fundamentals modules in business administration forms the basis for the successful completion of advanced courses in the field of business administration and management.

Content
This module provides fundamentals of business administration and management. It focuses on the fields of production and operations management, marketing, as well as on the fundamentals of management and financial accounting.

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

Module: Introduction to Programming [TVWL1INFO1]

Coordination: N. N.
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2511000	Introduction to Programming with Java (p. 255)	3/1/2	W	5	N. N.

Learning Control / Examinations
The assessment consists of a written resp. computer-based exam (60 min) according to Section 4 (2),1 of the examination regulation.
The successful completion of the compulsory tests in the computer lab is prerequisited for admission to the written resp. computer-based exam.
The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Qualification Goals
see German version

Content
see German version

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

Module: Foundations of Informatics [TVWL1INFO2]

Coordination: Y. Sure-Vetter, H. Schmeck
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2511010	Foundations of Informatics I (p. 180)	2/2	S	5	R. Studer, Y. Sure-Vetter
2511012	Foundations of Informatics II (p. 181)	3/1	W	5	H. Schmeck

Learning Control / Examinations

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

The examinations are offered every semester. Re-examinations are offered at every ordinary examination date. For a successful module assessment both partial exams have to be passed.

- Foundations of Informatics I: Written exam in the first week of the recess period (60 min)
- Foundations of Informatics II: Written exam in the first week of the recess period (90 min). It is possible to gain 0,3-0,4 additional grading points for a passed exam by successful completion of a bonus exam.

When both partial exams are passed, the overall grade of the module is the average of the grades for each course weighted by the credit points and truncated after the first decimal.

Conditions
None.

Recommendations

It is strongly recommended to attend the courses of the core program in the following sequence: *Introduction to Programming with Java* [2511000], *Foundations of Informatics I* [2511010], *Foundations of Informatics II* [2511012]

Qualification Goals
The student

- knows the main principles, methods and systems of computer science,
- can use this knowledge for applications in advanced computer science courses and other areas for situation-adequate problem solving,
- is capable of finding strategic and creative responses in the search for solutions to well defined, concrete, and abstract problems.

The student can deepen the learned concepts, methods, and systems of computer science in advanced computer science lectures.

Content

This module conveys knowledge about modeling, logic, algorithms, sorting and searching algorithms, complexity theory, problem specifications, and data structures. From the field of theoretical computer science, formal models of automata, languages and algorithms are presented and applied to the architecture of computer systems.

Workload
The total workload for this module is approximately 300 hours.

Module: Introduction to Operations Research [TVWL1OR]

Coordination: S. Nickel, O. Stein, K. Waldmann
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2550040	Introduction to Operations Research I (p. 145)	2/2/2	S	4,5	S. Nickel, O. Stein, K. Waldmann
2530043	Introduction to Operations Research II (p. 146)	2/2/2	W	4,5	S. Nickel, O. Stein, K. Waldmann

Learning Control / Examinations
The assessment of the module is carried out by a written examination (120 minutes) according to Section 4(2), 1 of the examination regulation.
In each term (usually in March and July), one examination is held for both courses.
The overall grade of the module is the grade of the written examination.

Conditions
None.

Recommendations
Mathematics I und II. Programming knowledge for computing exercises.
It is strongly recommended to attend the course *Introduction to Operations Research I* [2550040] before attending the course *Introduction to Operations Research II* [2530043].

Qualification Goals
The student

- names and describes basic notions of the essential topics in Operations Research (Linear programming, graphs and networks, integer and combinatorial optimization, nonlinear programming, dynamic programming and stochastic models),

- knows the indispensable methods and models for quantitative analysis,

- models and classifies optimization problems and chooses the appropriate solution methods to solve optimization problems independently,

- validates, illustrates and interprets the obtained solutions.

Content
This module treats the following topics: linear programming, network models, integer programming, nonlinear programming, dynamic programming, queuing theory, heuristic models.
This module forms the basis of a series of advanced lectures with a focus on both theoretical and practical aspects of Operations Research.

Workload
See German version.

Module: Introduction to Civil Law [TVWL1JURA1]

Coordination: T. Dreier
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24012	Civil Law for Beginners (p. 128)	4/0	W	4	T. Dreier, O. Knöfel

Learning Control / **Examinations**
The assessment of this module consists of a written examination according to § 4(2), 1 of the examination regulation.
The grade of the module is the grade of the written examination.

Conditions
None.

Qualification Goals
The student

Content
The module genrally introduces into law. What is law, why are legal rules valid, and what is the role of law in conjunction with social behaviour, technological and market developments? What is the relationship between law and justice? Moreover, the distinction between civil law, public law and criminal law will be highlighted. The basiscs of jurisdiction, international conflicts and alternative dispute settlement will be discussed. The main focus of the course is on the fundamental notions of civil law as defined and regulated in the German Civil Code (Bürgerliches Gesetzbuch, BGB), such as subjects and objects of law, legally binding declarations, agency, the formation of contracts, standard terms and conditions, consumer protection, performance of contractual promises. The course ends with an outlook to the law of contracts and property law.

Workload
See German version.

Module: Constitutional and Administrative Law [TVWL1JURA3]

Coordination: G. Sydow
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24016	Public Law I - Basic Principles (p. 235)	2/0	W	3	G. Sydow
24520	Public Law II - Public Economic Law (p. 236)	2/0	S	3	G. Sydow

Learning Control / Examinations
The assessment of this module consists of a written examination according to § 4(2), 1 of the examination regulation for each course.
The grade of the module is the average of the single grades weighted by the related credit points.

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)

- The course *Public Law I* [24016] should be attend before the course *Public Law II* [24520].

Qualification Goals
The lecture covers the core principles of public law. Students shall become acquainted with the basics of constitutional law, the fundamental rights which route governmental actions and the entire legal system, as well as possibilities of actions and instruments (especially law, administrative act, public-private contract) of the public authority. Furthermore the distinction between public and private law will be clarified. Moreover, possibilities of legal protection regarding administrative behavior will be addressed. Students shall learn to classify problems in public law and to solve (simple) administrative and constitutional cases.

Content
The course covers core material of constitutional and administrative law. It begins with the differentiation between public and private law. In the constitutional law part, the course will concentrate on the rule of law and individual rights, especially those protecting communication and entrepreneurship. The administrative law part will explain the different legal instruments of the administration how to act (rule, order, contract, etc.) and their propositions. Also, court proceedings to sue the administrative will be discussed. Students will learn the technique how to solve (simple) administrative and constitutional cases

Workload
See German version.

Module: Mathematics I [TVWL1MATH1]

Coordination: G. Last
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
01350	Mathematics I (p. 219)	4/2/2	W	7	G. Last, M. Folkers, D. Hug, S. Winter

Learning Control / Examinations
The assessment is carried out as two partial exams (according to Section 4(2), 1 and 3 of the examination regulation) of the single course of this module.

Conditions
None.

Recommendations
It is strongly recommended to attend the modules in the following sequence: *Mathematics I*, *Mathematics II* and *Mathematics III*.

Qualification Goals
See German version.

Content

Workload
The total workload for this course is approximately 210 hours. For further information see German version.

Module: Mathematics II [TVWL1MATH2]

Coordination: G. Last
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
01830	Mathematics II (p. 220)	4/2/2	S	7	G. Last, M. Folkers, D. Hug, S. Winter

Learning Control / Examinations
The assessment is carried out as two partial exams (according to Section 4(2), 1 and 3 of the examination regulation) of the single course of this module.

Conditions
None.

Recommendations
It is strongly recommended to attend the modules in the following sequence: *Mathematics I*, *Mathematics II* and *Mathematics III*.

Qualification Goals
See German version.

Content

Workload
The total workload for this course is approximately 210 hours. For further information see German version.

Module: Mathematics III [TVWL1MATH3]

Coordination: G. Last
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
01352	Mathematics III (p. 221)	4/2/2	W	7	G. Last, M. Folkers, D. Hug, S. Winter

Learning Control / Examinations
The assessment is carried out as written exam (according to Section 4(2), 1 and 3 of the examination regulation) of the single course of this module.

Conditions
None.

Recommendations
It is strongly recommended to attend the modules in the following sequence: *Mathematics I*, *Mathematics II* and *Mathematics III*.

Qualification Goals
See German version.

Content

Workload
The total workload for this course is approximately 210 hours. For further information see German version.

Module: Statistics [TVWL1STAT]

Coordination: W. Heller
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2600008	Statistics I (p. 318)	4/0/2	S	5	W. Heller
2610020	Statistics II (p. 319)	4/0/2	W	5	W. Heller

Learning Control / Examinations
The assessment of this module consists of two written examinations according to Section 4(2), 1 of the examination regulation (one for each of the courses Statistics I and II).
The overall grade of the module is the average of the grades of these two written examinations.

Conditions
Notice: The lecture *Statistics I* [25008/25009] is part of the preliminary examination concerning Section 8(1) of the examination regulation. This examination must be passed until the end of the examination period of the second semester. Any Re-examinations has to be passed until the end of the examination period of the third semester. Otherwise the examination claim will be lost.

Recommendations
To some extend knowledge of the content of the module Mathematics [WW1MATH/WI1MATH] is assumed. Therefore it is recommended to attend the course *Mathematics 1* [01350] before attending the module *Statistics* [TVWL1STAT].
It ist recommended to attend the course *Statistics I* [25008/25009] before the course *Statistics II* [25020/25021].
Each course is complemented by an exercise, a tutorium and a computing laboratory. It highly recommended to attend these too.

Qualification Goals
See German version.

Content
The module contains the fundamental methods and scopes of Statistics.
A. Descriptive Statistics: univariate und bivariate analysis
B. Probability Theory: probability space, conditional and product probabilities, transformation of probabilities, parameters of location and dispersion, most importand discrete and continuous distributions, covariance and correlation, convolution and limit distributions
C. Theory of estimation and testing: suffency of statistics, point estimation (optimality, ML-method), internal estimations, theory of tests (optimality, most important examples of tests)

Workload
See German version.

Module: Physics [TVWL1NW1]

Coordination: T. Schimmel
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
4040011	Experimental Physics A (p. 164)	4/2	W	7	T. Schimmel, S. Walheim
4040021	Experimental Physics B (p. 165)	4/2	S	7	T. Schimmel, S. Walheim

Learning Control / Examinations
See German version.

Conditions
See German version.

Qualification Goals
See German version.

Content

Workload
The total workload for this module is approximately 420 hours. For further information see German version.

Module: Inorganic Chemistry [TVWL1NW3]

Coordination: C. Anson
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

	ECTS Credits	Cycle	Duration
	14	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
5006/5007	General and Inorganic Chemistry (p. 96)	3/2	W	7	T. Stumpf
5043/5046	Inorganic Chemistry Practical (p. 103)	0/6/2	S	7	C. Anson

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

Conditions
It is necessary to have passed the examination of the lecture course *General and Inorganic Chemistry* before taking the Practical class.

Recommendations
None.

Qualification Goals
The student should

- gain a basic knowledge of chemistry,
- be able to put this chemical knowledge into practice.

Content
Within the module, atomic structure, chemical formulae, stoichiometry, chemical bonding, reaction equilibria, the complex separation of mixtures, analytical chemistry and the handling of hazardous substances are taught.

Workload
See under the individual sections of the module.

Remarks
The Inorganic Chemistry Practical Class consists of the Practical Class itself (6 SWS) and the Seminar for the Practical (2 SWS). It takes place in the semester break after the end of the summer semester, and lasts two weeks. The seminar takes place during the Practical Class Seminar (Block) und findet in den Semesterferien nach dem Sommersemester statt. The dates of the Practical will be announced by the Institute of Inorganic Chemistry.
It is necessary to obtain some laboratory equipment.
Further information on www.aoc.kit.edu/1179.php

6   Modules of the Specialization Program

6.1   Economics

Module: Econometrics and Economics [TVWL3VWL7]

Coordination: W. Heller
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

ECTS Credits 9	Cycle	Duration

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2521325/2521326	Statistics and Econometrics in Business and Economics (p. 317)	2/2	W	4,5	W. Heller
2520365	Decision Theory (p. 161)	2/1	S	4,5	K. Ehrhart
25549	Theory of Business Cycles (p. 328)	2/1	W	4,5	M. Hillebrand
2550550	Analysis of multivariate Data (p. 97)	2/2	W	4,5	O. Grothe

Learning Control / Examinations
See German version.

Conditions
Successful passing of the corresponding modules of the basic program.
For further information see German version.

Qualification Goals
See German version.

Content

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

Module: Public Finance [TVWL3VWL9]

Coordination: B. Wigger
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2560120	Public Revenues (p. 233)	2/1	S	4,5	B. Wigger, Assistenten
2560129	Specific Aspects in Taxation (p. 315)	3	W	4,5	B. Wigger, Armin Bader
2560122	Monetary and Financial Policy (p. 175)	3	W	4,5	B. Wigger, J. Nagel
2560131	Introduction to Public Finance (p. 148)	3	W	4,5	B. Wigger

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 exams are offered at the beginning of the recess period about the subject matter of the latest held lecture. Re-examinations are offerd at every ordinary examination date. The assessment procedures are described for each course of the module seperately.
The overall grade for the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Conditions
Successful passing of the corresponding modules of the basic program.

Recommendations
It is recommended to attend the course *Spezielle Steuerlehre* [2560129] after having completed the course *Öffentliche Einnahmen* [2560120].

Qualification Goals
See German version.

Content
As a branch of Economics, Public Finance is concerned with the theory and policy of the public sector and its interrelations with the private sector. It analyzes the economic role of the state from a normative as well as from a positive point of view. The normative view examines efficiency- and equity-oriented motives for government intervention and develops fiscal policy guidelines. The positive view explains the actual behavior of economic agents in public sector affairs. Special fields of Public Finance are public revenues, i.e. taxes and public debt, public expenditures for publicly provided goods, and welfare programs.

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

Remarks
See German version.

Module: Economic Policy I [TVWL3VWL10]

Coordination: I. Ott
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2561204	Competition in Networks (p. 347)	2/1	W	4,5	K. Mitusch
2560280	Basic Principles of Economic Policy (p. 150)	2/1	S	4,5	I. Ott
2560120	Public Revenues (p. 233)	2/1	S	4,5	B. Wigger, Assistenten

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 exams are offered at the beginning of the recess period about the subject matter of the latest held lecture. Re-examinations are offerd at every ordinary examination date. The assessment procedures are described for each course of the module seperately.
The overall grade for the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Conditions
Successful passing of the corresponding modules of the basic program.

Recommendations
Basic knowledge of micro- and macroeconomics is assumed, as taught in the courses Economics I [2610012], and Economics II [2600014].

Qualification Goals
Students shall be given the ability to

- understand and deepen basic concepts of micro- and macroeconomic theories
- apply those theories to economic policy issues
- understand government interventions in the market and their legitimation from the perspective of economic welfare
- learn how theory-based policy recommendations are derived

Content

- Intervention in the market: micro-economic perspective
- Intervention in the market: macroeconomic perspective
- Institutional economic aspects
- Economic policy and welfare economics
- Carriers of economic policy: political-economic aspects

Workload
Total expenditure of time for 9 credits: 270 hours.

Attendance time per lecture: 3x14h

Preparation and wrap-up time per lecture: 3x14h

Rest: Exam Preparation

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

Remarks
The course "Basic Principles of Economic Policy" [2560280] is not offered in summer term 2015.

Module: Economic Theory [TVWL3VWL12]

Coordination: C. Puppe
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2520525	Introduction to Game Theory (p. 149)	2/1	S	4,5	C. Puppe, P. Reiss
252517	Welfare Economics (p. 350)	2/1	S	4,5	C. Puppe
2560238	Industrial Organization (p. 191)	2/1	S	4,5	P. Reiss
2520527	Advanced Topics in Economic Theory (p. 94)	2/1	S	4,5	M. Hillebrand, K. Mitusch
2560550	Auction & Mechanism Design (p. 110)	2/1	S	4,5	N. Szech
2560137	Economics and Behavior (p. 142)	2/1	W	4,5	N. Szech

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

Successful passing of the corresponding modules of the basic program.

Qualification Goals

See German version.

Content

Workload

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

Module: Applied Microeconomics [TVWL3VWL13]

Coordination: P. Reiss
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2520525	Introduction to Game Theory (p. 149)	2/1	S	4,5	C. Puppe, P. Reiss
2560238	Industrial Organization (p. 191)	2/1	S	4,5	P. Reiss
2561204	Competition in Networks (p. 347)	2/1	W	4,5	K. Mitusch
2560120	Public Revenues (p. 233)	2/1	S	4,5	B. Wigger, Assistenten
2560550	Auction & Mechanism Design (p. 110)	2/1	S	4,5	N. Szech
2560137	Economics and Behavior (p. 142)	2/1	W	4,5	N. Szech
2520365	Decision Theory (p. 161)	2/1	S	4,5	K. Ehrhart

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
Successful passing of the corresponding modules of the basic program.

Recommendations
Completion of the module Economics [WW1VWL] is assumed.

Qualification Goals
Students

- are introduced to the basic theoretical analysis of strategic interaction situations and shall be able to analyze situations of strategic interaction systematically and to use game theory to predict outcomes and give advice in applied economics settings, (course „Introduction to Game Theory");
- are exposed to the basic problems of imperfect competition and its implications for policy making; (course „Industrial Organization");
- are provided with the basic economics of network industries (e.g., telecom, utilities, IT, and transport sectors) and should get a vivid idea of the special characteristics of network industries concerning planning, competition, competitive distortion, and state intervention, (course "Competition in Networks").

Content
The module's purpose is to extend and foster skills in microeconomic theory by investigating a variety of applications. Students shall be able to analyze real-life problems using microeconomics.

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

Remarks
Starting summer term 2015, the lecture "Decision Theory" [2520365] can be chosen in the module.

6.2 Business Administration

Module: Strategy and Organization [TVWL3BWLUO1]

Coordination: H. Lindstädt
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2577900	Management and Strategy (p. 332)	2/0	S	3.5	H. Lindstädt
2577902	Managing Organizations (p. 240)	2/0	W	3.5	H. Lindstädt
2577910	Problem solving, communication and leadership (p. 250)	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
Successful passing of the corresponding modules of the basic program.

Qualification Goals
See German version.

Content

Workload
See German version.

Module: Management Accounting [TVWL3BWLIBU1]

Coordination: M. Wouters
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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. 209)	2/2	S	4,5	M. Wouters
2579902	Management Accounting 2 (p. 210)	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
Successful passing of the corresponding modules of the basic program.

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.

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

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

  • 2530216 Financial Management
  • 2530210 Management Accounting

Module: Industrial Production I [TVWL3BWLIIP]

Coordination: F. Schultmann
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2581950	Fundamentals of Production Management (p. 185)	2/2	S	5,5	F. Schultmann
2581960	Production Economics and Sustainability (p. 252)	2/0	W	3,5	M. Fröhling
2581996	Logistics and Supply Chain Management (p. 205)	2/0	S	3,5	M. Wiens

Learning Control / Examinations
The assessment is carried out as partial exams (according to section 4 (2), 1 SPO) of the core course "Fundamentals of Production Management" [2581950] 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
Successful passing of the corresponding modules of the basic program.
The course "Fundamentals of Production Management" [2581950] and one additional activity have to be chosen.

Recommendations
All courses are specifically designed to be taken independently.
Bearing in mind the master programme, we recommend combining this module with "Industrial Production II" [WW4BWLIIP2] and/or "Industrial Production III" [WW4BWLIIP6].

Qualification Goals

- Students shall be aware of the important role of industrial production and logistics for production management.
- Students shall use relevant concepts of production management and logistics in an adequate manner.
- Students shall be able to reflect on decision principles in firms and their circumstances in the light of the production management aspects studied.
- Students shall be proficient in describing essential tasks, difficulties and solutions to problems in production management and logistics
- Students shall be able to describe relevant approaches of modeling production and logistic systems.
- Students shall be aware of the important role of material and energy-flows in production systems.
- Students shall be proficient in using exemplary methods for solving selected problems.

Content
This module is designed to introduce students into the wide area of industrial production and logistics management. It focuses on strategic production management under the aspect of sustainability. The courses use interdisciplinary approaches of systems, also theory to describe the central tasks of industrial production management and logistics. Herein, attention is drawn upon strategic corporate planning, research and development as well as site selection. Students will obtain knowledge in solving internal and external transport and storage problems with respect to supply chain management and disposal logistics.

Workload
Total effort will account to 270 hours (9 credit points) and can be allocated according to the credit point rating. Therefore, a course with 3.5 credits requires an effort of approximately 105h and a course with 5.5 credits 165h.
The total effort for each course consists of attending lectures and tutorials, examination times and the time an average student needs to prepare himself in order to pass the exam with an average grade.

Module: Energy Economics [TVWLIIP2]

Coordination: W. Fichtner
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2581010	Introduction to Energy Economics (p. 147)	2/2	S	5,5	W. Fichtner
2581012	Renewable Energy – Resources, Technology and Economics (p. 267)	2/0	W	3,5	R. McKenna
2581005	Corporate Governance in Energy Economics (p. 331)	2/0	S	3,5	H. Villis
2581959	Energy Policy (p. 158)	2/0	S	3,5	M. Wietschel

Learning Control / Examinations
The assessment is carried out as partial written exams (according to Section 4(2), 1 of the examination regulation) about the lecture *Introduction into Energy Economics* [2581010] and one optional lecture of the 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
Successful passing of the corresponding modules of the basic program.
The lecture *Introduction into Energy Economics* [2581010] 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

- is able to understand interdependencies in energy economics and to evaluate ecological impacts in energy supply,

- is able to assess the different energy carriers and their characteristics,

- knows the energy political framework conditions,

- gains knowledge about new market-based conditions and the cost and potentials of renewable energies in particular.

Content
Introduction to Energy Economics: Characterisation (reserves, suppliers, cost, technologies) of different energy carriers (coal, gas, oil, electricity, heat etc.)
Renewable Energy - Resources, Technology and Economics: Characterisation of different renewable energy carriers (wind, solar, hydro, geothermal etc.)
Corporate Governance in Energy Economics: Challenges of the management of a large company in energy economics (superior leadership role, structures, processes and projects from a leadership perspective etc.)
Energy Policy: Management of energy flows, energy-political targets and instruments (emission trading etc.)

Workload
See German version.

Remarks
See German version.

Module: Essentials of Finance [TVWL3BWLFBV1]

Coordination: M. Uhrig-Homburg, M. Ruckes
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2530575	Investments (p. 201)	2/1	S	4,5	M. Uhrig-Homburg
2530216	Financial Management (p. 171)	2/1	S	4,5	M. Ruckes

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
Successful passing of the corresponding modules of the basic program.

Qualification Goals
The student

- has fundamental skills in modern finance

- has fundamental skills to support investment decisions on stock, bond and derivative markets

- applies concrete models to assess investment decisions on financial markets as well as corporate investment and financing decisions.

Content
The module *Essentials of Finance* deals with fundamental issues in modern finance. The courses discuss fundamentals of the valuation of stocks. A further focus of this module is on modern portfolio theory and analytical methods of capital budgeting and corporate finance.

Workload
See German version.

Module: Topics in Finance I [TVWL3BWLFBV5]

Coordination: M. Uhrig-Homburg, M. Ruckes
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2530210	Cost and Management Accounting (p. 199)	2/1	S	4,5	T. Lüdecke
2530232	Financial Intermediation (p. 172)	3	W	4,5	M. Ruckes
2530550	Derivatives (p. 140)	2/1	S	4,5	M. Uhrig-Homburg
2530296	Exchanges (p. 133)	1	S	1,5	J. Franke
2530299	Business Strategies of Banks (p. 177)	2	W	3	W. Müller
2530570	International Finance (p. 198)	2	S	3	M. Uhrig-Homburg, Dr. Walter
2540454	eFinance: Information Engineering and Management for Securities Trading (p. 144)	2/1	W	4,5	C. Weinhardt
2560129	Specific Aspects in Taxation (p. 315)	3	W	4,5	B. Wigger, Armin Bader
2530219	Asset Management (p. 109)	2	W	3	A. Sauer

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 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
Successful passing of the corresponding modules of the basic program.
Das Modul ist außerdem erst dann bestanden, wenn zusätzlich das Modul *Essentials in Finance* [TVWL3BWLFBV1] zuvor erfolgreich mit der letzten Teilprüfung abgeschlossen wurde.
Zudem kann das Modul *Topics in Finance II* [TVWL3BWLFBV6] gewählt werden.

Qualification Goals
The student

- has advanced skills in modern finance

- is able to apply these skills in practice in the fields of finance and accounting, financial markets and banking

Content
The module *Topics in Finance I* is based on the module *Essentials of Finance.* The courses deal with advanced issues concerning the fields of finance and accounting, financial markets and banking from a theoretical and practical point of view.

Workload
See German version.

Module: Topics in Finance II [TVWL3BWLFBV6]

Coordination: M. Uhrig-Homburg, M. Ruckes
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2530210	Cost and Management Accounting (p. 199)	2/1	S	4,5	T. Lüdecke
2530232	Financial Intermediation (p. 172)	3	W	4,5	M. Ruckes
2530550	Derivatives (p. 140)	2/1	S	4,5	M. Uhrig-Homburg
2530296	Exchanges (p. 133)	1	S	1,5	J. Franke
2530299	Business Strategies of Banks (p. 177)	2	W	3	W. Müller
2530570	International Finance (p. 198)	2	S	3	M. Uhrig-Homburg, Dr. Walter
2540454	eFinance: Information Engineering and Management for Securities Trading (p. 144)	2/1	W	4,5	C. Weinhardt
2560129	Specific Aspects in Taxation (p. 315)	3	W	4,5	B. Wigger, Armin Bader
2530219	Asset Management (p. 109)	2	W	3	A. Sauer

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 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
Successful passing of the corresponding modules of the basic program.
It is only possible to choose this module in combination with the module *Essentials in Finance* [TVWL3BWLFBV1]. The module is passed only after the final partial exam of *Essentials in Finance* is additionally passed.
In addition to that it is possible to choose the module *Topics in Finance I* [TVWL3BWLFBV5].

Qualification Goals
The student

- has advanced skills in modern finance
- is able to apply these skills in practice in the fields of finance and accounting, financial markets and banking

Content

Workload
See German version.

Remarks
The module *Topics in Finance II* is based on the module *Essentials of Finance.* The courses deal with advanced issues concerning the fields of finance and accounting, financial markets and banking from a theoretical and practical point of view.

Module: Risk and Insurance Management [TVWL3BWLFBV3]

Coordination: U. Werner
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2550055	Principles of Insurance Management (p. 248)	3/0	S	4,5	U. Werner
2530326	Enterprise Risk Management (p. 160)	3/0	W	4,5	U. Werner

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 lectures are examined by oral presentations and related term papers in the context of the lectures. Furthermore, there is a final oral examination.

The grade of each examination consists of the oral presentation and the term paper (50 percent) and the oral examination (50 percent). 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
Successful passing of the corresponding modules of the basic program.

Qualification Goals
See German version.

Content
See German version.

Workload
See German version.

Module: eBusiness and Service Management [TVWL3BWLISM1]

Coordination: C. Weinhardt
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2595466	Foundations of Digital Services (p. 173)	2/1	S	4,5	C. Weinhardt, H. Fromm
2590452	Management of Business Networks (p. 211)	2/1	W	4,5	C. Weinhardt
2540454	eFinance: Information Engineering and Management for Securities Trading (p. 144)	2/1	W	4,5	C. Weinhardt
2540498	Special Topics in Information Engineering & Management (p. 312)	3	W/S	4,5	C. Weinhardt

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
Successful passing of the corresponding modules of the basic program.

Qualification Goals
The students

- understand the strategic and operative design of information and information products,

- analyze the role of information on markets,

- evaluate case studies regarding information products,

- develop solutions in teams.

Content
This module gives an overview of the mutual dependencies of strategic management and information systems. The central role of information is exemplified by the structuring concept of the *information life cycle*. The single phases of this life cycle from generation over allocation until dissemination and use of the information are analyzed from a business and microeconomic perspective, applying classical and new theories. The state of the art of economic theory on aspects of the information life cycle are presented. The lecture is complemented by exercise courses.
The courses "Management of Business Networks", "eFinance: Information engineering and management in finance" and ""eServices" constitute three different application domains in which the basic principles of the Internet Economy are deepened. In the course "Management of Business Networks" the focus is set on the strategic aspects of management and information systems. It is held in English and teaches parts of the syllabus with the support of a case study elaborated with Lecturers from Concordia University, Montreal, or if applicable, Rotterdam School of Management. Thus the matter of strategic enterprise networks, a.k.a. smart business networks is also analysed by employing an international perspective.
The course "eFinance: information engineering and management for securities tradingprovides theoretically profound and also practical-oriented background about the functioning of international financial markets. The focus is placed on the economic and technical design of markets as information processing systems.
In "eServices" the increasing impact of electronic services compared to the traditional services is outlined. The Information- und Communication Technologies enable the provision of services, which are mainly characterized by interactivity and individuality. This course provides basic knowledge about the development and management of ICT-based servies.
The theortic fundamentals of Information Engineering and Management can be enriched by a practical experience in Special Topics in Information Engineering and Management. Any practical Seminar at the IM can be chosen for the course Special Topics in Information Engineering and Management.

Workload
See German version.

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

Module: eFinance [TVWL3BWLISM3]

Coordination: C. Weinhardt
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2540454	eFinance: Information Engineering and Management for Securities Trading (p. 144)	2/1	W	4,5	C. Weinhardt
2530550	Derivatives (p. 140)	2/1	S	4,5	M. Uhrig-Homburg
2530296	Exchanges (p. 133)	1	S	1,5	J. Franke
2530570	International Finance (p. 198)	2	S	3	M. Uhrig-Homburg, Dr. Walter

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
Successful passing of the corresponding modules of the basic program.
The course *eFinance: Information Engineering and Management for Securities Trading* [2540454] is compulsory and must be examined.

Qualification Goals
The students

- are able to understand and analyse the value creation chain in stock broking,

- are able to adequatly identify, design and use methods and systems to solve problems in finance,

- are able to evaluate and criticize investment decisions by traders,

- are able to apply theoretical methods of econometrics,

- learn to elaborate solutions in a team.

Content
The module "eFinance: Information engineering and management in finance" addresses current problems in the finance sector. It is investigated the role of information and knowledge in the finance sector and how information systems can solve or extenuate them. Speakers from practice will contribute to lectures with their broad knowledge. Core courses of the module deal with the background of banks and insurance companies and the electronic commerce of stocks in global finance markets. In addtion the course Derivatives offers an insight into future and forward contracts as well as the assesment of options. Exchanges and International Finance are also alternatives which provide a suplementary understanding for capital markets.
Information management topics are in the focus of the lecture "eFinance: information engineering and management for securities trading". For the functioning of the international finance markets, it is necessary that there is an efficient information flow. Also, the regulatory frameworks play an important role. In this context, the role and the functioning of (electronic) stock markets, online brokers and other finance intermediaries and their platforms are presented. Not only IT concepts of German finance intermediaries are presented, but also international system approaches will be compared. The lecture is supplemented by speakers from the practice (and excursions, if possible) coming from the Deutsche Börse and the Stuttgart Stock Exchange.

Workload
See German version.

Remarks
The current seminar courses for this semester, which are complementary to this module, are listed on following webpage: the http://www.iism.kit.edu/im/lehre

Module: CRM and Service Management [TVWL3BWLISM4]

Coordination: A. Geyer-Schulz
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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. 134)	2/1	W	4,5	A. Geyer-Schulz
2540522	Analytical CRM (p. 98)	2/1	S	4,5	A. Geyer-Schulz
2540520	Operative CRM (p. 237)	2/1	W	4,5	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. Therby every leture is examined by a written exam (according to Section 4(2), 1 of the examination regulation) and by succcessful completion of exercises (according to Section 4 (2), 3 of the examination regulation).
The grades of the individual lectures consists of the grade of the written exam (approximately 90 percent resp. 100 of 112 points) and of the exercise performance (approximately 10 percent resp. 12 of 112 points). In the case of passing the written exam (50 points) the points of the exercise performance will be added to the points of the written exam. 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
Successful passing of the corresponding modules of the basic program.

Qualification Goals
The student

- understands service management as the managerial foundation of customer relationship management and the resulting implications for strategic management, the organisational structure, and the functional areas of the comapany,

- develops and designs service concepts and service systems on a conceptual level,

- works in teams on case studies and respects project dates, integrates international literature of the discipline,

- knows the current developments in CRM in science as well as in industry,

- knows the scientific methods (from business administration, statistics, informatics) which are most relevant for analytic CRM and he autonomously applies these methods to standard cases,

- designs, implements, and analyzes operative CRM processes in concrete application domains (e.g. campaign management, call center management, . . .).

Content
In the module *CRM and Service Management* [TVWL3BWLISM4] we teach the principles of modern customer-oriented management and its support by system architectures and CRM software packages. Choosing customer relationship management as a company's strategy requires service management and a strict implmentation of service management in all parts of the company.
For operative CRM we present the design of customer-oriented, IT-supported business processes based on business process modelling and we explain these processes in concrete application scenarios (e.g. marketing campaign management, call center management, sales force management, field services, . . .).
Analytic CRM is dedicated to improve the use of knowledge about customers in the broadest sense for decision-making (e.g. product-mix decisions, bonus programs based on customer loyality, . . .) and for the improvement of services. A requirement for this is the tight integration of operative systems with a data warehouse, the development of customer-oriented and flexible reporting systems, and – last but not least – the application of statistical methods (clustering, regression, stochastic models, . . .).

Workload
See German version.

Remarks
The lecture *Customer Relationship Management* [2540508] is given in English.
The courses *Analytical CRM* and *Operative CRM* will take place in an alternating way from winter term 14/15. Analytical CRM is offered for a last time in the summer term 14. Details on the cycle and on the exams can be found on http://www.em.uni-karlsruhe.de/studies/.

Module: Specialization in Customer Relationship Management [TVWL3BWLISM5]

Coordination: A. Geyer-Schulz
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2540522	Analytical CRM (p. 98)	2/1	S	4,5	A. Geyer-Schulz
2540520	Operative CRM (p. 237)	2/1	W	4,5	A. Geyer-Schulz
2561204	Competition in Networks (p. 347)	2/1	W	4,5	K. Mitusch
2595466	Foundations of Digital Services (p. 173)	2/1	S	4,5	C. Weinhardt, H. Fromm

Learning Control / Examinations

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

- Successful passing of the corresponding modules of the basic program.

- It is only possible to choose this module in combination with the module *CRM and Servicemanagement* [TVWL3BWLISM4]. The module is passed only after the final partial exam of *CRM and Servicemanagement* is additionally passed.

- At least, one of the courses *Analytic CRM* [2540522] and *Operative CRM* [2540520] has to be taken.

Qualification Goals

The student

- knows the scientific methods (from business administration, statistics, informatics) which are most relevant for analytic CRM and he autonomously applies these methods to standard cases,

- gains an overview of the market for CRM software,

- designs, implements, and analyzes operative CRM processes in concrete application domains (e.g. campaign management, call center management, . . .),

- is aware of the problems of protecting the privacy of customers and the implications of privacy law.

Content

In this module, analsis methods and techniques for the management and improvement of customer relations are presented. Furthermore, modelling, implementation, introduction, change, analysis and valuation of operative CRM processes are treated. Regaring the first part, we teach analysis methods and techniques suitable for the management and improvement of customer relations. For this goal we treat the principles of customer- and service-oriented management as the foundation of successful customer relationship management. In addition, we show how knowledge of the customer can be used for decision-making at an aggregate level (e.g. planning of sortiments, analysis of customer loyality, . . .). A basic requirement for this is the integration and collection of data from operative processes in a suitably defined data-warehouse in which all relevant data is kept for future analysis. The process of transfering data from the operative systems into the data warehouse is known as the ETL process (Extraction / Translation / Loading). The process of modelling a data-warehouse as well as the so-called extraction, translation, and loading process for building and maintaining a data-warehouse are discussed in-depth. The data-warehouse serves as a base for flexible management reporting. In addition, various statistic methods (e.g. cluster analysis, regression analysis, stochastic models, . . .) are presented which help in computing suitable key performance indicators or which support decision-making.
Regaring the opervative part, we emphasize the design of operative CRM processes. This includes the modelling, implementation, introduction and change, as well as the analysis and evaluation of operative CRM processes. Petri nets and their extensions are the scientific foundation of process modelling. The link of Petri nets to process models used in industry as e.g. UML activity diagrams is presented. In addition, a framework for process innovation which aims at a radical improvement of key business processes is introduced. The following application areas of operative CRM processes are presented and discussed:

- Strategic marketing processes
- Operative marketing processes (campaign managament, permission marketing, . . .)
- Customer service processes (sales force management, field services, call center management, . . .)

Workload
See German version.

Remarks
The courses *Analytical CRM* and *Operative CRM* will take place in an alternating way from winter term 14/15. Analytical CRM is offered for a last time in the summer term 14. Details on the cycle and on the exams can be found on http://www.em.uni-karlsruhe.de/studies/.

Module: Supply Chain Management [TVWL3BWLISM2]

Coordination: S. Nickel
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2590452	Management of Business Networks (p. 211)	2/1	W	4,5	C. Weinhardt
2540496	Management of Business Networks (Introduction) (p. 212)	2	W	3	C. Weinhardt
2550486	Facility Location and Strategic Supply Chain Management (p. 316)	2/1	W	4,5	S. Nickel
2118078	Logistics - organisation, design and control of logistic systems (p. 206)	3/1	S	6	K. Furmans
2550488	Tactical and Operational Supply Chain Management (p. 326)	2/1	S	4,5	S. Nickel

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
At least one of the courses *Management of Business Networks [2590452]* and *Management of Business Networks (Introduction) [2540496]* has to be taken.
Successful passing of the corresponding modules of the basic program.

Recommendations
None.

Qualification Goals
The students

- are able to understand and evaluate the control of cross-company supply chains based on a strategic and operative view,
- are able to analyse the coordination problems within the supply chains,
- are able to identify and integrate adequate information system infrastructures to support the supply chains,
- are able to apply theoretical methods from the operations research and the information management,
- learn to elaborate solutions in a team

Content
The module "Supply Chain Management" gives an overview of the mutual dependencies of information systems and of supply chains spanning several enterprises. The specifics of supply chains and their information needs set new requirements for the operational information management. In the core lecture "Management of Business Networks" the focus is set on the strategic aspects of management and information systems. The course is held in English and teaches parts of the syllabus with the support of a case study elaborated with Prof Kersten from Concordia University, Montreal, Canada. The course MBN introduction is consisting out of the first part of the regular MBN lecture, but as it has less credits will not include the analysis of the case study.
The module is completed by an elective course addressing appropriate optimization methods for the Supply Chain Management and for modern logistic approaches.

Workload
See German version.

Remarks
The planned lectures in the next terms can be found on the websites of the respective institutes IISM, IFL and IOR.

Module: Design, Construction and Sustainability Assessment of Buildings [TVWL3BWLOOW1]

Coordination: T. Lützkendorf
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2586404	Design and Construction of Buildings (p. 120)	2/1	W	4,5	T. Lützkendorf
2585404	Sustainability Assessment of Buildings (p. 121)	2/1	S	4,5	T. Lützkendorf

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
Successful passing of the corresponding modules of the basic program.

Recommendations
The combination with the module *Real Estate Management* [TVWL3BWLOOW2] is recommended.
Furthermore a combination with courses in the area of

- Industrial production (energy flow in the economy, energy politics, emissions)
- Civil engineering and architecture (building physics, building construction)

is recommended.

Qualification Goals
The student

- knows the basics of sustainable design, construction and operation of buildings with an emphasis on building ecology
- has knowledge of building ecology assessment procedures and tools for design and assessment
- is capable of applying this knowledge to assessing the ecological advantageousness of buildings as well as their contribution to a sustainable development.

Content
Sustainable design, construction and operation of buildings currently are predominant topics of the real estate sector, as well as "green buildings". Not only designers and civil engineers, but also other actors who are concerned with project development, financing and insurance of buildings or portfolio management are interested in these topics.
On the one hand the courses included in this module cover the basics of energy-efficient, resource-saving and health-supporting design and construction of buildings. On the other hand fundamental assessment procedures for analysing and communicating the ecological advantageousness of technical solutions are discussed. With the basics of green building certification systems the lectures provide presently strongly demanded knowledge.
Additionally, videos and simulation tools are used for providing a better understanding of the content of teaching.

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

Module: Real Estate Management [TVWL3BWLOOW2]

Coordination: T. Lützkendorf
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2586400	Real Estate Management I (p. 263)	2/2	W	4,5	T. Lützkendorf
2585400	Real Estate Management II (p. 264)	2/2	S	4,5	T. Lützkendorf

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
Successful passing of the corresponding modules of the basic program.

Recommendations
The combination with the module *Design Constructions and Assessment of Green Buildings* [TVWL3BWLOOW1] is recommended.
Furthermore a combination with courses in the area of

- Finance

- Insurance

- Civil engineering and architecture (building physics, building construction, facility management)

is recommended.

Qualification Goals
The student

- possesses an overview concerning the different facets and interrelationships within the real estate business, the important decision points in real estate lifecycle and the different views and interests of the actors concerned, and

- is capable of applying basic economic methods an procedures to problems within the real estate area.

Content
The real estate business offers graduates very interesting jobs and excellent work- and advancement possibilities. This module provides an insight into the macroeconomic importance of this industry, discusses problems concerned to the administration of real estate and housing companies and provides basic knowledge for making decisions both along the lifecycle of a single building and the management of real estate portfolios. Innovative operating and financing models are illustrated, as well as the current development when looking at real estate as an asset-class.
This module is also suitable for students who want to discuss macroeconomic, business-management or financial problems in a real estate context.

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

Module: Foundations of Marketing [TVWL3BWLMAR]

Coordination: M. Klarmann
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2572177	Brand Management (p. 213)	2/1	W	4,5	B. Neibecker
2571152	Managing the Marketing Mix (p. 216)	2/1	S	4,5	M. Klarmann
2572158	Services Marketing and B2B Marketing (p. 141)	2	W	3	M. Klarmann, J. Kim
2572155	International Marketing (p. 197)	1	W	1,5	M. Klarmann

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
Successful passing of the corresponding modules of the basic program.
The course *Marketing Mix* is compulsory and must be examined.

Qualification Goals
The aim of this module is to prepare the students properly for tasks in a marketing or sales department. Especially technical oriented companies choose engineers with technical knowledge and understanding for marketing and sales.
Students
- know the most important concepts, approaches, and theories of the marketing mix (product management, price management, communication management and sales management)
- can make decisions about current and future products (innovation management and management of established products; e.g. conjoint analysis)
- know how customers perceive brands and how to influence that
- comprehend how customers respond to prices (e.g. price-demand function)
- know how to determine prices based on conceptual and quantitative considerations
- know the basics of price differentiation
- are familiar with the instruments of communication and are able to design them accurately
- know how to allocate the communication budget
- know how to target consumers via market segmentation
- know how to position a product
- know how to analyze the significance and satisfaction of a customer
- know how create a relationship to the customer and to the retailer
- are familiar with the particularities in specific marketing contexts (Business-to-Business Marketing, Marketing of Services, International Marketing)

Content
The core course of the module is "Marketing Mix". This course is compulsory and must be examined. "Marketing Mix" contains instruments and methods that enable you to goal-oriented decisions in the operative marketing management (product management, pricing, promotion and sales management).
To deepen the marketing knowledge students can complete the module in two ways:

  • by choosing the course "Brand Management".

  • by choosing the combination of the courses "Services- and B2B-Marketing" and "International Marketing".

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

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

Module: Human Resources and Organizations [TVWL3BWLIAP2]

Coordination: P. Nieken
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2573001	Personnel Policies and Labor Market Institutions (p. 243)	2/1	S	4,5	P. Nieken
253003	Human Resource Management (p. 242)	2/1	W	4,5	P. Nieken

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
Successful passing of the corresponding modules of the basic program.

Recommendations
Completion of module Business Administration is recommended.
Basic knowledge of microeconomics, game theory and statistics is recommended.

Qualification Goals
The student

- knows and analyzes basic concepts, instruments, and challenges of present human resource and organizational management.
- uses the techniques he / she has learned to evaluate strategic situations which occur in human resource management.
- knows the relevant labor market institutions and can explains their tasks.
- has basic knowledge of fit and challenges of different scientific methods in the context of personnel and organizational economics.

Content
Students' acquire basic knowledge in the field of human resource and organizational management. Strategic as well as operative aspects of human resource management practices are analyzed. The students learn to apply methods and instruments to plan, select, and manage staff. Labor market institutions and selected aspects of personnel politics are examined and evaluated.
The focus lies on the strategic analysis of decisions and the use microeconomic or behavioral approaches. Empirical results of field or lab studies are discussed critically.

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

Remarks
This module has been added summer 2015.

6.3   Informatics

Module: Emphasis Informatics [TVWL3INFO1]

Coordination: H. Schmeck, A. Oberweis, R. Studer
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2511020	Advanced Programming - Java Network Programming (p. 256)	2/1/2	S	5	D. Seese, D. Ratz
2511026	Advanced Programming - Application of Business Software (p. 257)	2/1/2	W	5	A. Oberweis, S. Klink
2511030	Applied Informatics I - Modelling (p. 100)	2/1	W	5	A. Oberweis, Y. Sure-Vetter
2511032	Applied Informatics II - IT Systems for e-Commerce (p. 101)	2/1/1	S	5	J. Zöllner, N.N.
2511102	Algorithms for Internet Applications (p. 95)	2/1	W	5	H. Schmeck
2511300	Knowledge Management (p. 349)	2/1	W	4	R. Studer
2511206	Software Engineering (p. 308)	2/1	S	4	A. Oberweis
2511100	Efficient Algorithms (p. 143)	2/1	S	5	H. Schmeck
Platzhalter	Special Topics of Applied Informatics (p. 313)	2/1	W/S	5	A. Oberweis, H. Schmeck, R. Studer
2511200	Database Systems (p. 138)	2/1	S	5	A. Oberweis, Dr. D. Sommer

Learning Control / Examinations

The assessment is carried out as two partial exams (according to Section 4(2) of the examination regulation) of the single courses of this module. For passing the module exam in every singled partial exam the respective minimum requirements has to be achieved.

- Partial exam I: *Advanced Programming - Java Network Programming* [25889] or alternativly *Advanced Programming - Application of Business Software* [2540886/2590886]
- Partial exam II: all the rest

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

Conditions

Successful passing of the corresponding modules of the basic program.

Qualification Goals

The student

- has the capability of dealing with the practical application of the Java programming language (which is the dominating programming language in many application areas) or alternatively the ability to configure, parameterize and deploy enterprise software to enable, support and automate business processes,
- is familiar with methods and systems of a core topic or core application area of computer science,
- can choose these methods and system situation adequately and can furthermore design and employ them for problem solving,
- is able to independently find strategic and creative answers in the finding of solutions to well defined, concrete, and abstract problems.

Content

In this module, object-oriented programming skills using the Java programming language are further deepened. Alternatively important fundamentals of business information systems are conveyed that enable, support and accelerate new forms of

business processes and organizational forms. Based on a core application area, basic methods and techniques of computer science are presented.

Workload
See German version.

Module: Electives in Informatic [TVWL3INFO2]

Coordination: H. Schmeck, A. Oberweis, R. Studer
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2511030	Applied Informatics I - Modelling (p. 100)	2/1	W	5	A. Oberweis, Y. Sure-Vetter
2511032	Applied Informatics II - IT Systems for e-Commerce (p. 101)	2/1/1	S	5	J. Zöllner, N.N.
2511102	Algorithms for Internet Applications (p. 95)	2/1	W	5	H. Schmeck
2511100	Efficient Algorithms (p. 143)	2/1	S	5	H. Schmeck
2511200	Database Systems (p. 138)	2/1	S	5	A. Oberweis, Dr. D. Sommer
2511206	Software Engineering (p. 308)	2/1	S	4	A. Oberweis
2511300	Knowledge Management (p. 349)	2/1	W	4	R. Studer
Platzhalter	Special Topics of Applied Informatics (p. 313)	2/1	W/S	5	A. Oberweis, H. Schmeck, R. Studer

Learning Control / Examinations
The assessment is carried out as two partial exams (according to Section 4(2) of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. For passing the module exam in every singled partial exam the respective minimum requirements has to be achieved.
The examinations are offered every semester. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately.
When every singled examination is passed, the overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Conditions
Successful passing of the corresponding modules of the basic program.

Qualification Goals
The student

- knows and has mastered methods and systems for core topics and core application areas of computer science,
- can choose these methods and system situation adequately and can furthermore design and employ them for problem solving,
- is able to independently find strategic and creative answers in the finding of solutions to well defined, concrete, and abstract problems.

Content
The elective module conveys advanced knowledge in the area of applied computer science. This includes, for example, the efficient design and optimization of technical systems, the design and management of database applications or the systematic development of large software systems. Moreover, modeling of complex systems, the use of computer science methods to support knowledge management, and the design and implementation of service-oriented architectures are discussed in this module.

Workload
See German version.

Remarks
The course "Semantic Web Technologies" will not be offered any more in this module from summer term 2015 on. The examination will be offered latest until winter term 2015/2016 (repeaters only).

6.4   Operations Research

Module: Applications of Operations Research [TVWL3OR5]

Coordination: S. Nickel
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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. 316)	2/1	W	4,5	S. Nickel
2550488	Tactical and Operational Supply Chain Management (p. 326)	2/1	S	4,5	S. Nickel
2550490	Software Laboratory: OR Models I (p. 309)	1/2	W	4,5	S. Nickel
2550134	Global Optimization I (p. 178)	2/1	W	4,5	O. Stein
2550662	Simulation I (p. 306)	2/1/2	W/S	4,5	K. Waldmann

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
At least one of the courses *Facility Location and strategic Supply Chain Management* [2550486] and *Tactical and operational Supply Chain Management* [2550488] has to be taken.
Successful passing of the corresponding modules of the basic program.

Qualification Goals
The student

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

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

Workload

Total effort for 9 credits: ca. 270 hours.

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

Remarks

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

Module: Methodical Foundations of OR [TVWL3OR6]

Coordination: O. Stein
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2550111	Nonlinear Optimization I (p. 231)	2/1	S	4,5	O. Stein
2550113	Nonlinear Optimization II (p. 232)	2/1	S	4,5	O. Stein
2550134	Global Optimization I (p. 178)	2/1	W	4,5	O. Stein
2550136	Global Optimization II (p. 179)	2/1	W	4,5	O. Stein
2550486	Facility Location and Strategic Supply Chain Management (p. 316)	2/1	W	4,5	S. Nickel
2550679	Markov Decision Models I (p. 324)	2/1/2	W	5	K. Waldmann

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 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
At least one of the lectures *Nonlinear Optimization I* [2550111] and *Global Optimization I* [2550134] has to be examined.
Successful passing of the corresponding modules of the basic program.

Qualification Goals
The student

- names and describes basic notions for optimization methods, in particular from nonlinear and from global optimization,

- knows the indispensable methods and models for quantitative analysis,

- models and classifies optimization problems and chooses the appropriate solution methods to solve also challenging optimization problems independently and, if necessary, with the aid of a computer,

- validates, illustrates and interprets the obtained solutions.

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

Workload
See german version.

Remarks
The planned lectures and courses for the next three years are announced online (http://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 Methods and Simulation [TVWL3OR7]

Coordination: K. Waldmann
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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. 324)	2/1/2	W	5	K. Waldmann
2550682	Markov Decision Models II (p. 325)	2/1/2	S	4,5	K. Waldmann
2550662	Simulation I (p. 306)	2/1/2	W/S	4,5	K. Waldmann
2550665	Simulation II (p. 307)	2/1/2	W/S	4,5	K. Waldmann
2550111	Nonlinear Optimization I (p. 231)	2/1	S	4,5	O. Stein
2550488	Tactical and Operational Supply Chain Management (p. 326)	2/1	S	4,5	S. Nickel

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 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

Successful passing of the corresponding modules of the basic program.

Qualification Goals

The student posses profound 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.

Workload

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

Remarks

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

6.5   Statistics

Module: Statistical Applications of Financial Risk Management [TVWL3STAT]

Coordination: W. Heller
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2521325/2521326	Statistics and Econometrics in Business and Economics (p. 317)	2/2	W	4,5	W. Heller
2520375	Data Mining and Applications (p. 136)	2	S	4,5	G. Nakhaeizadeh

Learning Control / Examinations
The assessment is carried out as partial exams of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module 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
Successful passing of the corresponding modules of the basic program.

Qualification Goals
See German version.

Content

Workload
See German version.

Module: Statistics and Econometrics [TVWL3STAT1]

Coordination: M. Schienle, O. Grothe
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

ECTS Credits	Cycle	Duration
9		2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520022	Financial Econometrics (p. 170)	2/2	W	4,5	M. Schienle
2550550	Analysis of multivariate Data (p. 97)	2/2	W	4,5	O. Grothe
2521350	Statistical Modeling of generalized re-gression models (p. 320)	2/2	W	4,5	W. Heller
2520375	Data Mining and Applications (p. 136)	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
Successful passing of the corresponding modules of the basic program.

Qualification Goals
The student

- shows an advanced understanding of Econometric techniques and statistical model building.

- is able to develop Econometric models for applied problems based on available data

- is able to apply techniques and models with statistical software, to interpret results and to judge on different approaches with appropriate statistical criteria.

Content
The courses provide a solid Econometric and statistical foundation of techiques necessary to conduct valid regression, time series and multivariate analysis.

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

Remarks
New module starting winter term 2015/2016. It replaces the old module "Statistical Applications of Financial Risk Management" [WW3STAT].

6.6 Engineering Sciences

Module: Introduction to Technical Logistics [TVWL3INGMB13]

Coordination: K. Furmans
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2117051	Material flow in logistic systems (p. 217)	3/1	W	6	K. Furmans
2118097	Warehousing and distribution systems (p. 203)	2	S	4	M. Schwab, J. Weiblen
2117056	Airport logistics (p. 208)	2	W	4	A. Richter
2118085	Automotive Logistics (p. 207)	2	S	4	K. Furmans
2118089	Application of technical logistics in sorting- and distribution technology (p. 105)	2	S	4	J. Föller
2118094	Information Systems in Logistics and Supply Chain Management (p. 193)	2	S	4	C. Kilger
2117500	Energy efficient intralogistic systems (p. 157)	2	W	4	F. Schönung, M. Braun
2117095	Basics of Technical Logistics (p. 186)	3/1	W	6	M. Mittwollen, Madzharov
2117096	Elements of Technical Logistics (p. 155)	3	W	4	M. Mittwollen, Madzharov
2117097	Elements of Technical Logistics and Project (p. 156)	4	W	6	M. Mittwollen, Madzharov
2117064	Application of technical logistics in modern crane systems (p. 104)	2	W	4	M. Golder
2118087	Selected Applications of Technical Logistics (p. 112)	3	S	4	M. Mittwollen, Madzharov
2118088	Selected Applications of Technical Logistics and Project (p. 113)	4	S	6	M. Mittwollen, Madzharov
2500005	Production and Logistics Controlling (p. 253)	2	W	3	H. Wlcek

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.
To improve the overall grade of the module up to one grading scale (0.3) there might be taken an optional term paper in the field of the IFL. The term paper may not be convalidated in the seminar module.

Conditions
One of the core courses *Material Flow in Logistic Systems* [2117051] or *Basics of Technical Logistics* [2117095] or *Elements and systems of Technical Logistics* [2117096] is mandatory. *Elements and systems of Technical Logistics* is only allowed to be examined after *Basics of Technical Logistics* is passed successfully in this or an other module. For simultaneous attending of both courses, examination dates are sequenced accordingly.

Qualification Goals
The student aquires

- well-founded knowledge and method knowledge in the main topics of technical logistics,
- expertise and understanding about the functionality of conveyor technology,
- ability for modeling logistic systems with adequate accuracy by using simple models,
- ability to evaluate logistic systems and to identify cause-and-effects-chains within logistic systems.

Content

The module *Introduction to Technical Logistics* provides first insights into main topics of technical logistics. Within the lectures, the interaction between several components of material handling systems will be clarified. The focus will be on technical characteristics of material handling technology and basics for sizing of material handling systems. To gain a deeper understanding, the course is accompanied by exercises and further improved by case studies.

Workload

See German version.

Module: Combustion Engines I [TVWL3INGMB34]

Coordination: H. Kubach
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2133113	Combustion Engines I (p. 334)	2/1	W	5	H. Kubach, T. Koch
2133121	Energy Conversion and Increased Efficiency in Internal Combustion Engines (p. 159)	2	W	4	T. Koch, H. Kubach

Learning Control / Examinations
The assessment consists of an oral exam (60 min) taking place in the recess period (according to §4 (2), 2 of the examination regulation). The exam takes place in every semester. Reexaminations are offered at every ordinary examination date.

Conditions
None.

Recommendations
None.

Qualification Goals
The student can name and explain the working princile of combustion engines. He is able to analyse and evaluate the combustion process. He is able to evaluate influences of gas exchange, mixture formation, fuels and exhaust gas aftertreatment on the combustion performance. He can solve basic research problems in the field of engine development.
The student can name all important influences on the combustion process. He can analyse and evaluate the engine process considering efficiency, emissions and potential.

Content
Introduction, History, Concepts
Working Principle and Termodynamics
Characteristic Parameters
Air Path
Fuel Path
Energy Conversion
Fuels
Emissions
Exhaust Gas Aftertreatment
Reaction kinetics
Gas exchange
Ignition
Flow field of gasoline engines
Working process
Pressure trace analysis
Thermodynamic analysis of the high pressure process
Exergy analysis and waste heat recuperation
Aspects of sustainability

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

Module: Combustion Engines II [TVWL3INGMB35]

Coordination: H. Kubach
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

ECTS Credits	Cycle	Duration
9	Every term	

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2134151	Combustion Engines II (p. 335)	2/1	S	5	H. Kubach, T. Koch
2133108	Fuels and Lubricants for Combustion Engines (p. 124)	2	W	4	B. Kehrwald
2134138	Fundamentals of catalytic exhaust gas aftertreatment (p. 182)	2	S	4	E. Lox
2134134	Analysis tools for combustion diagnostics (p. 225)	2	S	4	U. Wagner
2134137	Engine measurement techniques (p. 228)	2	S	4	S. Bernhardt
2134141	Gas Engines (p. 174)	2	S	4	R. Golloch
2134150	Analysis of Exhaust Gas und Lubricating Oil in Combustion Engines (p. 93)	2	S	4	M. Gohl
2134139	Model based Application Methods (p. 227)	2	S	4	F. Kirschbaum

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 weighted average of the grades for each course and truncated after the first decimal.

Conditions
It is only possible to choose this module in combination with the module *Combustion Engines I.* The module is passed only after the final partial exam of *Combustion Engines I* is additionally passed.
The course *Combustion Engines II* [2134131] has to be attended.

Recommendations
Basic skills in thermodynamics are recommended.

Qualification Goals
See courses.

Content

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

Module: Manufacturing Technology [TVWL3INGMB23]

Coordination: V. Schulze
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2149657	Manufacturing Technology (p. 169)	4/2	W	9	V. Schulze, F. Zanger

Learning Control / Examinations

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

To improve the overall grade of the module up to one grading scale (0.3) there might be taken an optional term paper in the field of the wbk. The term paper may not be convalidated in the seminar module.

Conditions

None.

Qualification Goals

The students

- can name different manufacturing processes, can describe their specific characteristics and are capable to depict the general function of manufacturing processes and are able to assign manufacturing processes to the specific main groups.
- are enabled to identify correlations between different processes and to select a process depending on possible applications.
- are capable to describe the theoretical basics for the manufacturing processes they got to know within the scope of the course and are able to compare the processes.
- are able to correlate based on their knowledge in materials science the processing parameters with the resulting material properties by taking into account the microstructural effects.
- are qualified to evaluate different processes on a material scientific basis.

Content

Within this engineering sciences-oriented module the students will get to learn principle aspects of manufacturing technology. Further information can be found at the description of the lecture "Manufacturing Technology".

Workload

270 hours.

Module: Specialization in Production Engineering [TVWL3INGMB22]

Coordination: V. Schulze
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2149667	Quality Management (p. 261)	2	W	4	G. Lanza
2149669	Materials and Processes for Body Lightweight Construction in the Automotive Industry (p. 218)	2	W	4	D. Steegmüller, S. Kienzle
2150681	Metal Forming (p. 329)	2	S	4	T. Herlan
2150683	Control Technology (p. 323)	2	S	4	C. Gönnheimer
2149655	Gear Cutting Technology (p. 340)	2	W	4	M. Klaiber
2149001	Production Technology and Management in Automotive (p. 254)	2	W	4	V. Stauch, S. Peters
2150601	Integrative Strategies in Production and Development of High Performance Cars (p. 195)	2	S	4	K. Schlichtenmayer

Learning Control / Examinations
The assessment is carried out as partial exams (according to Section 4 (2), 1-3 SPO) 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. To improve the overall grade of the module up to one grading scale (0.3) there might be taken an optional term paper in the field of the wbk. The term paper may not be convalidated in the seminar module.

Conditions
None.

Qualification Goals
The students

- are able to apply the methods of production science to new problems.
- are able to analyze and evaluate the suitability of the methods, procedures and techniques for a specific problem.
- are able to use their knowledge target-oriented to achieve an efficient production technology.
- are able to analyze new situations and choose methods of production science target-oriented based on the analyses, as well as justifying their selection.
- are able to describe and compare complex production processes exemplarily.

Content
Within this module the students will get to know and learn about production science. Manifold lectures and excursions as part of several lectures provide specific insights into the field of production science.

Workload
270 hours.

Module: Integrated Production Planning [TVWL3INGMB24]

Coordination: V. Schulze, Gisela Lanza
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2150660	Integrated production planning (p. 196)	4/2	S	9	G. Lanza

Learning Control / Examinations
The assessment is carried out as partial exams (according to Section 4(2), 1-3 SPO 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.
To improve the overall grade of the module up to one grading scale (0.3) there might be taken an optional term paper in the field of the wbk. The term paper may not be convalidated in the seminar module.

Conditions
None.

Qualification Goals
The students

- can discuss basic questions of production technology.
- are able to apply the methods of integrated production planning they have learned about to new problems.
- are able to analyze and evaluate the suitability of the methods, procedures and techniques they have learned about for a specific problem.
- can apply the learned methods of integrated production planning to new problems.
- can use their knowledge targeted for efficient production technology.

Content
Within this engineering sciences-oriented module the students will get to learn principle aspects of organization and planning of production systems. Further information can be found at the description of the lecture "Integrated Production Planning".

Workload
270 hours.

Module: Machine Tools and Industrial Handling [TVWL3INGMB32]

Coordination: J. Fleischer
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2149902	Machine Tools and Industrial Handling (p. 345)	4/2	W	9	J. Fleischer

Learning Control / Examinations
The assessment is carried out as partial exams (according to Section 4(2), 1-3 SPO 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. To improve the overall grade of the module up to one grading scale (0.3) there might be taken an optional term paper in the field of the wbk. The term paper may not be convalidated in the seminar module.

Conditions
None.

Qualification Goals
The students

- are capable to explain the use and application of machine tools and handling devices as well as differentiate their characteristics and structure.
- are able to name and describe the essential components (frame, main spindles, feed axis, peripheral equipment, control) of machine tools.
- Are capable to distinguish and select and describe the essential components regarding structure, characteristics advantages and disadvantages.
- are enabled to dimension the main components of machine tools.
- are able to name and describe the control principles of machine tools.
- are capable to name examples of machine tools and industrial handling as well as to deduce compare the essential components. Additionally they can allocate manufacturing processes.
- are enabled to identify drawbacks as well as derive and asses measures for improvements.
- are qualified to apply methods for selection and evaluation of machine tools.
- are experienced to deduce the particular failure characteristics of a ball screw.

Content
The module overviews the assembly, dimensioning and application of machine tools and industrial handling. A consolidated and practice oriented knowledge is imparted about the choice, dimensioning and assessment of production machines. At first, the major components of machine tools are explained systematically. At this, the characteristics of dimensioning of machine tools are described in detail. Finally, the application of machine tools is demonstrated by means of example machines of the manufacturing processes turning, milling, grinding, massive forming, sheet metal forming and toothing.

Workload
270 hours.

Module: Product Lifecycle Management [TVWL3INGMB21]

Coordination: J. Ovtcharova
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2121350	Product Lifecycle Management (p. 251)	3/1	W	6	J. Ovtcharova
2122387	Computer Integrated Planning of New Products (p. 265)	2	S	4	R. Kläger
2122376	PLM for product development in mechatronics (p. 245)	2/0	S	4	M. Eigner
2122014	Information Engineering (p. 192)	2	S	3	J. Ovtcharova, J. Ovtcharova
2121357	PLM-CAD Workshop (p. 246)	4	W/S	4	J. Ovtcharova

Learning Control / Examinations
The assessment is carried out as a written exam about *Product Lifecycle Management* (90 min) (according to Section 4(2), 1 of the examination regulation) and a oral exam (ca. 30 min.) about another lecture (according to Section 4(2), 2 of the examination regulation), 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 made up of the grade for the written examination [67%] and the grade for the oral examination [33%].

Conditions
The course *Product Lifecycle Management* [2121350] is compulsory and has to be passed.

Qualification Goals
The students should:

- have basic knowledge about the challenges in product and process data management regarding the whole product lifecycle;
- have understanding about challenges and functional concepts of product lifecycle management;
- be able to operate common PLM systems.

Content
This module describes management and organizational approaches of Product Lifecycle Management, their application in IT and the potential benefits of PLM system solutions. Optional courses of this module introduce current product development processes in the scope of enterprise PLM system solutions.

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

Module: Microsystem Technology [TVWL3INGMBIMT1]

Coordination: V. Saile
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2141861	Introduction to Microsystem Technology I (p. 183)	2	W	3	A. Guber, Prof. J. Korvink
2142874	Introduction to Microsystem Technology II (p. 184)	2	S	3	A. Guber, Prof. Dr. J. Korvink
2143875	Introduction to Microsystem Technology - Practical Course (p. 247)	2	W/S	3	A. Last
2142890	Physics for Engineers (p. 244)	2/2	S	6	P. Gumbsch, A. Nesterov-Müller, D. Weygand, T. Förtsch
2143892	Selected Topics on Optics and Microoptics for Mechanical Engineers (p. 114)	2	W/S	3	T. Mappes
2142883	BioMEMS - Microsystems Technologies for Life-Sciences and Medicine II (p. 130)	2	S	3	A. Guber
2142879	BioMEMS - Microsystems Technologies for Life-Sciences and Medicine III (p. 131)	2	S	3	A. Guber
2142881	Microactuators (p. 226)	2	S	3	M. Kohl
2141865	Novel Actuators and Sensors (p. 230)	2	W	3	M. Kohl, M. Sommer
2143876	Nanotechnology with Clusterbeams (p. 229)	2	W	3	J. Gspann
2142140	Bionics for Engineers and Natural Scientists (p. 132)	2	S	3	H. Hölscher
23486 / 23487	Optoelectronic Components (p. 239)	2 / 1	S	4,5	W. Freude

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
This module cannot be combined with the module Microsystem Technology in the Master studies.
The course Basics of microsystemtechnology I [2141861] is compulsory and must be examined.

Qualification Goals

- construction and production of e. g. mechanical, optical, fluidic and sensory microsystems.

Content
The module offers courses in microsystem technology. Knowledge is imparted in various fields like basics in construction and production of e. g. mechanical, optical, fluidic and sensory microsystems.

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

Remarks
If you have any questions concerning the module, please contact Prof. Dr. Andreas E. Guber.

Module: Power Networks [TVWL3INGETIT3]

Coordination: T. Leibfried, B. Hoferer
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
23391/23393	Systems for Electrical Energy (p. 154)	2/1	S	4,5	T. Leibfried
23371/23373	Power Network Analysis (p. 152)	2/2	W	6	T. Leibfried

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 examinations take place at the beginning of the recess period. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately.
The overall grade of the module is the weighted average of the grades for each course and truncated after the first decimal.

Conditions
None.

Qualification Goals
The student

- has basic and advanced knowledge of electrical power engineering,

- is capable to analyse, calculate and develop electrical power engineering systems.

Content
The module deals with basic knowledge about the structure and operation of electrical power networks and their needed facilities. Further lectures give an insight into specific topics, such as Automation in electric power engineering or the procedures for generating electrical energy.

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

Module: Energy Generation and Network Components [TVWL3INGETIT4]

Coordination: T. Leibfried, B. Hoferer
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
23356	Electric Power Generation & Power Grid (p. 162)	2/0	W	3	B. Hoferer
23390	Engineering, Design and Operation of Power Transformers (p. 111)	2/0	S	3	M. Schäfer
23382	Technique of Electrical Installation (p. 153)	2/0	S	3	A. Kühner
23396	Automation of Power Grids (p. 116)	2/0	S	3	R. Eichler

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 examinations take place at the beginning of the recess period. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately.
The overall grade of the module is the weighted average of the grades for each course and truncated after the first decimal.

Conditions
It is only possible to choose this module in combination with the module *Power Networks* [TVWL3INGETIT3]. The module is passed only after the final partial exam of *Power Networks* is additionally passed.

Qualification Goals
The student

- has basic and advanced knowledge of electrical power engineering,

- is capable to analyse, calculate and develop electrical power engineering systems.

Content
The module deals with basic knowledge about the structure and operation of electrical power networks and their needed facilities. Further lectures give an insight into specific topics, such as Automation in electric power engineering or the procedures for generating electrical energy.

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

Module: Mobility and Infrastructure [TVWL3INGBGU1]

Coordination: R. Roos
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
6200405	Transportation (p. 336)	2	S	3	P. Vortisch
6200407	Design Basics in Highway Engineering (p. 122)	2/0	S	3	R. Roos
6200404	Spatial Planning and Planning Law (p. 262)	2/0	S	3	W. Jung

Learning Control / Examinations
The assessment of the module is carried out as a general written examination (150 minutes) according to §4(2), 1 of the examination regulation.
The exam is offered in each semester as well as the re-examination. In case of failing or to improve the examinationgrade an additional oral examination (according to §4(2), 2 of the examination regulation) is offered in the same examination periode.
The overall grade of the module corresponds to the grade of the written examination or the average of the marks for the written and the oral assessment.

Conditions
None.

Qualification Goals
Learning the fundamental terminology and methodology of spatial and transportation planning, traffic engineering as well as highway engineering

Content
Basic tasks and contents of different planning levels, for example: Land use and conflicts, provision of services and infrastructure as well as their costs, planning on local, regional, national and European level.

Fundamentals of transportation planning (convention for analyses, surveys of travel behaviour), fundamentals of traffic engineering

Design Basics in Highway Engineering: Road network layout, driving dynamics, principles of highway design; earthworks, pavements and their dimensioning

Workload
See German version.

Module: Fundamentals of construction [TVWL3INGBGU3]

Coordination: S. Haghsheno
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
6200409	Construction Technology (p. 119)	4	S	6	S. Haghsheno, S. Gentes
6200106	Project Management (p. 258)	2	W	3	S. Haghsheno, H. Schneider

Learning Control / Examinations
See German version.

Conditions
None.

Recommendations
None.

Qualification Goals
The student

- is familiar with all substantial domains of construction
- knows and understands substantial construction methods and construction machines
- masters basic construction calculations
- knows and understands the fundamentals of project management in civil engineering

can apply his / her knowledge in a goal-oriented manner to accomplish a construction project efficiently

Content
Courses of this module comprise methods and machines from all construction domains. Specifically, the module covers production planning as well as substantial parts of structural engineering and underground engineering, including auxiliary systems. In addition to the explanation of fundamentals, machines, and methods the courses include performance calculations. Further, students receive an introduction to project management in civil engineering which includes project phases, project organization, and the columns of project management which are schedule management, cost management, and quality management.

Workload
The distribution takes place according to each courses credit points within the module.

Remarks
We encourage students to deepen their knowledge in construction by building additional customized modules from the courses offered by TMB. Please consult with the tutors of this module. Further information is available at www.tmb.kit.edu.

Module: Basics of Track Guided Transport Systems [TVWL3INGBGU4]

Coordination: M. Weigel
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
6200517	Basics of Track Guided Transport Systems (p. 187)	2	W	3	E. Hohnecker
6234801	Operation (p. 123)	2	S	3	E. Hohnecker
6234802	Facilities and Rolling Stock (p. 102)	1/1	S	3	E. Hohnecker

Learning Control / Examinations
The assessment is carried out as a general written module exam according to Section 4 Abs. 2, Nr. 1 of the examination regulation. The module exam has a duration of 90 min.
The exam is offered each semester. The re-examination is offered upon prior agreement with the interested participants and not later than the next regular examination date.
The overall grade of the module is the grade for the exam.

Conditions
All courses are obligatory.

Recommendations
None.

Qualification Goals
See German version.

Content
See courses.

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

Module: Understanding and Prediction of Disasters 1 [TVWL3INGINTER6]

Coordination: M. Kunz
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2501111	Climatology (p. 202)	3/1	S	5,5	P. Braesicke
57535	Meteorological Natural Hazards (p. 223)	2	S	3,5	M. Kunz
GEOD-BFB-1	Remote Sensing (p. 166)	3/2/1	S	6	Hinz, Weidner
20241/42	Remote Sensing Systems (p. 167)	1/1	S	2	S. Hinz, U. Weidner
20265/66	Remote Sensing Methods (p. 168)	2/1	S	3	S. Hinz, U. Weidner
20267	Hauptvermessungsübung III (p. 189)	0/1	S	1	S. Hinz, Weidner
6200509	Hydraulic Engineering and Water Management (p. 344)	2/1	W	4,5	F. Nestmann
2600101	Geological Hazards and Risks (p. 176)	2/1	W	4	Wenzel, Gottschämmer
6200511	Hydrology (p. 190)	2/1	W	4,5	E. Zehe
20712/13	Introduction to GIS for students of natural, engineering and geo sciences (p. 151)	2/2	W	5	Rösch

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
There are no singular exams for Remote Sensing Systems [20241/42] and Remote Sensing Methods [20265/66]. Therefore it not possible to choose Remote Sensing [GEOD-BFB-1] and additionally the courses Remote Sensing Systems, Remote Sensing Methods or the project Angewandte Fernerkundung [20267] (because they are already included). See also "Recommendations".

Recommendations
The courses Remote Sensing Systems [20241/42] and Remote Sensing Methods [20265/66] may be chosen as a minimal combination for the exam. However, it is recommended to choose the comprehensive combination Remote Sensing [GEOD-BFB-1], which includes Remote Sensing Systems [20241/42], Remote Sensing Methods [20265/66] and the project Angewandte Fernerkundung [20267].

Qualification Goals
See German version.

Content
See German version.

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

Remarks
Students, who successfully completed both modules "Understanding and Prediction of Disasters" I and II (alternatively: one of the modules in Bachelor and Master) can get a certificate of the module coordinator (CEDIM). This certificate lists the successful completed courses within the two modules.

Module: Understanding and Prediction of Disasters 2 [TVWL3INGINTER7]

Coordination: M. Kunz
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
2501111	Climatology (p. 202)	3/1	S	5,5	P. Braesicke
57535	Meteorological Natural Hazards (p. 223)	2	S	3,5	M. Kunz
GEOD-BFB-1	Remote Sensing (p. 166)	3/2/1	S	6	Hinz, Weidner
20241/42	Remote Sensing Systems (p. 167)	1/1	S	2	S. Hinz, U. Weidner
20265/66	Remote Sensing Methods (p. 168)	2/1	S	3	S. Hinz, U. Weidner
20267	Hauptvermessungsübung III (p. 189)	0/1	S	1	S. Hinz, Weidner
6200509	Hydraulic Engineering and Water Management (p. 344)	2/1	W	4,5	F. Nestmann
2600101	Geological Hazards and Risks (p. 176)	2/1	W	4	Wenzel, Gottschämmer
6200511	Hydrology (p. 190)	2/1	W	4,5	E. Zehe
20712/13	Introduction to GIS for students of natural, engineering and geo sciences (p. 151)	2/2	W	5	Rösch

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
There are no singular exams for Remote Sensing Systems [20241/42] and Remote Sensing Methods [20265/66]. Therefore it not possible to choose Remote Sensing [GEOD-BFB-1] and additionally the courses Remote Sensing Systems, Remote Sensing Methods or the project Angewandte Fernerkundung [20267] (because they are already included). See also "Recommendations".

Recommendations
The courses Remote Sensing Systems [20241/42] and Remote Sensing Methods [20265/66] may be chosen as a minimal combination for the exam. However, it is recommended to choose the comprehensive combination Remote Sensing [GEOD-BFB-1], which includes Remote Sensing Systems [20241/42], Remote Sensing Methods [20265/66] and the project Angewandte Fernerkundung [20267].

Qualification Goals
See German version.

Content
See German version.

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

Remarks
Students, who successfully completed both modules "Understanding and Prediction of Disasters" I and II (alternatively: one of the modules in Bachelor and Master) can get a certificate of the module coordinator (CEDIM). This certificate lists the successful completed courses within the two modules.

Module: Extracurricular Module in Engineering [TVWL3INGAPL]

Coordination: Prüfer einer Ingenieurwissenschaftlichen Fakultät
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

ECTS Credits	Cycle	Duration
9		

Learning Control / Examinations
The assessment of the module is determined by the respective module corrdinator. It can either be in the form of a general exam or partial exams, and must be contain at least 9 credit points and at least 6 hours per week. The examination may contain presentations, experiments, laboratories, term papers, etc. At least 50 percent of the module examination has to be in the form of a written or an oral examination (according to Section 4 (2), 1 or 2 of the examination regulation).

The formation of the overall grade of the module will be determined by the respective module coordinator.

Conditions
See German version.

Qualification Goals
See German version.

Content

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

6.7   Law

Module: Commercial Law [TVWL3JURA2]

Coordination: Z. (ZAR)
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
24504	Advanced Civil Law (p. 129)	2/0	S	3	T. Dreier
24011	Commercial and Corporate Law (p. 188)	2/0	W	3	Z. (ZAR), O. Knöfel
24506	Exercises in Civil Law (p. 249)	2/0	W/S	3	T. Dreier

Learning Control / Examinations

Conditions
Successful passing of the corresponding modules of the basic program.

Qualification Goals
The student

- possesses in-depth knowledge of the general and specific law of obligations and of property law;

- is able to penetrate the interaction of the statutory provisions of the German Civil Code (different types of contracts and the respective rules on liability; performance; impairment of performance; the different ways by which property may be transferred and the *in rem* security rights) and of commercial and company law (especially in respect of the peculiarities of commercial transactions, commercial agency, the law of merchants as well as German law of business organizations);

- in the Private Law Exercises ("Privatrechtliche Übung") gains the skill to solve legal problems using legal methods.

Content
The module is based on the module "Introduction in Civil Law". The students get profound Knowledge in special contract types of the German Civil Law as well as in complex constructions in business law. In addition to that the module wants to impart the competence in solving legal problems with legal methods.

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

Module: Intellectual Property Law [TVWL3JURA4]

Coordination: T. Dreier
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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. 200)	2/0	W	3	T. Dreier
24121	Copyright (p. 333)	2/0	W	3	T. Dreier
24656	Patent Law (p. 241)	2/0	S	3	P. Bittner
24136 / 24609	Trademark and Unfair Competition Law (p. 215)	2/0	W/S	3	Y. Matz
VGE	Computer Contract Law (p. 339)	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
Successful passing of the corresponding modules of the basic program.

Qualification Goals
See German version.

Content
See courses.

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

Module: Private Business Law [TVWL3JURA5]

Coordination: Z. (ZAR)
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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. 337)	2/0	S	3	Z. (ZAR)
24671	Law of Contracts (p. 338)	2/0	S	3	Z. (ZAR)
24167	Employment Law I (p. 106)	2	W	3	A. Hoff
24668	Employment Law II (p. 107)	2	S	3	A. Hoff
24168	Tax Law I (p. 321)	2/0	W	3	D. Dietrich
24646	Tax Law II (p. 322)	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
Successful passing of the corresponding modules of the basic program.

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.

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

Module: Public Business Law [TVWL3JURA6]

Coordination: G. Sydow
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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. 327)	2/0	S	3	G. Sydow
24082	Public Media Law (p. 234)	2	W	3	C. Kirchberg
24666	European and International Law (p. 163)	2/0	S	3	G. Sydow
24140	Environmental Law (p. 330)	2	W	3	G. Sydow
24018	Data Protection Law (p. 139)	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
Successful passing of the corresponding modules of the basic program.

Qualification Goals
See German version.

Content

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

6.8   Sociology

Module: Sociology/Empirical Social Research [TVWL3SOZ]

Coordination: G. Nollmann
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.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)
11005	Social structures of modern societies (p. 310)	2	W	4	G. Nollmann
spezSoz	Special Sociology (p. 314)	2	W/S	2	G. Nollmann, Pfadenhauer, Haupt, Grenz, Eisewicht, Kunz, Dukat, Albrecht, Enderle
SozSem	Projectseminar (p. 259)	2	W/S	4	G. Nollmann, Kunz, Haupt, Grenz, Eisewicht, Enderle, Dukat, Albrecht

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

Conditions
None.

Recommendations
Knowledge of Statistics 1 and Statistics 2 is required.

Qualification Goals
The student

- Gains theoretical and methodical knowledge of social processes and structures

- Is able to apply acquired knowledge practically

- Is able to present work results in a precise and clear way

Content
This module offers students the possibility to get to know research problems and to answer these theoretically as well as empirically. For example: Who does earn how much in his job and why? How do subcultures emerge? Why are boys' grades in school always worse than those of girls? Do divorces have negative influences on the development of children? How does mass consumption influence the individual? Is there a world society emerging?

In addition, this module contains courses on sociological methods that are essential to answer the above questions scientifically.

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

Module: Qualitative Social Research [TVWL3SOZ2]

Coordination: M. Pfadenhauer
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

ECTS Credits	Cycle	Duration
9		2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
5011015	Interpretative Social Research Methods (p. 224)	2/0	W	4	M. Pfadenhauer
spezSoz	Special Sociology (p. 314)	2	W/S	2	G. Nollmann, Pfadenhauer, Haupt, Grenz, Eisewicht, Kunz, Dukat, Albrecht, Enderle
n.n.	Explorative-interpretative Project Seminar (p. 260)	2/0	W/S	4	M. Pfadenhauer, Kunz, Grenz, Eisewicht, Dukat, Enderle, Albrecht

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.

Recommendations
It is recommended to attend the lecture on interpretative methods of social research before attending the project.

Qualification Goals
The student

- possesses a basic overview of the well-established and some of the advanced explorative methods of data collection and interpretative methods of data evaluation,
- can address basic sociological questions to subjects of different types,
- and is capable of choosing and applying appropriate explorative-interpretative methods according to a research question.

Content
Qualitative Social Research is of major importance not only in (Social) Sciences but also in applied economic contexts. Within the framework of this module the student gets thaught basic and advanced methods of non-standardised data collection, fixation and evaluation. Accordingly the module consists of three courses:

- the lecture 'Interpretative Social Research Methods' which ends with a written exam (4 LP).
- a course 'Special Sociology' of choice in which 2 or 4 credits have to be obtained (6 credits needed in course and project course combined).
- a project course focusing on explorative-interpreative methods in which 2 or 4 credits have to be obtained (6 credits needed in course and project course combined).

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

6.9 General Modules

Module: Seminar Module [TVWL3SEM1]

Coordination: Studiendekan (Fak. f. Wirtschaftswissenschaften)
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

ECTS Credits	Cycle	Duration
3	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
SemAIFB1	Seminar in Enterprise Information Systems (p. 269)	2	W/S	3	R. Studer, A. Oberweis, T. Wolf, R. Kneuper
SemAIFB2	Seminar Efficient Algorithms (p. 271)	2	W/S	3	H. Schmeck
SemAIFB4	Seminar Knowledge Management (p. 295)	2	W	3	R. Studer
2530280	Seminar in Finance (p. 278)	2	W/S	3	M. Uhrig-Homburg, M. Ruckes
SemFBV1	Seminar Risk and Insurance Management (p. 291)	2	W/S	3	U. Werner
2530353	Seminar Financial Economics and Risk Management (p. 279)	2	W/S	3	M. Ulrich
2577915	Seminar: Management and Organization (p. 304)	2	W/S	3	H. Lindstädt
2579904	Seminar Management Accounting (p. 285)	2	W/S	3	M. Wouters
2579905	Special Topics in Management Accounting (p. 311)	2		3	M. Wouters, F. Stadtherr
2572197	Seminar in strategic and behavioral marketing (p. 296)	2	W	3	B. Neibecker
SemETU1	Seminar in Marketing and Sales (Bachelor) (p. 281)	2	S	3	M. Klarmann, S. Feurer
SemIIP2	Seminar in Industrial Production (p. 283)	2	W/S	3	F. Schultmann, M. Fröhling
SemEW	Seminar Energy Economics (p. 272)	2	W/S	3	W. Fichtner, P. Jochem, D. Keles, R. McKenna, V. Bertsch
2540524	Bachelor Seminar in Information Engineering and Management (p. 118)	2	W/S	3	A. Geyer-Schulz
SemIW	Seminar Information Engineering and Management (p. 284)	2	W/S	3	C. Weinhardt
2595470	Seminar Service Science, Management & Engineering (p. 292)	2	W/S	3	C. Weinhardt, R. Studer, S. Nickel, H. Fromm, W. Fichtner, G. Satzger
2595475	Seminar Mobility Services (p. 286)	2	W	3	G. Satzger, C. Stryja
SemTuE1	Entrepreneurship Seminar (p. 275)			3	O. Terzidis
2585420/2586420	Topics of Sustainable Management of Housing and Real Estate (p. 108)	2	W/S	3	T. Lützkendorf, D. Lorenz
SemWIOR2	Seminar Economic Theory (p. 348)	2	W/S	3	C. Puppe
SemWIOR3	Seminar in Experimental Economics (p. 298)	2	W/S	3	N. N.
n.n.	Seminar in Behavioral and Experimental Economics (p. 277)	2	W/S	3	P. Reiss
n.n.	Seminar on Topics in Experimental Economics (p. 288)	2	S	3	P. Reiss
SemPÖ1	Seminar on Morals and Social Behavior (p. 287)	2	W/S	3	N. Szech
SemPÖ2	Seminar on Topics in Political Economics (p. 289)	2	W/S	3	N. Szech
SemIWW2	Seminar in International Economy (p. 280)	2/0	W/S	3	J. Kowalski

SemIWW3	Seminar in Economic Policy (p. 282)	2	W/S	3	I. Ott
2560130	Seminar Public Finance (p. 273)	2	W/S	3	B. Wigger, Assistenten
n.n.	Selected Topics in Public Management and Governance (p. 115)	2	W	3	B. Wigger, N. Edwards
SemETS3	Seminar on Macroeconomic Theory (p. 300)	2		3	M. Hillebrand
2560263	Seminar on Network Economics (p. 301)	2	W/S	3	K. Mitusch
2561209	Seminar Transport Economics (p. 302)	2	W/S	3	K. Mitusch, E. Szimba
2550131	Seminar in Continous Optimization (p. 299)	2	W/S	3	O. Stein
SemWIOR1	Seminar Stochastic Models (p. 294)	2	W/S	3	K. Waldmann
2550491	Seminar in Discrete Optimization (p. 297)	2	W/S	3	S. Nickel
SemSTAT	Seminar Statistics (p. 293)	2		3	N.N.
SemING	Seminar in Engineering Science (p. 194)	2	W/S	3	Fachvertreter ingenieurwissenschaftlicher Fakultäten
SemIFL	Seminar Conveying Technology and Logistics (p. 274)	2	W/S	3	K. Furmans
21690sem	Seminar paper "Production Engineering" (p. 305)	2	W/S	3	V. Schulze, G. Lanza, J. Fleischer
SemMath	Seminar in Mathematics (p. 222)	2	W/S	3	Fachvertreter der Fakultät für Mathematik
RECHT	Seminar: Legal Studies (p. 303)	2	W/S	3	Inst. ZAR
2573011	Seminar Human Resource Management (p. 276)	2	W/S	3	P. Nieken
2573010	Seminar Human Resources and Organizations (p. 290)	2	W/S	3	P. Nieken
semSTAT1	Applied Econometrics (p. 268)	2	W	3	M. Schienle
2521388	Seminar Data Mining I (p. 270)	2	W	3	G. Nakhaeizadeh

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

Conditions
All modules of the basic program should be completed. For further information see German version.

Qualification Goals

- Students are able to independently deal with a defined problem in a specialized field based on scientific criteria.
- They are able to research, analyze the information, abstract and derive basic principles and regularities from unstructured information.
- They can solve the problems in a structured manner using their interdisciplinary know-how.
- They know how to validate the obtained results.
- Finally, they are able to logically and systematically present the results both orally and in written form in accordance with scientific guidelines (structuring, technical terminology, referencing). They can argue and defend the results professionally in the discussion.

Content
Competences which are gained in the seminar module especially prepare the student for composing the final thesis. Within the term paper and the presentation the student exercises himself in scientific working techniques supported by the supervisor.
Beside advancing skills in techniques of scientific working there are gained integrative key qualifications as well. A detailed description o these qualifications is given in the section "Key Qualifications" of the module handbook.
Furthermore, the module also includes additional key qualifications provided by the KQ-courses.

Workload
See German version.

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

Module: Internship [TVWL3EXPRAK]

Coordination: Der Vorsitzende des Prüfungsausschusses
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

ECTS Credits	Cycle	Duration
10		

Learning Control / Examinations
The assessment is carried out by the evidence of completed full-time internships of at least 12 weeks with at least 20 working hours per week and a presentation of the internship in the form of a written report on the activities.

1. Information on evidence of completed full-time internships:

The internship is proofed by the certificate of the intern's office. The certificate has to be formally correct with official corporate letterhead and handwritten countersigned by a responsible employee of the company.

The certificate must at least contain the following information:

* Company / Location
* Duration: from ... to ...
* Hours of work (weakly)
* Working interruption, indicating the vacation and sick days
* Department
* Headwords to the activitis

2. Information on to the presentation:

The internship report should be at least one page (typewritten, not handwritten) for each Location. It must be countersigned by a representative of the intern's office.

Conditions
Internships, that were completed even before studying may be recognized, if the criteria for recognition are met. After recognition of the compulsory internship, there can be taken a semester off for a voluntary, student-related internship. The possibility is particularly interesting in view of the master programme, which requires internships of at least 12 weeks.
Regarding to the election of the company, in which the internship is completed, there are no specific rules. Beside of banks, public administration or international organizations even large industrial companies be considered, because of the technical profile of the Bachelor Programme.
With a view to the future professional career, it is recommended to absolve the internship in a larger, possibly international company.

Qualification Goals

- has general insight into the essential processes in a company,

- is in a position to identify operation correlations and has the knowledge and skills to facilitate a fast understanding of the processes in the company,

- in addition to practical professional experience and competences, also has key competences such as own initiative, ability to work in a team and communication skills as well as ability to integrate into corporate hierarchies and procedures,

- has the experience to accomplish complex IT and business tasks under realistic conditions within the framework of the relevant legal aspects and while applying the total acquired knowledge (interlaced thinking),

- has an idea of the professional development potential in the economy through pursuit of study-related activities,

- knows the technical and professional requirements in the individually targeted future occupation and can take this knowledge into account for the future planning of his/her studies and career,

- can assess and estimate own technical and professional strengths and weaknesses through his/her evaluation of the company.

Content
Primarily the internship should be done to gain economic and business work experiences. Certainly, the interns are free to integrate technical activities as well. A commercial internship provides an insight into business or administrative processes of business transactions. Therefor departments such as controlling, organizing, marketing and planning appear particularly

suitable. It remains the companies and interns left, which stations and areas the intern will eventually go through. But the focus should always be in accordance with operational realities of the company.

Regarding the election of the company, in which the internship is absolved, there are no specific rules. Beside of banks, public administration or international organizations even large industrial companies be considered, because of the technical profile of the Bachelor Programme.

Workload
See German version.

Remarks
Vacation days are not figured into the internship.
Only three sick leave days may incurred at all. Any additional sick days are not figured into the internship.
A relevant vocational education of at least two years is accepted as a performance equivalent to the internship.

Module: Bachelor Thesis [TVWL3THESIS]

Coordination: Der Vorsitzende des Prüfungsausschusses
Degree programme: Technische Volkswirtschaftslehre SPO 2015 (B.Sc.)

ECTS Credits	Cycle	Duration
12		

Learning Control / Examinations
The Bachelor Thesis is a written exam which shows that the student can autonomously investigate a scientific problem in Economics Enginieering. The Bachelor Thesis is described in detail in § 11 of the examination regulation.
The review is carried out by at least one examiner of the Department of Economics and Management, or, after approval by at least one examiner of another faculty. 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.
The regular processing time takes three months. On a reasoned request of the student, the examination board can extend the processing time of a maximum of on month. If the Bachelor Thesis is not completed in time, this exam is "failed", unless the student is not being responsible (eg maternity leave).
With consent of the examinor the thesis can be written in English as well. Other languages require besides the consent of the examiner the approval of the examination board. The issue of the Bachelor Thesis may only returned once and only within the first month of processing time. A new topic has to be released within four weeks.

The overall grade of the module is the grade of the Bachelor Thesis.

Conditions
Prerequisite for admission to the Bachelor thesis is that the student is usually in the 3rd Academic year (5th and 6th semester) and has at most one of the exams of the core program (according to § 17 paragraph 2 examination regulation) not been completed.

It is recommended to begin the Bachelor Thesis in the 5th or 6th Semester.
A written confirmation of the examinor about supervising the Bachelor's Thesis is required.
Please pay regard to the institute specific rules for supervising a Bachelor Thesis.

The Bachelor Thesis has to contain the following declaration: "I hereby declare that I produced this thesis without external assistance, and that no other than the listed references have been used as sources of information. Passages taken literally or analogously from published or non published sources is marked as this." If this declaration is not given, the Bachelor Thesis will not be accepted.

Qualification Goals
The student can independently work on a relevant topic in accordance with scientific criteria within the specified time frame.
He/she is in a position to research, analyze the information, abstract and identify basic principles and regulations from less structured information.
He/she reviews the task ahead, can select scientific methods and techniques and apply them to solve a problem or identify further potential. 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 clearly structure a research paper and communicate in writing using the technical terminology.

Content
The Bachelor Thesis is the first major scientific work. The topic of the Bachelor Thesis will be chosen by the student themselves and adjusted with the examinor. The topic has to be related to Economics Engineering and has to refer to subject-specific or interdisciplinary problems.

Workload
See German version.

7   Courses

7.1   All Courses

Course: Analysis of Exhaust Gas und Lubricating Oil in Combustion Engines [2134150]

Coordinators: M. Gohl
Part of the modules: Combustion Engines II (p. 67)[TVWL3INGMB35]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Summer term	de

Learning Control / Examinations
Letter of attendance or oral exam (25 minutes, no auxillary means)

Conditions
none

Recommendations
Knowledge in the field of engine technology and measurement techniques is advantageous

Learning Outcomes
The Students can point out the challenges concerning the current emission standards in engine development. They can name and explain the basic principles of measurement techniques and methods to analyse exhaust gas components and components of engine oil. Hence, the students have the ability to choose the right methods for a given Problem and to interpret the results.

Content
The students get involved in the application of different measurement techniques in the field of exhaust gas and lubricating oil analysis. The functional principles of the systems as well as the application areas of the latter are discussed. In addition to a general overview of standard applications, current specific development and research activities are introduced.

Workload
regular attendance: 24 hrs
self study: 96 hrs

Media
Lecture with Powerpoint slides

Literature
The lecture documents are distributed during the courses.

Course: Advanced Topics in Economic Theory [2520527]

Coordinators: M. Hillebrand, K. Mitusch
Part of the modules: Economic Theory (p. 32)[TVWL3VWL12]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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.

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

Literature
The course is based on the excellent textbook "Microeconomic Theory" (Chapters 1-5, 10, 13-20) by A.Mas-Colell, M.D.Whinston, and J.R.Green.

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

Course: Algorithms for Internet Applications [2511102]

Coordinators: H. Schmeck
Part of the modules: Emphasis Informatics (p. 55)[TVWL3INFO1], Electives in Informatic (p. 57)[TVWL3INFO2]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	2/1	lecture + exercise	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.

Workload
The total workload for this course is approximately 150.0 hours. For further information see German version.

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: General and Inorganic Chemistry [5006/5007]

Coordinators: T. Stumpf
Part of the modules: Inorganic Chemistry (p. 28)[TVWL1NW3]

ECTS Credits	Hours per week	Type	Term	Instruction language
7	3/2	lecture + exercise	Winter term	de

Learning Control / Examinations
Assessment is by a written exam lasting 150 min. (Section 4(2), 1 of the Examination Regulations.
The examination is offered in every semester and may be retaken on any official examination date.
Further information about the examination can be found on http://www.aoc.kit.edu/1937.php

Conditions
None.

Recommendations
None.

Learning Outcomes
Basic understanding of inorganic chemistry. Familiarity with the periodic table of elements, atomic structure and the different forms of chemical bonding. Knowledge of the different elements and inorganic compounds, together with their principal chemical behaviour, structures, sources and production.

Content

   • Structure of matter, atomic structure and the periodic table of elements

   • Introduction to chemical bonding

   • Covalent compounds, ionic crystals, metals

   • Chemical reactions, stoichiometry, ideal gas law

   • Chemical equilibria, solubility product

   • Acid-base reactions

   • Redox reactions and electrochemistry

   • Chemistry of the Elements

   • Industrial processes

Workload
The total workload for this course is approximately 210 hours. For further information see German version.

Media
Powerpoint presentations

Literature
Mortimer, Müller: Chemie, Thieme Verlag
Binnewies: Allgemeine und anorganische Chemie, Spektrum Verlag
Riedel: Moderne Anorganische Chemie, de Gruyter Verlag
Hollemann, Wiberg: Lehrbuch der Anorganischen Chemie, de Gruyter Verlag

Remarks
None.

Course: Analysis of multivariate Data [2550550]

Coordinators: O. Grothe
Part of the modules: Statistics and Econometrics (p. 63)[TVWL3STAT1], Econometrics and Economics (p. 29)[TVWL3VWL7]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/2	lecture + exercise	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.

Recommendations
It is recommended to attend the courses *Statistics 1 [2600008]* und *Statistics 2 [2610020]* in advance.

Learning Outcomes
Students

- choose appropriate methods for the illustration of multivariate data, for structure analysis as well as dimension reduction, and apply these.
- apply software.

Content

- Multivariate Data
- Correlation Analysis
- Variance Analysis
- Factor- and Principal Component Analysis
- Discriminant function analysis
- Cluster Analysis

Workload
The total workload for this course is approximately 135 hours.
Lecture: 30 hours
Preparation of lecture: 75 hours
Exam preparation: 30 hours

Media
Script

Literature
see lecture

Remarks
New course starting winter term 2015/2016.
The lecture is offered irregularly. The curriculum of the next three years is available online.

Course: Analytical CRM [2540522]

Coordinators: A. Geyer-Schulz
Part of the modules: CRM and Service Management (p. 45)[TVWL3BWLISM4], Specialization in Customer Relationship
Management (p. 47)[TVWL3BWLISM5]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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
We expect knowledge about data models and the UML modelling language concerning information systems.

Learning Outcomes
The Student

- understands the principal scientific methods from statistics and informatics used in analytical CRM and their application to enterprise decision problems and independently applies these methods to standard cases,
- understands the components for creating and managing a data warehouse from operative system sources including the processes and steps involved and applies these methods to a simple example, and
- uses his knowledge to conduct a standard CRM analysis on enterprise data for a busines decision problem and deduces and justifies a recommendation for appropriate action.

Content
The course Analytical CRM deals with methods and techniques for analysis concerning the management and improval of customer relationships. Knowledge about customers is aggregated and used for enterprise decision problems like product line planning, customer loyality, etc. A necessary precondition for these analyses is the transformation of data stemming from operative systems into a common data warehouse that assembles all necessary information. This requires transformation of data models and processes for creating and managing a data warehouse, like ETL processes, data quality and monitoring. The generation of customer oriented and flexible reports for different business purposes is covered. The course finally treats several different statistical analysis methods like clustering, regression etc. that are necessary for generating important indicators (like customer lifetime value, customer segmenatation). As external data source, customer surveys are introduced.

Workload
The total workload for this lecture will amount to approximately 135 hours (4.5 credits).
\begin{tabular}{lcr}
\hline
\textbf{Activity} & & \textbf{Workload} \\
\hline
Attendance time & & \\

Attendance of lecture & 15 x 90min & 22h 30m \\
Attendance of exercise & 7 x 90min & 10h 30m \\
\hline
Self-study & & \\
Preparation of lecture & & 22h 30m \\
Wrap-up of lecture & & 22h 30m \\
Preparation of excercise& & 25h 00m \\
Preparation of assessment & & 31h 00m \\
\hline
Assessment & & 1h 00m \\
\hline
\hline
Sum & & 135h 00m \\
\end{tabular}

Media
slides

Literature
Ponnia, Paulraj. Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals. Wiley, New York, 2001.
Duda, Richard O. und Hart, Peter E. und Stork, David G. Pattern Classification. Wiley-Interscience, New York, 2. Ausgabe, 2001.
Maddala, G. S. Introduction to Econometrics. Wiley, Chichester, 3rd Ed., 2001.
Theil, H. Principles of Econometrics. Wiley, New York, 1971.

Remarks
The lecture ultimately takes place in summer term of 2014. Afterwards the lecture is hold in alternation with "2540520 - Operative CRM". The current schedule can be seen on the chair's website (http://www.em.uni-karlsruhe.de/studies/).

Course: Applied Informatics I - Modelling [2511030]

Coordinators: A. Oberweis, Y. Sure-Vetter
Part of the modules: Emphasis Informatics (p. 55)[TVWL3INFO1], Electives in Informatic (p. 57)[TVWL3INFO2]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	2/1	lecture + exercise	Winter term	de

Learning Control / Examinations
The assessment consists of 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 strengths and weaknesses of various modeling approachesfor Information Systems and choose an appropriate method for a given problem,
- create UML models, ER models and Petri nets for given problems,
- model given problems in Description Logics and apply description logic rules,
- describe the main ontology concepts and languages and explain SPARQL queries,
- create and evaluate a relational database schema and express queries in relational algebra.

Content
In the context of complex information systems, modelling is of central importance, e.g. – in the context of systems to be developed – for a better understanding of their functionality or in the context of existing systems for supporting maintenance and further development.
Modelling, in particular modelling of information systems, forms the core part of this lecture. The lecture is organized in two parts. The first part mainly covers the modelling of static aspectes, the second part covers the modelling of dynamic aspects of information systems.
The lecture sets out with a definition of modelling and the advantages of modelling. After that, advanced aspects of UML, the Entity Relationship model (ER model) and description logics as a means of modelling static aspects will be explained. This will be complemented by the relational data model and the systematic design of databases based on ER models. For modelling dynamic aspects, different types of petri-nets as well as well as event driven process chains together with their respective analysis techniques will be introduced.

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

Media
Slides.

Literature

- Bernhard Rumpe. Modellierung mit UML, Springer-Verlag, 2004.
- R. Elmasri, S. B. Navathe. Fundamentals of Database Systems. Pearson Education 2009.
- W. Reisig. Petrinetze, Springer-Verlag, 2010.

Elective literature:

- Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, York Sure: Semantic Web - Grundlagen, Springer, 2008 (ISBN 978-3-540-33993-9)
- Staab, Studer: Handbook on Ontologies, Springer, 2003
- J.L. Peterson: Petri Net Theory and Modeling of Systems, Prentice Hall, 1981.
- Franz Baader, Diego Calvanese, Deborah McGuinness, Daniele Nardi, Peter Patel-Schneider. The Description Logic Handbook - Theory, Implementation and Applications, Cambridge 2003.

Course: Applied Informatics II - IT Systems for e-Commerce [2511032]

Coordinators: J. Zöllner, N.N.
Part of the modules: Emphasis Informatics (p. 55)[TVWL3INFO1], Electives in Informatic (p. 57)[TVWL3INFO2]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	2/1/1	lecture + exercise + tutorial	Summer 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 successful completion of the compulsory exercises is prerequisite for the admission to the written exam.
The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Recommendations
Knowledge of content of the module [WI1INFO].

Learning Outcomes
The student learns about concepts and technologies for designing big, distributed application architectures. Students apply industry-relevant technology to solve application-oriented problems in lab classes.

Content
The course Applied Informatics II [2511032] covers various facets of electronic commerce which have to be supported by adequate and efficient distributed information systems. Key topics are middleware technologies and distributed application architectures. Document description and exchange (incl. XML), Java EE, Web technologies, and Web services are additional topics.

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

Media
Slides, internet resources.

Literature
Tba in the lecture.

Course: Facilities and Rolling Stock [6234802]

Coordinators: E. Hohnecker
Part of the modules: Basics of Track Guided Transport Systems (p. 78)[TVWL3INGBGU4]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	1/1	lecture + exercise	Summer term	de

Learning Control / Examinations
See German version.

Conditions
See module description.

Learning Outcomes
See German version.

Content
stations and terminals for passengers and freight, basics of rolling stock and electrical drive

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Remarks
See German version.

Course: Inorganic Chemistry Practical [5043/5046]

Coordinators: C. Anson
Part of the modules: Inorganic Chemistry (p. 28)[TVWL1NW3]

ECTS Credits	Hours per week	Type	Term	Instruction language
7	0/6/2	practical course	Summer term	de

Learning Control / Examinations
Assessment is by the total marks obtained for analysis results and laboratory reports. ("assessment other than by examination": Section 4(2), 3 of the Examination Regulations).

Conditions
The lecture course *General and Inorganic Chemistry* is compulsory, and the examination must be passed before taking the Practical Class.

Recommendations
None.

Learning Outcomes
The safe handling of chemicals; the ability to carry out simple qualitative analyses, a deepening of the theoretical basics.

Content

- Hazards and safety in the laboratory
- Simple chemical working techniques
- Specific reactions, separations and determinations of anions and cations
- The practical application of fundamental principles of the separation of substances, redox chemistry, acid-base reactions and complex formation in qualitative analysis.

Workload
The total workload for this course is approximately 210.0 hours. For further information see German version.

Media
Powerpoint presentations

Literature
Jander-Blasius: „Einführung in das anorganisch-chemische Praktikum (Einschließlich der quantitativen Analyse)", S. Hirzel Verlag (15th edition, 2005) ISBN-10: 3-7776-1364-9

Remarks
The Inorganic Chemistry Practical Class consists of the Practical Class itself (6 SWS) and the Seminar for the Practical (2 SWS). It takes place in the semester break after the end of the summer semester, and lasts two weeks. The seminar takes place during the Practical Class Seminar (Block) und findet in den Semesterferien nach dem Sommersemester statt. The dates of the Practical will be announced by the Institute of Inorganic Chemistry.
It is necessary to obtain some laboratory equipment.
Further information on www.aoc.kit.edu/1179.php

Course: Application of technical logistics in modern crane systems [2117064]

Coordinators: M. Golder
Part of the modules: Introduction to Technical Logistics (p. 64)[TVWL3INGMB13]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Winter term	de

Learning Control / Examinations
oral, approx. 20min, appointment after acknowledgement

Conditions
none

Recommendations
technical interest; Beneficial: Knowledge of the lecture 'Technical logistics I, basics'

Learning Outcomes
Students are capable to

- explain and apply relevant terms and their definitions like load, stress and strain
- name technical rules and standards applicable in crane design
- explain and discuss the importance of safety factors and dynamic factors
- name and describe the required verification measures in crane design
- describe the objective, approach and aspects when transferring the dynamic behavior of a crane into an elasto-kinetic model
- transfer the approach of dimensioning a bridge crane to any other material handling equipment

Content
Fundamentals of modern (bridge) crane design

- Content and application of relevant technical rules, standards and guidelines
- Terminology, definitions, dimensioning methods and verification measures in (bridge) crane design
- Concept of safety and dynamic factors
- Dimensioning of a bridge crane considering operating conditions, classification of different crane components as well as safety factors and dynamic factors
- Environmental factors on a crane system regarding strain, stability and fatigue strength
- Elasto-kinetic modelling of the dynamic behavior of a crane system and its quality

Workload
regular attendance: 21 hours
self-study: 99 hours

Media
presentations, black board

Literature
None.

Remarks

Course: Application of technical logistics in sorting- and distribution technology [2118089]

Coordinators: J. Föller
Part of the modules: Introduction to Technical Logistics (p. 64)[TVWL3INGMB13]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam according to §4 (2), 2 of the examination regulation. It may be a written exam (according to §4 (2), 1 of the examination regulation) in the case of large number of participants.

Conditions
None.

Recommendations
None.

Learning Outcomes
Students are able to:

- Describe and classify basics and characteristics of application of sorting and distribution of goods,
- Solve drive and control tasks with appropriate concept selection,
- Design systems with appropriate calculation methods and evaluate them financially, and
- Judge about the confirmity of the system by using relevant standards and set of rules.

Content
Basics of goods sorting and distribution technology, employment characteristics, classification, interpretation, dimensioning, costs considerations. Relevant control, modern sets of rules and propulsion principles

Workload
regular attendance: 21 hours
self-study: 99 hours

Media
presentations, black board

Literature
None.

Remarks

Course: Employment Law I [24167]

Coordinators: A. Hoff
Part of the modules: Private Business Law (p. 84)[TVWL3JURA5]

ECTS Credits	Hours per week	Type	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.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

Literature
tba at the beginning of the course.

Course: Employment Law II [24668]

Coordinators: A. Hoff
Part of the modules: Private Business Law (p. 84)[TVWL3JURA5]

ECTS Credits	Hours per week	Type	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.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

Literature
Tba at the beginning of the course.

Course: Topics   of   Sustainable   Management   of   Housing   and   Real   Estate [2585420/2586420]

Coordinators: T. Lützkendorf, D. Lorenz
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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.

Conditions
None.

Learning Outcomes

- Students autonomously compile a paper treating of a marked-off subject within the area of real estate economics respectively sustainable construction, and present their results within the seminar.

- Therefore they master the principles of scientific writing, especially research, reasoning and citation, as well as handling information suspiciously.

- Through own and observed experiences they develop the ability to hold scientific presentations, including technical, formal, rethorical and didactical aspects.

Content
The seminar deals with changing up-to-date topics concerning Real Estate Economics or Sustainable Construction.
Current topics and schedules are announced at the beginning of term.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Media
A reader dealing with the basics of scientific writing is provided (in german language).

Course: Asset Management [2530219]

Coordinators: A. Sauer
Part of the modules: Topics in Finance I (p. 39)[TVWL3BWLFBV5], Topics in Finance II (p. 40)[TVWL3BWLFBV6]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	lecture	Winter 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.

Recommendations
Proficiency of the topics covered in the course "Investments" is required.

Learning Outcomes
Students are able to name the terms and definitions of professional asset management. They are able to structure, formally describe and analyze problems of professional asset management. Students are in a position to apply the instruments and methods of asset management.

Content
The course familiarizes students with the instruments, methods and terms of professional asset management. It conveys the knowledge of applying the relevant methods to students via practical exercises.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Media
Slides.

Literature
Investments and Portfolio Management,
Zvi Bodie, Alex Kane, Alan J. Marcus,
Mcgraw-Hill Publ.Comp., 9. Auflage (2011)
The Theory and Practice of Investment Management: Asset Allocation, Valuation, Portfolio Construction, and Strategies
Frank J. Fabozzi, Harry Markowitz
John Wiley & Sons; 2. Auflage (2011)

Course: Auction & Mechanism Design [2560550]

Coordinators: N. Szech
Part of the modules: Economic Theory (p. 32)[TVWL3VWL12], Applied Microeconomics (p. 33)[TVWL3VWL13]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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.
Students can earn a bonus to the final grade by successfully participating in the exercises.

Conditions
None.

Recommendations
Basic knowledge of microeconomics and statistics are recommended. A background in game theory is helpful, but not absolutely necessary.

Learning Outcomes
The students

- can analyze strategic behavior in auctions;

- can compare auction formats with regard to efficiency and revenue;

- are familiar with the basic theory of (Bayesian) mechanism design;

- master the revenue equivalence theorem for standard auctions;

- can apply mechanism design to one object auctions and bilateral trade.

Content
The course starts with the basic theory of equilibrium behavior and revenue management in one object standard auctions. The revenue equivalence theorem for standard auctions is introduced. Thereafter, the course focuses on mechanism design and its applications to one object auctions and bilateral trade.

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

Literature
Krishna, V.: Auction Theory, Academic Press, 2009.
Milgrom, P.: Putting Auction Theory to Work, Cambridge University Press, 2010.
Mathews, S.: A Technical Primer on Auction Theory I: Independent Private Values No. 1096. Northwestern University, Center for Mathematical Studies in Economics and Management Science, 1995.

Remarks
The lecture will be held in English.

Course: Engineering, Design and Operation of Power Transformers [23390]

Coordinators: M. Schäfer
Part of the modules: Energy Generation and Network Components (p. 75)[TVWL3INGETIT4]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2/0	lecture	Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam (20 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 summer semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
Students know the basics of electromagnetic lay-out design of power transformers as being used in power transformers. They know the design, the components and the technology being used, as well as the used material. The operating performance of power transformers can be calculated. Important aspects for the operation and maintenance of power transformers are known. Students are familiar with the major maintenance measures and are capable to adopt their knowledge onto other high-voltage equipment.

Content
The lectue is divided into the following clauses

- Applications and design variations of power transformers

- Components and design of power transformers

- Working principle of power transformers and shunt reactors. Induction law and its application for the precalculation of transformers. The magnetic field in iron coress, core designs, variations and air gaps in magnetic circuits. Magnetic materials and their properties, application in transformers and shunt reactors. Main and stray flux in transformers and calculation of the equivalent circuit. Stresses inside transformers during inrush and short circuits.

- Winding connections and vector groups of transformers,three phase power system, connected voltages and line to earth voltage, description of three phase systems, parallel connection of transformers.

- Precalculation of transformers.

- Losses in transformers and its origins in core and in the windings. Possible measures to influence loss generation. Cooling systems and its applications.

- High voltage DC transformers

- Factory testing of transformers. Persformance of type tests, standard test and special tests.

- Ovaerload capability of transformaer. Controlled overloading and emergency overload.

- Cervive and monitoring.

- Future trends and research and development activities.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Media
The material is distributed during any lecture

Remarks
The course consists of seven lecture blocks and one factory visit. Date and time is announced on the blackboards.

Course: Selected Applications of Technical Logistics [2118087]

Coordinators: M. Mittwollen, Madzharov
Part of the modules: Introduction to Technical Logistics (p. 64)[TVWL3INGMB13]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	3	lecture + exercise	Summer term	de

Learning Control / Examinations
after each lesson period; oral / written (if necessary) => (look at "Studienplan Maschinenbau", latest version)

Conditions
look at Empfehlungen (en)

Recommendations
GTL/ESTL should be visited in advance, knowledge out of GTL/ESTL preconditioned

Learning Outcomes
Students are able to:

- Model the dynamic behaviour of material handling systems and based on this calculate the dynamical behaviour and

- Transfer this approach autonomous to further, different material handling installations and

- Discuss the knowledge with subject related persons.

Content
design and dimension of machines from intralogistics // static and dynamic behaviour // operation properties and specifics // visit of real intralogistic system
Inside practical lectures: sample applications and calculations in addition to the lectures

Workload
The total workload for this course is approximately 120 hours. For further information see German version.

Media
supplementary sheets,projector, blackboard

Literature
Recommendations during lessons

Remarks
-

Course: Selected Applications of Technical Logistics and Project [2118088]

Coordinators: M. Mittwollen, Madzharov
Part of the modules: Introduction to Technical Logistics (p. 64)[TVWL3INGMB13]

ECTS Credits	Hours per week	Type	Term	Instruction language
6	4		Summer term	de

Learning Control / Examinations
Lesson: after each lesson period; oral / written (if necessary) => (look at "Studienplan Maschinenbau"); (counts two-thirds);
Project: presentation, marked (counts one third)

Conditions
none

Recommendations
GTL/ESTL should be visited in advance, knowledge out of GTL/ESTL preconditioned

Learning Outcomes
Students are able to:

- Model the dynamic behaviour of material handling systems and based on this calculate the dynamical behaviour and

- Transfer this approach autonomous to further, different material handling installations,

- Discuss the knowledge with subject related persons and

- Judge about systems in place and justify it in front of subject related persons.

Content
design and dimension of machines from intralogistics // static and dynamic behaviour // operation properties and specifics // visit of real intralogistic system // self manufactured project report
Inside practical lectures: sample applications and calculations in addition to the lectures
Self manufacturing of a project report to recesses the topic.

Workload
The total workload for this course is approximately 180 hours. For further information see German version.

Media
supplementary sheets,projector, blackboard

Literature
Recommendations during lessons

Course: Selected Topics on Optics and Microoptics for Mechanical Engineers [2143892]

Coordinators: T. Mappes
Part of the modules: Microsystem Technology (p. 73)[TVWL3INGMBIMT1]

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

Learning Control / Examinations
The assessment will consist of a oral exam (20 min) (following §4 (2), 2 of the examination regulation.

Conditions
None.

Recommendations
None.

Learning Outcomes
See German version.

Content

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

Course: Selected Topics in Public Management and Governance [n.n.]

Coordinators: B. Wigger, N. Edwards
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	Winter term	en

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Recommendations
Prior knowledge of public management and public governance, as evidenced by participation in courses such as Introduction to Public Management and Case Studies in Public Management, is strongly recommended.

Learning Outcomes
The student will demonstrate an advanced understanding of key topics dealt with in the seminar.

Content
Selected topics in public management and governance.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Media
Academic journal articles

Literature
Will be announced on Ilias.

Course: Automation of Power Grids [23396]

Coordinators: R. Eichler
Part of the modules: Energy Generation and Network Components (p. 75)[TVWL3INGETIT4]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2/0	lecture	Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam (20 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 summer semester. Re-examinations are offered at every ordinary examination date.

Conditions
Basic knowledge of power transmission and distribution; basic knowledge of IT

Learning Outcomes
The students understand methods, equipment, standards, current and future technology, state-of-the-art and trends of power systems control from a global (i.e. worldwide) perspective. They are able to identify problems related to power system control and to develop solution approaches. They have acquired an understanding of interrelationships from both physical and IT points of view, and they are able to describe power system control problems using the subject-specific terminology.

Content
This lecture presents an introduction to the important theoretical fundamentals of digital system design, which is scheduled for the students in the first semester of Electrical Engineering. Since the lecture cannot be based on student's knowledge of circuit technology, it focuses on abstract models for behaviours and structures. In addition the lecture will also relay the fundamentals, which are needed in other lectures.

At first the lecture delves into important conceptual information and shows that digital system design represents a special technical solution for the treatment of information. After this the concept of a system will be introduced and illustrated that complex systems require a hierarchical partitioning in order to be able to understand and design them. Based on this it can be concluded then that system design can be understood as a repeated transformation from descriptions of behaviour to descriptions of structure.

The terms message and signal are subject matter of a further chapter. Starting from time and amplitude continuous signals, simple time and value discrete binary signal representations will be introduced, as well as more complex signal forms derived from binary signals.

The representation of information by signals presupposes or implies an "agreement of allocation" between distinguishable elements of information representation and signal representation, the so-called codes. Therefore the lecture delivers the fundamental concepts of codes & coding and describes a few important classes & types of codes, which serve some of the following uses: analog/digital conversion for interfaces, error detection & error correction for numerical purposes, and optimal representation of information and/or signals. Code conversion and related topics finalize the consideration of this topic.

Formal and mathematical fundamentals will be treated in an extensive chapter. To begin the subject matter of the lecture is comprised of sets and quantities, the operations on these quantities, as well as the relations between set elements.

Afterwards several fundamentals of graph theory are introduced. It will be shown that logic algebra can serve as a basis for special Boolean algebra. Building upon the associated rules the concept of switching functions, their graphical representation and classification, the standard theories, and important basis systems for the representation of Boolean expressions will be derived and considered. Expansion theory, the computation with allocation blocks and terms, as well as measures for minimization are further topics of this chapter.

Having the formal basics available, applicable technical components and structures will be developed on the basis of binary switches, which allow for a direct conversion of formal relationships into solutions. Gates, circuit networks, synchronized sequential circuits, as well as specially derived functional units such as counters, registers, and digital memories lead to complex structures. The "All-purpose Computer" from J. von Neumann will be particularly dealt with.

To accompany the lecture material, assignments and the corresponding solutions will be given out and discussed during lecture hall exercises. Furthermore tutorials in small study groups will be held to deepen the understanding of the curriculum and methods taught. Furthermore computer exercises are offered in which digital circuits and their pattern of behaviour will be modeled and simulated with the help of the program LogicWorks.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Media
Slides of the lecture presentation.

Literature
Elective literature:

- Dieter Rumpel, Ji R. Sun: Netzleittechnik. Informationstechnik für den Betrieb elektrischer Netze Springer; Berlin (Januar 1989)
- Ernst-Günther Tietze: Netzleittechnik 1. Grundlagen; VWEW Energieverlag GmbH
- Ernst-Günther Tietze: Netzleittechnik Teil 2: Systemtechnik; VDE-Verlag
- Allen J. Wood, Bruce F. Wollenberg: Power Generation, Operation, and Control; Wiley-Interscience; 2nd edition (January 1996)
- Stuart A. Boyer: SCADA: Supervisory Control and Data Acquisition; ISA 3rd edition (June 2004)

Course: Bachelor Seminar in Information Engineering and Management [2540524]

Coordinators: A. Geyer-Schulz
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations
The assessment of this course is according to §4(2), 3 of the examination regulation in form of the written seminar thesis and a presentation.
The final mark is given, if the written seminar thesis was handed in as well as the presentation was held.
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 module description.

Recommendations
At least one of the following lectures should be successfully completed:

- *Customer Relationship Management* [2540508]

- *Analytic CRM* [2540522]

- *Operative CRM* [2540520]

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 write his seminar thesis (and later on, the bachelors/masters thesis) with the text setting system LaTeX and include format requirements as used by scientific publishers.

- to do a presentation in an adequate scientific manner.

- to write down the results of his investigations in the form of scientific publications.

Content
This seminar serves as an introduction into the process of scientific work. Students write a review for a selected scientific article. A profound literature search is required to judge the article. The review is written with LaTeX by using formating styles similiar to those of scienfitic publishers.
The seminar treats questions of Customer Relationship Management.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
A CRM-specific article is assigned to every student participating in this seminar. The chosen articles are published in the beginning of every term.
Elective literature:

- W. Thomson. A Guide for the Young Economist. The MIT Press, 2001

- D.J. Brauner, H.-U. Vollmer. Erfolgreiches wissenschaftliches Arbeiten. Verlag Wissenschaft & Praxis, 2004

- University of Chicago Press. The Chicago Manual of Style. University of Chicago Press, 13th ed., 1982

- American Psychological Association. Concise of Rules of APA Style. American Psychological Association, 2005

- American Psychological Association. Publication Manual of the American Psychological Association. American Psychological Association, 2001

Course: Construction Technology [6200409]

Coordinators: S. Haghsheno, S. Gentes
Part of the modules: Fundamentals of construction (p. 77)[TVWL3INGBGU3]

ECTS Credits	Hours per week	Type	Term	Instruction language
6	4	lecture + exercise	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
See German version.

Content

Workload
The total workload for this course is approximately 180 hours. For further information see German version.

Course: Design and Construction of Buildings [2586404]

Coordinators: T. Lützkendorf
Part of the modules: Design, Construction and Sustainability Assessment of Buildings (p. 50)[TVWL3BWLOOW1]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	Winter 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 two times only in the semester in which the lecture is takes place (winter semester). Re-examinations are offered at every ordinary examination date.

Conditions
None.

Recommendations
A combination with the module *Real Estate Management* [TVWL3BWLUO1] and with engineering science modules in the area of building physics and structural design is recommended.

Learning Outcomes
The student

- has an in-depth knowledge of aspects of energy-saving, resource-saving and health-oriented design, construction and operation of buildings (design for environment)

- has a critical understanding of the essential requirements, concepts and technical solutions for green buildings

- is able to integrate aspects of energy-saving, resource-saving and health-conscious construction into a holistic environmental design approach and to assess the advantages and disadvantages of different individual solutions.

Content
Taking low-energy buildings as an example the course is an introduction to cheap, energy-efficient, resource-saving and health-supporting design, construction and operation of buildings. Questions of the implementation of the principles of a sustainable development within the building sector are discussed on the levels of the whole building, its components, building equipment as well as the materials. Besides technical interrelationships basics dimensioning and various approaches to ecological and economical assessment play a role during the lectures, as well as the different roles of people involved into the building process. Topics are the integration of economical and ecological aspects into the design process, strategies of energy supply, low-energy and passive buildings, active and passive use of solar energy, selection and assessment of construction details, selection and assessment of insulation materials, greened roofs plus health and comfort.

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

Media
For a better clearness videos and simulation tools will be presented during the lectures.

Literature
Elective literature:
See german version.

Course: Sustainability Assessment of Buildings [2585404]

Coordinators: T. Lützkendorf
Part of the modules: Design, Construction and Sustainability Assessment of Buildings (p. 50)[TVWL3BWLOOW1]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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 two times only in the semester in which the lecture is takes place (summer semester). Re-examinations are offered at every ordinary examination date.

Conditions
None.

Recommendations
A combination with the module *Real Estate Management* [TVWL3BWLOOW2] and with engineering science modules from the areas building physics and structural designis recommended.

Learning Outcomes
The student

- has an in-depth knowledge of the classification of environmental design and construction of buildings within the overall context of sustainability

- has a critical understanding of the main theories and methods of assessing the environmental performance of buildings

- is able to use methods and tools to evaluate the environmental performance in design and decision processes or to interpret existing results

Content
The course identifies problems concerning the economical and environmental assessment of buildings along their lifecycle and discusses suitable procedures and tools supporting the decision making process. For example, the course addresses topics like operating costs, heat cost allocation, comparisons of heating costs, applied economical assessment methods, life cycle assessment as well as related design and assessment tools (e.g. element catalogues, databases, emblems, tools) and assessment procedures (e.g. carbon footprint, MIPS, KEA), which are currently available.

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

Literature
Elective literature:
See german version.

Course: Design Basics in Highway Engineering [6200407]

Coordinators: R. Roos
Part of the modules: Mobility and Infrastructure (p. 76)[TVWL3INGBGU1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2/0	lecture + exercise	Summer term	de

Learning Control / Examinations
See module description.

Conditions
See module description.

Recommendations
None.

Learning Outcomes
Provision of first insights into methodologies and techniques in the fields of highway design and road construction.

Content

- Highway design
- Road network layout
- Driving dynamics
- Fundamental principles of highway design in location, elevation and cross section
- Road construction
- Earthworks (requirements and test methods)
- Pavements (structure, construction methods and requirements)
- Pavement design according to the German guideline RStO

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Media
Lecture notes are provided for download (infomation will be made available in the lecture).

Course: Operation [6234801]

Coordinators: E. Hohnecker
Part of the modules: Basics of Track Guided Transport Systems (p. 78)[TVWL3INGBGU4]

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

Learning Control / Examinations
See German version.

Conditions
See module description.

Learning Outcomes
See German version.

Content
Operation systems, signalling systems, operation schedule and timetable construction

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Elective literature:
Fiedler: Grundlagen der Bahntechnik, Werner Verlag Düsseldorf
Pachl: Systemtechnik des Schienenverkehrs, Teubner-Verlag, Stuttgart

Remarks
See German version.

Course: Fuels and Lubricants for Combustion Engines [2133108]

Coordinators: B. Kehrwald
Part of the modules: Combustion Engines II (p. 67)[TVWL3INGMB35]

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

Learning Control / Examinations
oral examination, Duration: ca. 25 min., no auxiliary means

Conditions
None.

Recommendations
None.

Learning Outcomes
The students can name and explain composition and meaning of fuels, lubricants and coolants as important components in the system of todays Otto and Diesel engines as well as definition and chemical composition of fuels and lubricants, the meanig of crude oil as basic primary product, production processes, major properties, standards and specifications, testing methods.
They can point out future worldwide trends in the field of conventional and alternative fuels regarding emission standards and energy conservation

Content
Introduction and basics

Fuels for Gasoline and Diesel engines

Hydrogen

Lubricants for Gasoline and Diesel engines

Coolants for combustion engines

Workload
regular attendance: 24 hours
self-study: 96 hours

Literature
Lecturer notes

Course: Business Administration: Finance and Accounting [2610026]

Coordinators: M. Ruckes, M. Uhrig-Homburg
Part of the modules: Fundamentals of Business Administration 1 (p. 16)[TVWL1BWL2]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2/0/2	lecture + tutorial	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
Students

- are able to valuate bonds and cash flows in general,
- can valuate stocks,
- can make investment decisions,
- can analyse portfolios,
- are able to recognise business events in financial reports,
- can determine depreciation expenses,
- are able to valuate inventories,
- can analyse costs,
- knows the difference between financial and management accounting,
- knows cost center accounting,
- can estimate product costs.

Content

- **Investment and Finance:**
    - Valuation of Bonds and Stocks
    - Capital Budgeting
    - Portfolio Theory
- **Financial Accounting**
- **Management Accounting**

Workload
The total workload for this course is approximately 120 hours. For further information see German version.

Literature
Extensive bibliographic information will be given in the materials to the lecture.

Remarks
Key qualifications can be shown in an active participation through presentations of solutions and discussions in the tutorials which accompany the course. Each part of the course is taught by instructors specialised in the field of that part.

Course: Business Administration: Production Economics and Marketing [2600024]

Coordinators: M. Ruckes, W. Fichtner, M. Klarmann, Th. Lützkendorf, F. Schultmann
Part of the modules: Fundamentals of Business Administration 2 (p. 17)[TVWL1BWL3]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2/0/2	lecture + tutorial	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (90 minutes) according to Section 4(2), 1 of the examination regulation.

Conditions
None.

Learning Outcomes
Students

- are able to analyse and implement the marketing strategy and marketing measures (marketing mix: 4 Ps),
- can analyse, implement and manage procurement and production processes,
- are able to plan projects, and
- have skills about selected issues in energy economics.

Content
The course is made up of the following topics:
Marketing

- Foundations of marketing
- Strategic marketing
- Cosumer behaviour
- Product
- Price
- Promotion
- Sales
- Marketing Metrics

Production economics
In the part of production economics the student will learn basics in the field of production theory, procurement and resource aquisitions, production and operations management and industrial engineering.
Aspects of energy economics, technological foresights, construction industry and real estate markets will be treated.

Workload
The total workload for this course is approximately 120 hours. For further information see German version.

Literature
Further literature references are announced in the materials to the lecture.

Remarks
Key qualifications can be shown in an active participation through presentations of solutions and discussions in the tutorials which accompany the course.
Each part of the course is taught by instructors specialised in the field of that part.

Course: Business Administration: Strategic Management and Information Engineering and Management [2600023]

Coordinators: M. Ruckes, P. Nieken, H. Lindstädt, Ch. Weinhardt
Part of the modules: Fundamentals of Business Administration 1 (p. 16)[TVWL1BWL2]

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

Learning Control / Examinations
The assessment consists of a written exam (90 min.) according to Section 4(2), 1 of the examination regulation.
The assessment takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
Students

  - can explain, why firms exists,

  - are able to make rational decisions under uncertainty,

  - have skills about legal forms of firms,

  - can analyse, develop, and implement strategies.

  - can analyse organisational structures,

  - are able to analyse auctions,

  - understand special characteristics of information goods, and

  - know how security prices are determined in stock exchanges.

Content
The following topics are treated:
Foundations of Business Administration

  - Economic Principle

  - Business administration as science

  - Firm and company

  - Functions in firms

  - Constitutional decisions in firms

  - Die curraxit AG - a case study for the core program

Strategic Management

  - Mangarial decisions in firms

  - Corporate Governance

  - Organization of the firm

  - Foundations of strategic management

Information Engineering and Management

  - Digital economies and services

  - Auctions

  - Service markets und network effects

  - Information processing on financial markets

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Further literature references are announced in the materials to the lecture.

Course: Civil Law for Beginners [24012]

Coordinators: T. Dreier, O. Knöfel
Part of the modules: Introduction to Civil Law (p. 21)[TVWL1JURA1]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	4/0		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
The Students grasp the differences between civil law, public law and criminal law. In particular, students know the fundamental notions and constructions of Civil law as laid down in the German Civil Code (Bürgerliches Gesetzbuch, BGB), such as subjects and objects of law, legally binding declarations, the formation of contracts, standard terms and conditions, consumer protection, performance of contractual promises etc. Students are able to recognize the legal problems of a given factual situation and develop solutions to simple legal problems.

Content
The course starts with a general introduction into law. What is law, why are legal rules valid, and what is the role of law in conjunction with social behavior, technological and market developments? What is the relationship between law and justice? Moreover, the distinction between civil law, public law and criminal law will be highlighted. The basics of jurisdiction, international conflicts and alternative dispute settlement will be discussed. The main focus of the course is on the fundamental notions of civil law as defined and regulated in the German Civil Code (Bürgerliches Gesetzbuch, BGB), such as subjects and objects of law, legally binding declarations, agency, the formation of contracts, standard terms and conditions, consumer protection, performance of contractual promises. The course ends with an outlook to the law of contracts and property law.

Workload
The total workload for this course is approximately 120.0 hours. For further information see German version.

Media
Transparencies/Slides

Literature
Tba at the beginning of the course,
Elective literature:
Tba at the beginning of the course,

Course: Advanced Civil Law [24504]

Coordinators: T. Dreier
Part of the modules: Commercial Law (p. 82)[TVWL3JURA2]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2/0		Summer term	de

Learning Control / Examinations
The assesment ist explained in the module description.

Conditions
The course *Civil law for beginners* [24012] is required.

Learning Outcomes
Following what the students have learned in the course *Civil law for beginners* about the basic notions of law and, in particular, the general part of the German Civil Code (Bürgerliches Gesetzbuch, BGB), in this course the students shall acquire knowledge of contract and of property law. They will learn about the statutory regulation of place, time and modalities of the performance of contractual duties, as well as the statutory rules governing defaults of performing contractual promises (impossibility of performance; non-performance; delayed performance, defective performance). In addition the students will be presented with the different types of contracts and with both liability for fault and strict liability. As far as property law is concerned, the students shall understand the different types of transfer of ownership and of securities the German Civil Code provides for.

Content
Following what the students have learned in the course Civil law for beginners about the basic notions of law and, in particular, the general part of the German Civil Code (Bürgerliches Gesetzbuch, BGB), in this course the students shall acquire knowledge of contract and of property law. On the one hand, this includes the statutory rules on place, time and modalities of performance, and the statutory rules governing defaults of performing contractual promises (impossibility of performance; non-performance; delayed performance, defective performance). On the other hand, the statutory types of contracts will be discussed (in particular, sale, lease, contract for work and contract for services, lending and borrowing) as well as new types of combined contracts (e.g., leasing, factoring, computer contracts). Moreover, legal liability will be discussed both with regard to liability for fault and with regard to strict liability. As regards property law, possession and ownership will be discussed as well as the different forms of transfer of ownership and the most important of the security rights.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

Media
Transparencies/Slides

Literature
Tba at the beginning of the course.
Elective literature:
tba at the beginning of the course

Course: BioMEMS - Microsystems Technologies for Life-Sciences and Medicine II [2142883]

Coordinators: A. Guber
Part of the modules: Microsystem Technology (p. 73)[TVWL3INGMBIMT1]

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

Learning Control / Examinations
The assessment will consist of a oral exam (30 min) (following §4 (2), 2 of the examination regulation).

Conditions
None.

Recommendations
It is recommended to attend course BioMEMS I [2141864] beforehand.

Learning Outcomes
The lecture will first shortly address some relevant microtechnical manufacturing methods. Then,
selected biomedical applications will be presented, as the increasing use of
microstructures and microsystems in Life-Sciences und in medicine leads to improved medico-technical
products, instruments, and operation and analysis systems.

Content
Examples of use in Life-Sciences and biomedicine: Microfluidic Systems:
LabCD, Protein Cristallisation
Microarrys
Tissue Engineering
Cell Chip Systems
Drug Delivery Systems
Micro reaction technology
Microfluidic Cells for FTIR-Spectroscopy
Microsystem Technology for Anesthesia, Intensive Care and Infusion
Analysis Systems of Person´s Breath
Neurobionics and Neuroprosthesis
Nano Surgery

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

Media
Lecture script

Literature
Menz, W., Mohr, J., O. Paul: Mikrosystemtechnik für Ingenieure, VCH-Verlag, Weinheim, 2005

Buess, G.: Operationslehre in der endoskopischen Chirurgie, Band I und II;
Springer-Verlag, 1994
M. Madou
Fundamentals of Microfabrication

Course: BioMEMS - Microsystems Technologies for Life-Sciences and Medicine III [2142879]

Coordinators: A. Guber
Part of the modules: Microsystem Technology (p. 73)[TVWL3INGMBIMT1]

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

Learning Control / Examinations
The assessment will consist of a oral exam (30 min) (following §4 (2), 2 of the examination regulation).

Conditions
None.

Recommendations
It is recommended to attend course BioMEMS I [2141864] beforehand.

Learning Outcomes
The lecture will first shortly address some relevant microtechnical manufacturing methods. Then,
selected biomedical applications will be presented, as the increasing use of
microstructures and microsystems in Life-Sciences und in medicine leads to improved medico-technical
products, instruments, and operation and analysis systems.

Content
Examples of use in minimally invasive therapy
Minimally invasive surgery (MIS)
Endoscopic neurosurgery
Interventional cardiology
NOTES
OP-robots and Endosystems
License of Medical Products and Quality Management

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

Media
Lecture script

Literature
Menz, W., Mohr, J., O. Paul: Mikrosystemtechnik für Ingenieure, VCH-Verlag, Weinheim, 2005
Buess, G.: Operationslehre in der endoskopischen Chirurgie, Band I und II;
Springer-Verlag, 1994
M. Madou
Fundamentals of Microfabrication

Course: Bionics for Engineers and Natural Scientists [2142140]

Coordinators: H. Hölscher
Part of the modules: Microsystem Technology (p. 73)[TVWL3INGMBIMT1]

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

Learning Control / Examinations
The successfull attandence of the lecture is controlled by a 30 minutes written examination, and a subsequent oral examination (20 min). Passing the written exam is mandantory for the participation of the oral examination. The grade result is the result of the oral exam.

Conditions
None.

Recommendations
Basic knowledge in physics and chemistry

Learning Outcomes
The students should be able analyze, judge, plan and develop biomimetic strategies and products.

Content
Bionics focuses on the design of technical products following the example of nature. For this purpose we have to learn from nature and to understand its basic design rules. Therefore, the lecture focuses on the analysis of the fascinating effects used by many plants and animals. Possible implementations into technical products are discussed in the end.

Workload
lectures 30 h
self study 30 h
preparation for examination 30 h

Media
Slides of the lectures

Literature
Werner Nachtigall: Bionik – Grundlagen und Beispiele für Ingenieure und Naturwissenschaftler. Springer-Verlag Berlin (2002), 2. Aufl.

Course: Exchanges [2530296]

Coordinators: J. Franke
Part of the modules: Topics in Finance I (p. 39)[TVWL3BWLFBV5], Topics in Finance II (p. 40)[TVWL3BWLFBV6], eFi-
nance (p. 44)[TVWL3BWLISM3]

ECTS Credits	Hours per week	Type	Term	Instruction language
1,5	1	lecture	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?

Workload
The total workload for this course is approximately 45.0 hours. For further information see German version.

Literature
Elective literature:
Educational material will be offered within the lecture.

Course: Customer Relationship Management [2540508]

Coordinators: A. Geyer-Schulz
Part of the modules: CRM and Service Management (p. 45)[TVWL3BWLISM4]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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.

Workload

The total workload for this course is approximately 135 hours (4.5 credits).
\begin{tabular}{lcr}
\hline
\textbf{Activity} & & \textbf{Workload} \\
\hline
Attendance time & & \\
Attendance of lecture & 15 x 90min & 22h 30m \\
Attendance of exercise & 7 x 90min & 10h 30m \\
\hline
Self-study & & \\
Preparation of lecture & & 22h 30m \\
Wrap-up of lecture & & 22h 30m \\
Preparation of excercise& & 25h 00m \\
Preparation of assessment & & 31h 00m \\
\hline
Assessment & & 1h 00m \\
\hline

\hline
Sum & & 135h 00m \\
\end{tabular}
The integration of learningoutcomes (Content (content), Skills (skills) with levels and the estimated workload for an average student is intended.

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 Mining and Applications [2520375]

Coordinators: G. Nakhaeizadeh
Part of the modules: Statistics and Econometrics (p. 63)[TVWL3STAT1], Statistical Applications of Financial Risk Management (p. 62)[TVWL3STAT]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2	lecture	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

Workload

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

Literature

U. Fayyad, G. Piatetsky-Shapiro, P. Smyth, R. Uthurusamy, editors, Advances in Knowledge Discovery and Data Mining, AAAI/MIT Press, 1996 (order on-line from Amazon.com or from MIT Press).

- Jiawei Han, Micheline Kamber, Data Mining : Concepts and Techniques, 2nd edition, Morgan Kaufmann, ISBN 1558609016, 2006.

- David J. Hand, Heikki Mannila and Padhraic Smyth, Principles of Data Mining , MIT Press, Fall 2000

- Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Springer Verlag, 2001.

- Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Addison wesley (May, 2005). Hardcover: 769 pages. ISBN: 0321321367

- Ripley, B.D. (1996) Pattern Recognition and Neural Networks, Cambridge: Cambridge University Press.

- Ian witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, 2nd Edition, Morgan Kaufmann, ISBN 0120884070, 2005.

Remarks

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

Course: Database Systems [2511200]

Coordinators: A. Oberweis, Dr. D. Sommer
Part of the modules: Electives in Informatic (p. 57)[TVWL3INFO2], Emphasis Informatics (p. 55)[TVWL3INFO1]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	2/1	lecture + exercise	Summer term	de

Learning Control / Examinations
The assessment consists of an 1h written exam in the first week after lecture period.

Conditions
None.

Learning Outcomes
Students

- are familiar with the concepts and principles of data base models, languages and systems and their applications and explain it,
- design and model relational data bases on the basis of theoretical foundations,
- create queries for relational databases,
- know how to handle enhanced data base problems occurring in the enterprises.

Content
Database systems (DBS) play an important role in today's companies. Internal and external data is stored and processed in databases in every company. The proper management and organization of data helps to solve many problems, enables simultaneous queries from multiple users and is the organizational and operational base for the entire working procedures and processes of the company. The lecture leads in the area of the database theory, covers the basics of database languages and database systems, considers basic concepts of object-oriented and XML databases, conveys the principles of multi-user control of databases and physical data organization. In addition, it gives an overview of business problems often encountered in practice such as:

- Correctness of data (operational, semantic integrity)
- Restore of a consistent database state
- Synchronization of parallel transactions (phantom problem).

Workload
Lecture 30h
Exercise 15h

Preparation of lecture 30h
Preparation of exercises 30h
Exam preparation 44h
Exam &1h

Total: 150h

Media
Slides, Access to internet resources

Literature
Elective literature:

- Schlageter, Stucky. Datenbanksysteme: Konzepte und Modelle. Teubner 1983.
- S. M. Lang, P. C. Lockemann. Datenbankeinsatz. Springer-Verlag 1995.
- Jim Gray, Andreas Reuter. Transaction Processing: Concepts and Techniques. Morgan Kaufmann 1993.

Further literature will be given individually.

Course: Data Protection Law [24018]

Coordinators: G. Sydow
Part of the modules: Public Business Law (p. 85)[TVWL3JURA6]

ECTS Credits	Hours per week	Type	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.

Workload
90h

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: Topics in Finance I (p. 39)[TVWL3BWLFBV5], eFinance (p. 44)[TVWL3BWLISM3], Topics in Finance II (p. 40)[TVWL3BWLFBV6]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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.

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

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: Services Marketing and B2B Marketing [2572158]

Coordinators: M. Klarmann, J. Kim
Part of the modules: Foundations of Marketing (p. 52)[TVWL3BWLMAR]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	lecture	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
The aim of this course is to prepare students for two certain marketing perspectives. The service marketing is concentrated on the particularities coming up when a company sells services instead of products. Subjects in this section are for example:

  • Measuring service quality

  • Pricing services

  • Management of service staff

The second part of the course contains a business-to-business marketing perspective. Topics are below others:

  • Management of buying centers

  • Competitive Bidding

  • B2B-Branding

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

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

Course: Economics and Behavior [2560137]

Coordinators: N. Szech
Part of the modules: Economic Theory (p. 32)[TVWL3VWL12], Applied Microeconomics (p. 33)[TVWL3VWL13]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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.
The grade will be determined in a final written exam. Students can earn a bonus to the final grade by successfully participating in the exercises.

Conditions
None.

Recommendations
Basic knowledge of microeconomics and statistics are recommended. A background in game theory is helpful, but not absolutely necessary.

Learning Outcomes
The students

- gain insight into fundamental topics in behavioral economics;

- get to know different research methods in the field of behavioral economics;

- learn to critically evaluate experimental designs;

- get introduced to current research papers in behavioral economics;

- become acquainted with the technical terminology in English.

Content
The course covers topics from behavioral economics with regard to contents and methods. In addition, the students gain insight into the design of economic experiments. Furthermore, the students will become acquainted with reading and critically evaluating current research papers in the field of behavioral economics.

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

Literature
Kahnemann, Daniel: Thinking, Fast and Slow. Farrar, Straus and Giroux, 2011.
Ariely, Dan: Predictably irrational. New York: Harper Collins, 2008.
Ariely, Dan: The Upside of Irrationality. New York: HarperCollins, 2011.

Remarks
The lecture will be held in English.

Course: Efficient Algorithms [2511100]

Coordinators: H. Schmeck
Part of the modules: Emphasis Informatics (p. 55)[TVWL3INFO1], Electives in Informatic (p. 57)[TVWL3INFO2]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	2/1	lecture + exercise	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).
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).
Deviations from this type of assessment are announced at the beginning of this course.

Conditions
credits for the Informatics modules of years 1 and 2.

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 for the design and application of algorithms, data structures, and computer infrastructures 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
In a problem oriented way the course presents systematic approaches to the design and analysis of efficient algorithms using standard tasks of information processing as generic examples. Special emphasis is put on the influence of data structures and computer architectures on the performance and cost of algorithms.In particular, the course emphasizes the design and analysis of algorithms on parallel computers and in hardware, which is increasingly important considering the growing presence of multicore architectures. The course covers algebraic problems like matrix multiplication, evaluation of polynomials, fast Fourier transformation as well as sorting and searching, computational geometry, and leader election in distributed algorithms.

Workload
The total workload for this course is approximately 150.0 hours. For further information see German version.

Media

- powerpoint slides with annotations using a tablet pc
- access to applets and Internet resources
- lecture recording (camtasia)

Literature
Akl, S.G.: The Design and Analysis of Parallel Algorithms. Prentice-Hall, Englewood Cliffs, New Jersey,1989.
Borodin, Munro: The Computational Complexity of Algebraic and Numeric Problems (Elsevier 1975)
Cormen, Leiserson, Rivest: Introduction to Algorithms (MIT Press)
Sedgewick: Algorithms (Addison-Wesley) (many different versions available)
Elective literature:
will be announced in class

Course: eFinance: Information Engineering and Management for Securities Trading [2540454]

Coordinators: C. Weinhardt
Part of the modules: Topics in Finance I (p. 39)[TVWL3BWLFBV5], eFinance (p. 44)[TVWL3BWLISM3], Topics in Finance II (p. 40)[TVWL3BWLFBV6], eBusiness and Service Management (p. 42)[TVWL3BWLISM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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.

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

Media

- Powerpoint presentations
- recorded lecture available on the internet

Literature

- Picot, Arnold, Christine Bortenländer, 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 Operations Research I [2550040]

Coordinators: S. Nickel, O. Stein, K. Waldmann
Part of the modules: Introduction to Operations Research (p. 20)[TVWL1OR]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/2/2	lecture + tutorial	Summer term	de

Learning Control / Examinations
See module description.

Conditions
See module information.

Learning Outcomes
The student

- names and describes basic notions of the essential topics in Operations Research (Linear programming, graphs and networks, integer and combinatorial optimization, nonlinear programming, dynamic programming and stochastic models),

- knows the indispensable methods and models for quantitative analysis,

- models and classifies optimization problems and chooses the appropriate solution methods to solve optimization problems independently,

- validates, illustrates and interprets the obtained solutions.

Content
Examples for typical OR problems.
Linear Programming: Basic notions, simplex method, duality, special versions of the simplex method (dual simplex method, three phase method), sensitivity analysis, parametric optimization, multicriteria optimization.
Graphs and Networks: Basic notions of graph theory, shortest paths in networks, project scheduling, maximal flows in networks.

Workload
Berechnung des Arbeitsaufwands eines durchschnittlichen Studenten um die Lernziele zu erreichen. (Intern)
Eine Vernetzung von learningoutcomes (Wissen (content), Kompetenzen (skills) und levels mit dem dafür geschätzten Arbeitsaufwand eines durchschnittlichen Studenten ist anzustreben.

Media
Blackboard, slides, beamer presentations, lecture notes, OR software.

Literature

- Nickel, Stein, Waldmann: Operations Research, 2nd edition, Springer, 2014

- Hillier, Lieberman: Introduction to Operations Research, 8th edition. McGraw-Hill, 2005

- Murty: Operations Research. Prentice-Hall, 1995

- Neumann, Morlock: Operations Research, 2. Auflage. Hanser, 2006

- Winston: Operations Research - Applications and Algorithms, 4th edition. PWS-Kent, 2004

Course: Introduction to Operations Research II [2530043]

Coordinators: S. Nickel, O. Stein, K. Waldmann
Part of the modules: Introduction to Operations Research (p. 20)[TVWL1OR]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/2/2	lecture + tutorial	Winter term	de

Learning Control / Examinations
See module description.

Conditions
See corresponding module information. Especially the course *Introduction to Operations Research I* [2550040] is assumed.

Learning Outcomes
The student

- names and describes basic notions of the essential topics in Operations Research (Linear programming, graphs and networks, integer and combinatorial optimization, nonlinear programming, dynamic programming and stochastic models),

- knows the indispensable methods and models for quantitative analysis,

- models and classifies optimization problems and chooses the appropriate solution methods to solve optimization problems independently,

- validates, illustrates and interprets the obtained solutions.

Content
Integer and Combinatorial Programming: Basic notions, cutting plane metehods, branch and bound methods, branch and cut methods, heuristics.
Nonlinear Programming: Basic notions, optimality conditions, solution methods for convex and nonconvex optimization problems.
Dynamic and stochastic models and methods: dynamical programming, Bellman method, lot sizing models, dyanical and stochastic inventory models, queuing theory.

Workload
Berechnung des Arbeitsaufwands eines durchschnittlichen Studenten um die Lernziele zu erreichen. (Intern)
Eine Vernetzung von learningoutcomes (Wissen (content), Kompetenzen (skills) und levels mit dem dafür geschätzten Arbeitsaufwand eines durchschnittlichen Studenten ist anzustreben.

Media
Blackboard, slides, beamer presentations, lecture notes, OR software

Literature

- Nickel, Stein, Waldmann: Operations Research, 2nd edition, Springer, 2014

- Hillier, Lieberman: Introduction to Operations Research, 8th edition. McGraw-Hill, 2005

- Murty: Operations Research. Prentice-Hall, 1995

- Neumann, Morlock: Operations Research, 2. Auflage. Hanser, 2006

- Winston: Operations Research - Applications and Algorithms, 4th edition. PWS-Kent, 2004

Course: Introduction to Energy Economics [2581010]

Coordinators: W. Fichtner
Part of the modules: Energy Economics (p. 37)[TVWLIIP2]

ECTS Credits	Hours per week	Type	Term	Instruction language
5,5	2/2	lecture + exercise	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam according to Section 4(2), 1 of the examination regulation.

Conditions
See module description.

Learning Outcomes
The student is able to

- characterize and judge the different energy carriers and their peculiarities,

- understand contexts related to energy economics.

Content
1. Introduction: terms, units, conversions
2. The energy carrier gas (reserves, resources, technologies)
3. The energy carrier oil (reserves, resources, technologies)
4. The energy carrier hard coal (reserves, resources, technologies)
5. The energy carrier lignite (reserves, resources, technologies)
6. The energy carrier uranium (reserves, resources, technologies)
7. The final carrier source electricity
8. The final carrier source heat
9. Other final energy carriers (cooling energy, hydrogen, compressed air)

Workload
The total workload for this course is approximately 165.0 hours. For further information see German version.

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

Literature
Complementary literature:
Pfaffenberger, Wolfgang. Energiewirtschaft. ISBN 3-486-24315-2
Feess, Eberhard. Umweltökonomie und Umweltpolitik. ISBN 3-8006-2187-8
Müller, Leonhard. Handbuch der Elektrizitätswirtschaft. ISBN 3-540-67637-6
Stoft, Steven. Power System Economics. ISBN 0-471-15040-1
Erdmann, Georg. Energieökonomik. ISBN 3-7281-2135-5

Course: Introduction to Public Finance [2560131]

Coordinators: B. Wigger
Part of the modules: Public Finance (p. 30)[TVWL3VWL9]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	3	lecture	Winter term	de

Learning Control / Examinations
See module description.

Conditions
None.

Recommendations
None.

Learning Outcomes
Students are able to:

- critically assess the economic role of the state in a market economy

- explain and discuss key concepts in public finance, including: public goods; economic externalities; and market failure

- explain and critically discuss competing theoretical approaches to public finance, including welfare economics and public choice theory

- explain the theory of bureaucracy according to Weber and critically assess its strengths and weaknesses

- evaluate the incentives inherent in the bureaucratic model, as well as the more recent introduction of market-oriented incentives associated with public-sector reform

- analyze the strategic implications of public decision making

Content
The course *Introduction to Public Finance* provides an overview of the fundamental issues in public economics. The first part of the course deals with normative theories about the economic role of the state in a market economy. Welfare economics theory is offered as a base model, with which alternative normative theories are compared and contrasted. Within this theoretical framework, arguments concerning efficiency and equity are developed as justification for varying degrees of economic intervention by the state. The second part of the course deals with the positivist theory of public economics. Processes of public decision making are examined and the conditions that lead to market failures resulting from collective action problems are discussed. The third part of the course examines a variety of public spending programs, including social security systems, the public education system, and programs aimed at reducing poverty. The fifth part of the course addresses the key theoretical and political issues associated with fiscal federalism.

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

Media
Lecture slides.

Literature
Wigger, B. U. 2006. ***Grundzüge der Finanzwissenschaft.*** Springer: Berlin.

Course: Introduction to Game Theory [2520525]

Coordinators: C. Puppe, P. Reiss
Part of the modules: Economic Theory (p. 32)[TVWL3VWL12], Applied Microeconomics (p. 33)[TVWL3VWL13]

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

Learning Control / Examinations
The assessment consists of a written exam (60 minutes) according to Section 4(2),1 of the examination regulation.
The exam takes place in the recess period and can be resited at every ordinary examination date.

Conditions
None.

Recommendations
Basic knowledge of mathematics and statistics is assumed.

Learning Outcomes
This course offers an introduction to the theoretical analysis of strategic interaction situations. At the end of the course, students shall be able to analyze situations of strategic interaction systematically and to use game theory to predict outcomes and give advice in applied economics settings.

Content
The course focusses on non-cooperative game theory. It discusses models, solution concepts, and applications for simultaneous games as well as sequential games. Various solution concepts, e.g., Nash equilibrium and subgame-perfect equilibrium, are introduced along with more advanced concepts. A short introduction to cooperative game theory is given if there is sufficient time.

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

Media
Slides, problem sets.

Literature
Compulsory textbook:
Gibbons (1992): A Primer in Game Theory, Harvester-Wheatsheaf.
Additional Literature:
Berninghaus/Ehrhart/Güth (2010): Strategische Spiele, Springer Verlag.
Binmore (1991): Fun and Games, DC Heath.
Fudenberg/Tirole (1991): Game Theory, MIT Press.
Heifetz (2012): Game Theory, Cambridge Univ. Press.

Course: Basic Principles of Economic Policy [2560280]

Coordinators: I. Ott
Part of the modules: Economic Policy I (p. 31)[TVWL3VWL10]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	Summer 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.

Conditions
The course "Basic Principles of Economic Policy" is compulsory and must be examined.

Recommendations
Basic knowledge of micro- and macroeconomics is assumed, as taught in the courses Economics I [2610012], and Economics II [2600014].

Learning Outcomes
Students shall be given the ability to

- understand and deepen basic concepts of micro- and macroeconomic theories
- apply those theories to economic policy issues
- understand government interventions in the market and their legitimation from the perspective of economic welfare
- learn how theory-based policy recommendations are derived

Content

- Intervention in the market: micro-economic perspective
- Intervention in the market: macroeconomic perspective
- Institutional economic aspects
- Economic policy and welfare economics
- Carriers of economic policy: political-economic aspects

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

Media

- lecture slides
- exercises

Literature
See announcements to the lecture

Remarks
The course "Basic Principles of Economic Policy" [2560280] is not offered in summer term 2015.

Course: Introduction to GIS for students of natural, engineering and geo sciences [20712/13]

Coordinators: Rösch
Part of the modules: Understanding and Prediction of Disasters 2 (p. 80)[TVWL3INGINTER7], Understanding and Prediction of Disasters 1 (p. 79)[TVWL3INGINTER6]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	2/2	lecture + exercise	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

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

Remarks
For further information, see http://www.gik.uni-karlsruhe.de/print/index.html?&no_cache=1&P=1

Course: Power Network Analysis [23371/23373]

Coordinators: T. Leibfried
Part of the modules: Power Networks (p. 74)[TVWL3INGETIT3]

ECTS Credits	Hours per week	Type	Term	Instruction language
6	2/2	lecture + exercise	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam (120 min) taking place at the beginning of the recess period (according to Section 4 (2), 1 of the examination regulation). The exam takes place in every winter semester. Re-examinations are offered at every ordinary examination date.

Conditions
See German version.

Learning Outcomes
The students are able to do calculations of load flows and short-circuit current calculations in the electric power network. They know the equivalent electric circuit of the equipment and the mathematics of the calculation methods, be it for symmetrical or asymmetrical networks.

Content
In its first part, this lecture introduces the High-Voltage technology and its basics. Especially, the reasons for the necessity for the power transmission with high voltages are given. Basic electrical configurations and stresses occurring at multi dielectric systems are presented. Finally the first chapter deals with discharge phenomena.
The second chapter deals with the three phase system. Especially, the mathematical treatment of three phase systems and the introduction of component systems are contained in this chapter.
The third and very comprehensive chapter deals with the transmission and distribution of electric energy. Firstly, the laws of power transmission via transmission lines are presented. Then, the stability of electric power systems and possibilities to increase the power transmission capacity are discussed. Finally, the physics of energy distribution in the medium and low voltage grid is shown.
The fourth chapter deals with the Calculation of electric power networks and systems. Firstly, the preparatory steps for the calculation of the power network are shown. After discussing the basic network analysis methods, the load flow calculation are shown. Especially, the method of current iteration and the Newton Raphson method are presented and the algorithms of the individual methods are shown using an example.
The fifth chapter deals with methods for the calculation of the 3 phase short circuit. Thereby, it is distinguished between the short circuit nearby the generator and far from the generator.
In the sixth chapter the unsymmetrical faults in power networks and their calculation are discussed. Therefore, the symmetrical components are introduced as a first step. Then, the circuits in symmetrical components of all important power network equipment are presented. The chapter closes with the mathematical treatment of unsymmetrical short circuits using the symmetrical component method.
To accompany the lecture, a collection of problems can be downloaded. During lecture hall exercises their solutions will be discussed.

Workload
The total workload for this course is approximately 180 hours. For further information see German version.

Media
Online material is available on: https://www.ieh.kit.edu/studium_und_lehre_bee.php and can be downloaded using a password.

Literature
Elective literature:
Will be announced in the lecture notes.

Remarks
The title of this course has been changed. Former name: Power Network Analysis (until SS2014).

Course: Technique of Electrical Installation [23382]

Coordinators: A. Kühner
Part of the modules: Energy Generation and Network Components (p. 75)[TVWL3INGETIT4]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2/0	lecture	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam taking place at the beginning of the recess period (according to Section 4 (2), 1 of the examination regulation). The exam takes place in every summer semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
Students know the practical fundamentals of electrical installations.

Content

- Capture 1: Electrical Power Distribution and Networking
- Capture 2: Electrical Power Supply of Buildings
- Capture 3: Electrical Power Supply in Buildings
- Capture 4: Protective Equipments
- Capture 5: Electrical Energy Applications
- Capture 6: Electrical Automation and System Engineering of Buildings
- Capture 7: Powermanagement of Buildings

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Media
Online material is available on:
https://www.ieh.kit.edu/studium_und_lehre_elektrische_installationstechnik.php

Course: Systems for Electrical Energy [23391/23393]

Coordinators: T. Leibfried
Part of the modules: Power Networks (p. 74)[TVWL3INGETIT3]

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

Learning Control / Examinations
The assessment consists of a written exam (120 min) taking place at the beginning of the recess period (according to Section 4 (2), 1 of the examination regulation). The exam takes place in every summer semester. Re-examinations are offered at every ordinary examination date.

Conditions
For a successful participation knowledge of the content of the course *Higher mathematics* and especially of complex computation is assumed.
The course is an obligatory course within the module and has to be attended.

Learning Outcomes
The students are able to calculate electric circuits (be it with passive or with controlled sources) within the time- and frequency domain. Furthermore, the students also know the major means of mains operation, their physical mode of action and their electric equivalent electric circuit.

Content
In its first part, this lecture is a consequent continuation of the calculation of electrical networks as it is presented in the lecture "Linear electrical networks". In the second part of this lecture, the basics of electric power network equipment are presented. This is the basis for all further lectures of power system technology.
The first chapter gives an introduction in the single phase and three phase AC system.
The second chapter deals with or is a repetition of electromagnetic basics. In a first step magnetic circuits and their calculation is treated. Subjects like main flux and stray flux are introduced, as well as self induction main inductance and stray inductance. The induction law leads directly to the transformer and the calculation of inductances and finally to the calculation of forces caused by a current flowing in a conduction which is located within a magnetic field.
The third and very comprehensive chapter deals with the mathematical description of electrical networks. Hereby, it is distinguished between networks with concentrated elements and networks with distributed elements. The calculation of networks with concentrated elements leads to differential equations with constant coefficients. Their solution as well as a special case, the sinusoidal excitation of such networks, is comprehensively demonstrated using examples. Finally, the description of electrical networks by a system of first order differential equations is shown and their solution is presented. Circuits with distributed elements are transmission lines. The transmission line theory for sinusoidal voltages and currents as well as for impulse voltages and currents is shown.
The fourth chapter deals with the Laplace Transform as a tool for electrical network analysis. First, the Duhamel integral (convolution integral) is presented. Then the Laplace Transform is derived out of the convolution integral and in a further subchapter the solution of differential equations using the Laplace Transform is demonstrated.
The fifth chapter deals with methods for network analysis. It demonstrates the mesh analysis, the nodal analysis, the superposition theorem, Norton's theorem, Thevenin's theorem and the Tellegen-Theorem. These formal methods are demonstrated using two examples circuits. These circuits are transistor amplifier with and without a transformer. This allows the calculation of networks with voltage or current dependent sources.
In the sixth chapter the structure of the electric power network is shown and explained.
The seventh chapter deals with power network equipment. Thereby, their steady state behaviour in the power network as well as their electrical and mechanical basic design is presented. The chapter contains synchronous generators, power transformers, reactors, capacitors, transmission lines and switch gear. For all of this power network equipment its steady state electrical circuit is derived. This gives the basis for all further lectures in the field of power network engineering.
To accompany the lecture, a collection of problems can be downloaded. During lecture hall exercises their solutions will be discussed.
The course comprises of the interleaved lecture blocks and exercises. Current information can be found on the IEH webpage.

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

Media
Online material is available on: www.ieh.kit.edu and can be downloaded using a password.

Literature
Elective literature:
Will be announced in the lecture notes.

Course: Elements of Technical Logistics [2117096]

Coordinators: M. Mittwollen, Madzharov
Part of the modules: Introduction to Technical Logistics (p. 64)[TVWL3INGMB13]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	3	lecture + exercise	Winter term	de

Learning Control / Examinations
after each lesson period; oral / written (if necessary) => (look at "Studienplan Maschinenbau", latest version)

Conditions
None.

Recommendations
previous / parallel visit of LV 21177095 "Grundlagen der Technischen Logistik"

Learning Outcomes
Students are able to:

- Describe elements and systems of technical logistics,
- Model and calculate structures and functions of special conveying machines,
- Describe interdependence of material flow systems and technique quantitatively and qualitatively and
- Equip material flow systems with appropriate machines.

Content
material flow systems and their (conveying) technical components
mechanical behaviour of conveyors;
structure and function of conveyor machines; elements of intralogistics (belt conveyor, racks, automatic guided vehicles, fan-in, bifurcation, and etc.)
sample applications and calculations in addition to the lectures inside practical lectures

Workload
The total workload for this course is approximately 120 hours. For further information see German version.

Media
supplementary sheets,projector, blackboard

Literature
recommendations during lectures

Course: Elements of Technical Logistics and Project [2117097]

Coordinators: M. Mittwollen, Madzharov
Part of the modules: Introduction to Technical Logistics (p. 64)[TVWL3INGMB13]

ECTS Credits	Hours per week	Type	Term	Instruction language
6	4	lecture + exercise	Winter term	de

Learning Control / Examinations
Lesson: after each lesson period; oral / written (if necessary) => (look at "Studienplan Maschinenbau"); (counts two-thirds);
Project: presentation, marked (counts one third)

Conditions
None.

Recommendations
previous / parallel visit of LV 21177095 "Grundlagen der Technischen Logistik"

Learning Outcomes
Students are able to:

- Describe elements and systems of technical logistics,

- Model and calculate structures and functions of special conveying machines,

- Describe interdependence of material flow systems and technique quantitatively and qualitatively,

- Equip material flow systems with appropriate machines and

- Judge about systems in place and justify it in front of subject related persons.

Content
mechanical behaviour of conveyors;
structure and function of conveyor machines; elements of intralogistics (belt conveyor, racks, automatic guided vehicles, fan-in, bifurcation, and etc.)
sample applications and calculations in addition to the lectures inside practical lectures
Self manufacturing of a project report to recesses the topic.

Workload
The total workload for this course is approximately 180.0 hours. For further information see German version.

Media
supplementary sheets,projector, blackboard

Literature
recommendations during lectures

Course: Energy efficient intralogistic systems [2117500]

Coordinators: F. Schönung, M. Braun
Part of the modules: Introduction to Technical Logistics (p. 64)[TVWL3INGMB13]

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

Learning Control / Examinations
The assessment consists of an oral exam according to §4 (2), 2 of the examination regulation. It may be a written exam (according to §4 (2), 1 of the examination regulation) in the case of large number of participants.

Conditions
None.

Recommendations
Knowledge of Electrical Engineering and Technical Mechanics is recommended.

Learning Outcomes
Students are able to:

- Describe and choose basic measures to enhance energy efficency,
- Specify this measures considering material handling processes like

    - steady conveyors,
    - unsteady conveyors,
    - as well as the necassary drives,

- Model based on this material handling systems and calculate their energy efficiency and
- Choose ressource efficient material handling systems.

Content
The main focuses of the course are:

- green supply chain
- processes in Intralogistic systems
- evaluation of energy consumption of conveyors
- modeling of conveying systems
- methods for energy savings
- approaches for energy efficiency increasing of continuous and discontinuous conveyors
- dimensioning energy efficient drives
- new approaches for resource efficient conveying systems.

Workload
regular attendance: 21 hours
self-study: 99 hours

Media
presentations, black board

Literature
None.

Remarks

Course: Energy Policy [2581959]

Coordinators: M. Wietschel
Part of the modules: Energy Economics (p. 37)[TVWLIIP2]

ECTS Credits	Hours per week	Type	Term	Instruction language
3,5	2/0	lecture	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 in every semester. Re-examinations are offered at every ordinary examination date.

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.

Workload
The total workload for this course is approximately 105.0 hours. For further information see German version.

Literature
Will be anounced in the lecture.

Course: Energy Conversion and Increased Efficiency in Internal Combustion Engines [2133121]

Coordinators: T. Koch, H. Kubach
Part of the modules: Combustion Engines I (p. 66)[TVWL3INGMB34]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Winter term	de

Learning Control / Examinations
See module description.

Conditions
None.

Recommendations
None.

Learning Outcomes
The students can name all important influences on the combustion process. They can analyse and evaluate the engine process considering efficiency, emissions and potential.

Content
1. Introduction
2. Thermodynamics of combustion engines
3. Fundamentals
4. gas exchange
5. Flow field
6. Wall heat losses
7. Combustion in gasoline engines
8. APR und DVA
9. Combustion in Diesel engines
10. Emissions
11. Waste heat recovery
12. Measures to increase efficiency

Workload
regular attendance: 24 hours, self-study: 96 hours

Remarks
This course was formerly named "Thermodynamics and Energy Conversion in Internal Combustion Engines".

Course: Enterprise Risk Management [2530326]

Coordinators: U. Werner
Part of the modules: Risk and Insurance Management (p. 41)[TVWL3BWLFBV3]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	3/0	lecture	Winter 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. term papers (50 percent) and the assessment of the oral exam (50 percent).

Conditions
None.

Learning Outcomes
Learning to identify, to analyse and to assess business risks; this serves as a basis for strategy and policy design regarding risks and opportunities of an enterprise. Introduction to approaches that allow to consider area-specific risk objectives, risk-bearing capacity and risk acceptance.

Content

1. Concepts and practice of risk management, based on decision theory

2. Goals, strategies and policies for the identification, analysis, assessment and management of risks

3. Insurance as an instrument for loss-financing

4. Selected aspects of risk management: e.g. environmental protection, organizational failure and D&O-coverage, development of a risk management culture

5. Organisation of risk management

6. Approaches for determining optimal combinations of risk management measures considering their investment costs and outcomes.

Workload
The overall amount of work necessary for this course is approx. 135 hours (4.5 ECTS-Credits).

Literature

- K. Hoffmann. Risk Management - Neue Wege der betrieblichen Risikopolitik. 1985.

- R. Hölscher, R. Elfgen. Herausforderung Risikomanagement. Identifikation, Bewertung und Steuerung industrieller Risiken. Wiesbaden 2002.

- W. Gleissner, F. Romeike. Risikomanagement - Umsetzung, Werkzeuge, Risikobewertung. Freiburg im Breisgau 2005.

- H. Schierenbeck (Hrsg.). Risk Controlling in der Praxis. Zürich 2006.

Elective literature:
Additional literature is recommended during the course.

Course: Decision Theory [2520365]

Coordinators: K. Ehrhart
Part of the modules: Econometrics   and   Economics   (p.   29)[TVWL3VWL7],   Applied   Microeconomics (p. 33)[TVWL3VWL13]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	Summer 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
See corresponding module information.
Knowledge in mathematics and statistics is required.

Learning Outcomes
The student will be made familiar with the basics in modern decision making particularly under uncertainty so that she will be able to analyze concrete decision problems and to develop simple solution procedures. By being confronted with experimental results in decision making the student should also be able to evaluate the behavioral part of decision making.

Content
This course deals with problems of decision making particularly under uncertainty. We introduce the expected utility theory of Neumann/Morgenstern and the prospect theory of Kahnemann/Tversky and discuss the concepts of stochastic dominance, risk aversion, loss aversion, reference points etc. We also consider the empirical validity of the different approaches. Additionally, the lecture provides an introduction to the theory of findings (epistemology), particularly with respect to decision theory.

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

Media
Script, overhead slides, additional printed material.

Literature

- Ehrhart, K.-M. und S.K. Berninghaus (2012): Decision Theory, Script, KIT.

- Hirshleifer und Riley (1997): The Analytics of Uncertainty and Information. London: Cambridge University Press, 4. Edtion.

- Berninghaus, S.K., K.-M. Ehrhart und W. Güth (2006): Strategische Spiele. Berlin u.a.: Springer, 3., Edtion

Remarks
The course "Decision Theory" [2520365] will not be offered any more in M.Sc. from winter term 2015/2016 on.

Course: Electric Power Generation & Power Grid [23356]

Coordinators: B. Hoferer
Part of the modules: Energy Generation and Network Components (p. 75)[TVWL3INGETIT4]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2/0	lecture	Winter term	de

Learning Control / Examinations
The assessment consists of an oral exam (20 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 winter semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
The goal is to relay theoretical fundamentals and solid understanding of electrical power engineering. The students are able to analyse problems in the field of power generation and power grid and to develop approaches to these problems.

Content

- Energy resources
- Energy consumption
- Types and use of power plants
- Conversion of primary energy in power plants
- Thermodynamical fundamental terms
- Process in steam power plants
- Steam power plants components
- Flue gas cleaning
- Thermal power plants
- Nuclear power plants
- Hydroelectric power plants
- Wind energy converters
- Solar energy plants

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Media
Material is available at the beginning of the lecture.

Literature
Elective literature:
Schwab; Elektroenergiesysteme; 1. Auflage 2006.

Course: European and International Law [24666]

Coordinators: G. Sydow
Part of the modules: Public Business Law (p. 85)[TVWL3JURA6]

ECTS Credits	Hours per week	Type	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.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

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 Physics A [4040011]

Coordinators: T. Schimmel, S. Walheim
Part of the modules: Physics (p. 27)[TVWL1NW1]

ECTS Credits	Hours per week	Type	Term	Instruction language
7	4/2	lecture + exercise	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
See German version.

Content

Workload
The total workload for this course is approximately 210 hours. For further information see German version.

Course: Experimental Physics B [4040021]

Coordinators: T. Schimmel, S. Walheim
Part of the modules: Physics (p. 27)[TVWL1NW1]

ECTS Credits	Hours per week	Type	Term	Instruction language
7	4/2	lecture + exercise	Summer term	

Learning Control / Examinations

Conditions

The course *Experimental Physics A* [02350] has to be completed successfully beforehand.

Learning Outcomes

See German version.

Content

Workload

The total workload for this course is approximately 210 hours. For further information see German version.

Course: Remote Sensing [GEOD-BFB-1]

Coordinators: Hinz, Weidner
Part of the modules: Understanding and Prediction of Disasters 2 (p. 80)[TVWL3INGINTER7], Understanding and Pre-
                         diction of Disasters 1 (p. 79)[TVWL3INGINTER6]

ECTS Credits	Hours per week	Type	Term	Instruction language
6	3/2/1	lecture + exercise + tutorial	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
See German version.

Content

Workload
The total workload for this course is approximately 180 hours. For further information see German version.

Media
e-Learning-Modul "Fernerkundung" (geoinformation.net)
lecture notes

Literature
Elective literature:
Albertz: Fernerkundung

Remarks
The credits have been changed from 7 to 6.
For further information, see http://www.ipf.kit.edu/

Course: Remote Sensing Systems [20241/42]

Coordinators: S. Hinz, U. Weidner
Part of the modules: Understanding and Prediction of Disasters 2 (p. 80)[TVWL3INGINTER7], Understanding and Pre-
diction of Disasters 1 (p. 79)[TVWL3INGINTER6]

ECTS Credits	Hours per week	Type	Term	Instruction language
2	1/1	lecture + exercise	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
See German version.

Content

Workload
The total workload for this course is approximately 60 hours. For further information see German version.

Media
e-Learning-Modul "Fernerkundung" (geoinformation.net)
lecture notes

Remarks
For further information, see www.ipf.kit.edu

Course: Remote Sensing Methods [20265/66]

Coordinators: S. Hinz, U. Weidner
Part of the modules: Understanding and Prediction of Disasters 2 (p. 80)[TVWL3INGINTER7], Understanding and Prediction of Disasters 1 (p. 79)[TVWL3INGINTER6]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2/1	lecture + exercise	Summer term	de

Learning Control / Examinations

Conditions
It is recommended to attend the course *Thermodynamics* beforehand.

Learning Outcomes
See German version.

Content

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Media
e-Learning-Modul "Fernerkundung" (geoinformation.net)
lecture notes

Course: Manufacturing Technology [2149657]

Coordinators: V. Schulze, F. Zanger
Part of the modules: Manufacturing Technology (p. 68)[TVWL3INGMB23]

ECTS Credits	Hours per week	Type	Term	Instruction language
9	4/2	lecture + exercise	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam taking place during the recess period (according to Section 4(2), 1) of the examination regulation).
The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None

Recommendations
None

Learning Outcomes
The students ...

- are capable to specify the different manufacturing processes and to explain their functions.
- are able to classify the manufacturing processes by their general structure and functionality according to the specific main groups.
- have the ability to perform a process selection based on their specific characteristics.
- are enabled to identify correlations between different processes and to select a process regarding possible applications.
- are qualified to evaluate different processes regarding specific applications based on technical and economic aspects.
- are experienced to classify manufacturing processes in a process chain and to evaluate their specific influence on surface integrity of workpieces regarding the entire process chain.

Content
The objective of the lecture is to look at manufacturing technology within the wider context of production engineering, to provide an overview of the different manufacturing processes and to impart detailed process knowledge of the common processes. The lecture covers the basic principles of manufacturing technology and deals with the manufacturing processes according to their classification into main groups regarding technical and economic aspects. The lecture is completed with topics such as process chains in manufacturing.
The following topics will be covered:

- Quality control
- Primary processing (casting, plastics engineering, sintering, additive manufacturing processes)
- Forming (sheet-metal forming, massive forming, plastics engineering)
- Cutting (machining with geometrically defined and geometrically undefined cutting edges, separating, abrading)
- Joining
- Coating
- Heat treatment and surface treatment
- Process chains in manufacturing

This lucture provides an excursion to an industry company.

Workload
regular attendance: 63 hours
self-study: 207 hours

Media
Lecture notes will be provided in ilias (https://ilias.studium.kit.edu/).

Literature
Lecture Notes

Remarks
None

Course: Financial Econometrics [2520022]

Coordinators: M. Schienle
Part of the modules: Statistics and Econometrics (p. 63)[TVWL3STAT1]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/2	lecture + exercise	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

Workload
The total workload for this course is approximately 135 hours (4.5 credits).
regular attendance: 30 hours
self-study: 65 hours
exam preparation: 40 hours

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 Management [2530216]

Coordinators: M. Ruckes
Part of the modules: Essentials of Finance (p. 38)[TVWL3BWLFBV1]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	Summer 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 at every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Recommendations
Knowledge of the content of the course Business Administration: Finance and Accounting [25026/25027] is recommended.

Learning Outcomes
Students

- are able to characterize the central questions of financial management,
- are in a position to explain the role of liquidity, compute important liquidity ratios and explain their meaning,
- are able to describe and discuss the basic principles of working capital management,
- know different types of corporate financing as well as their pros and cons,
- are in a position to analyze firms' capital strucures and to identify possible improvements,
- are familiar with basic questions of corporate distribution policy.

Content
Analytical methods and theories in the field of corporate finance with the main focus on:

- Liquidity and Working Capital Management
- Sources of short term/ long term finance
- Capital Structure
- Dividend policy

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

Literature
Elective literature:

- Ross, Westerfield, Jaffe, Jordan (2009): Modern Financial Management, McGraw-Hill International Edition
- Berk, De Marzo (2014): Corporate Finance, Pearson Addison Wesley

Course: Financial Intermediation [2530232]

Coordinators: M. Ruckes
Part of the modules: Topics in Finance I (p. 39)[TVWL3BWLFBV5], Topics in Finance II (p. 40)[TVWL3BWLFBV6]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	3	lecture	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

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

Literature
Elective literature:

- Hartmann-Wendels/Pfingsten/Weber (2014): Bankbetriebslehre, 6th edition, Springer Verlag.
- Freixas/Rochet (2008): Microeconomics of Banking, 2nd edition, MIT Press.

Course: Foundations of Digital Services [2595466]

Coordinators: C. Weinhardt, H. Fromm
Part of the modules: Specialization in Customer Relationship Management (p. 47)[TVWL3BWLISM5], eBusiness and Service Management (p. 42)[TVWL3BWLISM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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.

Recommendations
None.

Learning Outcomes
The student:
• understands the different perspectives on services and the concept of value generation in service networks,
• is able to understand and apply concepts, methods and tools for the design, development and management of digital services,
• gains experience in group work such as in solving case studies and in the professional presentation of those results,
• practices the use of English language as a preparation for work in an international environment

Content
The world is moving more and more towards "service-led" economies: in developed countries services already account for around 70% of gross value added. In order to design, engineer, and manage services, traditional "goods-oriented" models are often inappropriate. In addition, the rapid development of information and communication technology (ICT) pushes the economic importance of services that are rendered electronically (eServices) and, thus, drives competitive changes: increased interaction and individualization open up new dimensions of "value co-creation" between providers and customers; dynamic and scalable service value networks replace static value chains; digital services can be globally delivered and exchanged across today's geographic boundaries;

Building on a systematic categorization of (e)Services and on the general notion of "value co-creation", we cover concepts and foundations for engineering and managing IT-based services, allowing for further specialization in subsequent KSRI courses. Topics include service innovation, service economics, service modeling as well as the transformation and coordination of service value networks.

In addition, case studies, hands-on exercises and guest lectures will illustrate the applicability of the concepts. English language is used throughout the course to acquaint students with international environments.

Workload
The total workload for this course is approximately 135 hours. For further information see German version.

Media
lecture slides

Literature
Announced in the first session.

Remarks
This course was formerly named "eServices".
The credits have been changed from 5 to 4,5.

Course: Gas Engines [2134141]

Coordinators: R. Golloch
Part of the modules: Combustion Engines II (p. 67)[TVWL3INGMB35]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Summer term	

Learning Control / Examinations
Oral examination, duration 25 min., no auxillary means

Conditions
none

Recommendations
Knowledge about „Verbrennungsmotoren A und B" or "Fundamentals of Combustion Engines I and II"

Learning Outcomes
The student can name and explain the function, characteristics and application areas of gas and dual fuel engines. He is able to distinguish from engines using liquid fuels. The student describe and explain gaseous fuels, engine subsystems, combustion processes and exhaust gas aftertreatment technologies. He is capable to analyse and evaluate current development areas and technical challenges.

Content
Based on the basics of internal combustion engines the students learn about functions of modern gas and dual fuel engines. Core learning areas are gaseous fuels, combustion processes including abnormal combustion characteristics, subsystems like gas admission, ignition, safety and control systems. Further knowledge will be teached on emissions, exhaust gas aftertreatment, applications and operation characteristics.

Workload
Present time at university: 24 hours; studying at home: 96 hours

Media
Lecture with PowerPoint slides

Literature
Lecture Script, prepared by the lecturer. Obtainable at the Institut für Kolbenmaschinen
Recommended:
- Merker, Schwarz, Teichmann: Grundlagen Verbrennungsmotoren, Vieweg + Teubner Verlag 2011;
- Zacharias: Gasmotoren, Vogel Fachbuch 2001

Course: Monetary and Financial Policy [2560122]

Coordinators: B. Wigger, J. Nagel
Part of the modules: Public Finance (p. 30)[TVWL3VWL9]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	3	lecture	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
None.

Learning Outcomes
Successful completion of the course will enable students to . . .
- . . . understand the monetary and financial policy before the financial crisis.
- . . . explain the cause of the financial crisis.
- . . . describe and evaluate the monetary policy in crisis mode.
- . . . critically discuss the boundaries of monetary and financial policy.
- . . . discuss the challenges for monetary policy using the example of the European Monetary Union.
- . . . critically evaluate and discuss the topic "financial stability vs. monetary mandate - a contradiction?".

Content
The current financial crisis changed the operationel implementation of financial policy within the big currency areas. Especially financial policy within the european union faces great challenges because of the dept problems of some union members. Limitations seem to disappears.
The lecture covers this range of topics and explores the question whether the financial crisis changes/will change monetary policy.

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

Course: Geological Hazards and Risks [2600101]

Coordinators: Wenzel, Gottschämmer
Part of the modules: Understanding and Prediction of Disasters 2 (p. 80)[TVWL3INGINTER7], Understanding and Pre-
                            diction of Disasters 1 (p. 79)[TVWL3INGINTER6]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2/1	lecture + exercise	Winter term	en

Learning Control / Examinations
The course will comprise a series of problem sets, both computational and conceptual, that need to be presented to the entire class in short presentations. These exercises form the building blocks for being able to conduct the main project of the course. Grading schemeis: Problem sets (30%); Final report (30%); Final Presentation (30%); Participation in class (10%)

Conditions
None.

Recommendations
Knowledge of basicphyscs, linear algebra, advanced calculus, and some statustics; programming in MATLAB (orsimilar) is needed; students should have taken a basiccourse in seismology of geophysics.
This course is for MScand/or PhD students in Geophysics, Geology, or any engineering program that includes modules related to natura lrisk assessment due to earthquakes. The course teaches the physics of earthquakes, with focus on physica lphenomena, and their relation to seismichazard.

Learning Outcomes

- Gain a solid understanding of the physica lprocesses leading to and acting during earthquakes;
- Understand kinematics and dynamics of earthquakes, masterseismic-wavegeneration due to earthquakes, as well as their quantification and consequences in terms of seismichazard.

Content
The course will cover the following topics: review of dynamic elasticity, seismicwaves generation & propagation, and seismic-source theory; earthquakesource mechanics and scalingl aws; kinematics of earthquakes through inverse and forwardmodeling; earthquake dynamics in terms of friction and fracture; introduction to probabilistic seismichazard assessment and simulation-based shaking calculations; aspects of numerical methods in earthquake seismology are included as well. Earthquake phenomena from the lab-scale to the global scale and aspects of earthquake statistics complete the course.

Workload
The total workload for this course is approximately 120 hours. For further information see German version.

Course: Business Strategies of Banks [2530299]

Coordinators: W. Müller
Part of the modules: Topics in Finance I (p. 39)[TVWL3BWLFBV5], Topics in Finance II (p. 40)[TVWL3BWLFBV6]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	lecture	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.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Elective literature:

- A script is disseminated chapter by chapter during the course of the lecture.

- Hartmann-Wendels, Thomas; Pfingsten, Andreas; Weber, Martin; 2000, Bankbetriebslehre, 6th edition, Springer

Course: Global Optimization I [2550134]

Coordinators: O. Stein
Part of the modules: Applications of Operations Research (p. 58)[TVWL3OR5], Methodical Foundations of OR
                          (p. 60)[TVWL3OR6]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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 *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.

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

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: Methodical Foundations of OR (p. 60)[TVWL3OR6]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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 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.

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

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: Foundations of Informatics I [2511010]

Coordinators: R. Studer, Y. Sure-Vetter
Part of the modules: Foundations of Informatics (p. 19)[TVWL1INFO2]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	2/2	lecture + exercise	Summer term	de

Learning Control / Examinations
The assessment consists of an 1h 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
The student

- is able to formalise tasks in the domain of informatics and is able to identify solution methods
- knows the basic terminology of computer science and is capable of applying these terms to different problems.
- knows basic programming structures and is able to apply them (particularly simple data structures, object interaction and implementation of basic algorithms).

Content
The following topics are covered:

- Object Oriented Modeling
- Logic (Propositional Calculus, Predicate Logic, Boolean Algebra)
- Algorithms and Their Properties
- Sort-and Search-Algorithms
- Complexity Theory
- Problem Specification
- Dynamic Data Structures

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

Media
Lecture slides

Literature
Elective literature:

- H. Balzert. Lehrbuch Grundlagen der Informatik. Spektrum Akademischer Verlag 2004.
- U. Schöning. Logik für Informatiker. Spektrum Akademischer Verlag 2000.
- T. H. Cormen, C. E. Leiserson. Introduction to Algorithms, MIT Press 2001.

Additional literature will be announced in the lecture.

Course: Foundations of Informatics II [2511012]

Coordinators: H. Schmeck
Part of the modules: Foundations of Informatics (p. 19)[TVWL1INFO2]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	3/1	lecture + exercise	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam (90 min.) according to Section 4(2), 1 of the examination regulation.
If the grade obtained in the written exam is in between 1.3 and 4.0, a successful bonus exam will improve the grade by one level.
The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Recommendations
It is recommended to attend the course *Foundations of Informatics I* [2511010] beforehand.
Active participation in the practical lessons is strongly recommended.

Learning Outcomes
See German version.

Content
This course addresses formal models for automata, languages, and algorithms (theoretiscal informatics) as well as with real instantiations of these models (computer engineering) including computer architecture and organisation (hardware design, computer arithmetic, architectural concepts), programming languages (different language levels from micro programming up to problem oriented languages, compilation and execution), operating systems and client server systems, data organisation.

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

Literature
Multimedia cross-linked books for self-organized utilisation of exercise pool:
Lukas König, Friederike Pfeiffer, Hartmut Schmeck:100 Übungsaufgaben zu Grundlagen der Informatik, Band I: Theoretische Informatik. Oldenbourg Wissenschaftsverlag, November, 2013
Lukas König, Friederike Pfeiffer, Hartmut Schmeck: 100 Übungsaufgaben zu Grundlagen der Informatik, Band II: Technische Informatik. Oldenbourg Wissenschaftsverlag, November, 2013
Elective literature:
Will be announced in class.

Course: Fundamentals of catalytic exhaust gas aftertreatment [2134138]

Coordinators: E. Lox
Part of the modules: Combustion Engines II (p. 67)[TVWL3INGMB35]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2		Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam (30 min) according to §4 (2), 2 of the examination regulation. The grade of the exam is included in the overall grade of the module with a weighting factor of 3.

Conditions
The course *Combustion Engines A / Combustion Engines I* has to be completed beforehand.

Recommendations
None.

Learning Outcomes
The students can name and explain the scientific fundamentals of the catalytic exhaust gas aftertreatment, as well as the technical, political and economical parameters of its application in engines for passenger cars and HD vehicles.

The students are able to point out and explain which emissions are formed in combustion engines, why these emissions are helth-related critical and which measures the legislator has established to reduce the emissions.

Content
1. kind and source of emissions
2. emission legislation
3. principal of catalytic exhaust gas aftertreatment (EGA)
4. EGA at stoichiometric gasoline engines
5. EGA at gasoline engines with lean mixtures
6. EGA at diesel engines
7. economical basic conditions for catalytic EGA

Workload
regular attendance: 36 hours
self-study: 84 hours

Literature
Lecture notes available in the lectures

1. "Environmental Catalysis" Edited by G.Ertl, H. Knötzinger, J. Weitkamp Wiley-VCH Verlag GmbH, Weinheim, 1999 ISBN 3-527-29827-4
2. "Cleaner Cars- the history and technology of emission control since the 1960s" J. R. Mondt Society of Automotive Engineers, Inc., USA, 2000 Publication R-226, ISBN 0-7680-0222-2
3. "Catalytic Air Pollution Control - commercial technology" R. M. Heck, R. J. Farrauto John Wiley & Sons, Inc., USA, 1995 ISBN 0-471-28614-1
4. "Automobiles and Pollution" P. Degobert Editions Technic, Paris, 1995 ISBN 2-7108-0676-2
5. "Reduced Emissions and Fuel Consumption in Automobile Engines" F. Schaeder, R. van Basshuysen, Springer Verlag Wien New York, 1995 ISBN 3-211-82718-8
6. "Autoabgaskatalysatoren : Grudlagen - Herstellung - Entwicklung - Recycling - Ökologie" Ch. Hagelüken und 11 Mitautoren, Expert Verlag, Renningen, 2001 ISBN 3-8169-1932-4

Course: Introduction to Microsystem Technology I [2141861]

Coordinators: A. Guber, Prof. J. Korvink
Part of the modules: Microsystem Technology (p. 73)[TVWL3INGMBIMT1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	lecture	Winter term	en

Learning Control / Examinations
The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

Conditions
None.

Recommendations
The course Microsystem technology II [2142874] and the practical exercise [2143875] are recommended.

Learning Outcomes
The lecture gives an introduction into the basics of microsystems technology. In analogy to processes employed in fabrication of microelectronics circuits the core technologies as well as materials for producing microstructures and components are presented. Finally, various techniques for Silicon micromachining are explained and illustrated with examples for micro-components and micro-systems.

Content
- Introduction in Nano- and Microtechnologies
- Silicon and processes for fabricating microelectronics circuits
- Basic physics background and crystal structure
- Materials for micromachining
- Processing technologies for microfabrication
- Silicon micromachining
- Examples

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
M. Madou
Fundamentals of Microfabrication
Taylor & Francis Ltd.; Auflage: 3. Auflage. 2011

Course: Introduction to Microsystem Technology II [2142874]

Coordinators: A. Guber, Prof. Dr. J. Korvink
Part of the modules: Microsystem Technology (p. 73)[TVWL3INGMBIMT1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	lecture	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.

Recommendations
The course Microsystem technology I [2141861] and the practical exercise [2143875] are recommended.

Learning Outcomes
The lecture gives an introduction into the basics of microsystems technology. In the first part, methods for lithographic pattern transfer are summarized. Then specific techniques such as the LIGA process, micro-machining, and laser-patterning are explained and examples are given. Finally assembly and packaging methods are presented leading into a discussion of entire microsystems.

Content
- Introduction in Nano- and Microtechnologies
- Lithography
- LIGA-technique
- Mechanical microfabrication
- Patterning with lasers
- Assembly and packaging
- Microsystems

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
M. Madou
Fundamentals of Microfabrication
Taylor & Francis Ltd.; Auflage: 3. Auflage. 2011

Course: Fundamentals of Production Management [2581950]

Coordinators: F. Schultmann
Part of the modules: Industrial Production I (p. 36)[TVWL3BWLIIP]

ECTS Credits	Hours per week	Type	Term	Instruction language
5,5	2/2	lecture + exercise	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. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes

- Students should describe the tasks of strategic corporate planning.
- Students should be able to use general approaches in order to solve these problems.

Content
This lecture focuses on strategic production management with respect to various economic aspects. Interdisciplinary approaches of systems theory will be used to describe the challenges of industrial production. This course will emphasize the importance of R&D as the central step in strategic corporate planning to ensure future long-term success.
In the field of site selection and planning for firms and factories, attention will be drawn upon individual aspects of existing and greenfield sites as well as existing distribution and supply centres. Students will obtain knowledge in solving internal and external transport and storage problems with respect to supply chain management and disposal logistics.

Workload
Total effort required will account for approximately 165h (5.5 credits).

Media
Media will be provided on learning platform.

Literature
will be announced in the course

Course: Basics of Technical Logistics [2117095]

Coordinators: M. Mittwollen, Madzharov
Part of the modules: Introduction to Technical Logistics (p. 64)[TVWL3INGMB13]

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

Learning Control / Examinations
The assessment consists due to the number of attendees, of an oral or a written exam according to Section 4 (2), 1 of the examination regulation.

Conditions
None.

Recommendations
Some technical knowledge.

Learning Outcomes
Students are able to:

- Describe processes and machines of technical logistics,

- Model the fundamental structures and the impacts of material handling machines with mathematical models,

- Refer to industrially used machines and

- Model real machines applying knowledge from lessons and calculate their dimensions.

Content
Bases effect model of conveyor machines made for the change of position and orientation; conveyor processes; identification systems; drives; mechanical behaviour of conveyors; structure and function of conveyor machines; elements of intralogistics sample applications and calculations in addition to the lectures inside practical lectures

Workload
The total workload for this course is approximately 180.0 hours. For further information see German version.

Media
supplementary sheets,projector, blackboard

Literature
Recommendations during lessons

Course: Basics of Track Guided Transport Systems [6200517]

Coordinators: E. Hohnecker
Part of the modules: Basics of Track Guided Transport Systems (p. 78)[TVWL3INGBGU4]

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

Learning Control / Examinations
See German version.

Conditions
See module description.

Learning Outcomes
See German version.

Content
Definitions and classifications, basics of railway vehicles, track guided operation, railway alignment and operation

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Zilch, Diederichs, Katzenbach, Beckmann (Hrsg): Handbuch für Bauingenieure, Springer-Verlag 2012

Remarks
See German version.

Course: Commercial and Corporate Law [24011]

Coordinators: Z. (ZAR), O. Knöfel
Part of the modules: Commercial Law (p. 82)[TVWL3JURA2]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2/0		Winter term	de

Learning Control / Examinations
The assesment ist explained in the module description

Conditions
None.

Recommendations
It is recommended to attend the lecture *BGB for Advanced* [24504] in advance.

Learning Outcomes
the student is able to overview the specifics of commercial transactions, commercial agency and the law of merchants. Moreover, he knows the forms of organization available in German company law.

Content
The lecture begins with an introduction into the different terms of merchants of the German Commercial Code. Subsequently, the rules governing trade names, commercial registries and commercial agency are dealt with. This is followed by a presentation of the general rules of commercial transactions and of the specific commercial transactions. In company law, first of all, the basics of partnerships are explained. Thereafter, the focus will be on corporate law which is most important in practice.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

Media
Slides.

Literature
Klunzinger, Eugen

- Grundzüge des Handelsrechts, Verlag Vahlen, latest edition
- Grundzüge des Gesellschaftsrechts, Verlag Vahlen, latest edition

Elective literature:
tba at the beginning of the course.

Course: Hauptvermessungsübung III [20267]

Coordinators: S. Hinz, Weidner
Part of the modules: Understanding and Prediction of Disasters 2 (p. 80)[TVWL3INGINTER7], Understanding and Pre-
                            diction of Disasters 1 (p. 79)[TVWL3INGINTER6]

ECTS Credits	Hours per week	Type	Term	Instruction language
1	0/1	exercise	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
See German version.

Content

Workload
The total workload for this course is approximately 30 hours. For further information see German version.

Media
e-Learning-Modul "Fernerkundung" (geoinformation.net)
lecture notes

Literature
Elective literature:
Albertz: Fernerkundung

Course: Hydrology [6200511]

Coordinators: E. Zehe
Part of the modules: Understanding and Prediction of Disasters 2 (p. 80)[TVWL3INGINTER7], Understanding and Prediction of Disasters 1 (p. 79)[TVWL3INGINTER6]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	Winter term	de

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.

Learning Outcomes
See German version.

Content

Workload
The total workload for this course is approximately 135 hours. For further information see German version.

Course: Industrial Organization [2560238]

Coordinators: P. Reiss
Part of the modules: Economic Theory (p. 32)[TVWL3VWL12], Applied Microeconomics (p. 33)[TVWL3VWL13]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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.

Recommendations
Completion of the module Economics [WW1VWL] is assumed.

Learning Outcomes
The student

- understands the basic problems relating to imperfect competition and its policy implications,

- has basic skills of the game-theoretic and microeconomic modeling used in the field of Industrial Organization,

- applies these skills in the analysis of typical problems of Industrial Organization,

- understands the scope and implications of strategic behavior of firms in various market settings.

Content
This course introduces the theory of industrial organization using game theoretical models. The course is divided into two parts: The first part reviews standard market forms (monopoly, oligopoly, perfect competition). The second part discusses more advanced topics including price discrimination, strategic product differentiation, cartel formation, market entry, and research and development.

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

Media
Slides, problem sets.

Literature
Compulsory Textbook:
H. Bester (2012): Theorie der Industrieökonomik, Springer-Verlag.
Additional Literature:
J. Tirole (1988): Theory of Industrial Organization, MIT Press.
D. Carlton / J. Perloff (2005): Modern Industrial Organization, Pearson.
P. Belleflamme / M. Peitz (2010): Industrial Organization

Course: Information Engineering [2122014]

Coordinators: J. Ovtcharova, J. Ovtcharova
Part of the modules: Product Lifecycle Management (p. 72)[TVWL3INGMB21]

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

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes

Content

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Course: Information Systems in Logistics and Supply Chain Management [2118094]

Coordinators: C. Kilger
Part of the modules: Introduction to Technical Logistics (p. 64)[TVWL3INGMB13]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam according to §4 (2), 2 of the examination regulation. It may be a written exam (according to §4 (2), 1 of the examination regulation) in the case of large number of participants.

Conditions
Technical understanding is required.

Recommendations
It is recommended to attend the lecuture *Logistics - Organisation, Design, and Control of Logistic Systems*.

Learning Outcomes
Students are able to:

- Describe requirements of logistical processes regarding IT systems,

- Choose information systems to support logistical processes and use them according to the requirements of a supply chain.

Content
1) Overview of logistics systems and processes
2) Basic concepts of information systems and information technology
3) Introduction to IS in logistics: Overview and applications
4) Detailed discussion of selected SAP modules for logistics support

Workload
regular attendance: 21 hours
self-study: 99 hours

Media
presentations

Literature
Stadtler, Kilger: Supply Chain Management and Advanced Planning, Springer, 4. Auflage 2008

Remarks

Course: Seminar in Engineering Science [SemING]

Coordinators: Fachvertreter ingenieurwissenschaftlicher Fakultäten
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations

Conditions
None.

Learning Outcomes
See German version.

Content

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced in the respective seminar.
Elective literature:
Will be announced in the seminar.

Course: Integrative Strategies in Production and Development of High Performance Cars [2150601]

Coordinators: K. Schlichtenmayer
Part of the modules: Specialization in Production Engineering (p. 69)[TVWL3INGMB22]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture + exercise	Summer term	de

Learning Control / Examinations
The assessment is carried out as an written exam. The examination is offered every semester. Reexaminations are offered at every ordinary examination date.

Conditions
None

Learning Outcomes
The students . . .

- are capable to specify the current technological and social challenges in automotive industry.
- are qualified to identify interlinkages between development processes and production systems.
- are able to explain challenges and solutions of global markets and global production of premium products.
- are able to explain modern methods to identify key competences of producing companies.

Content
The lecture deals with the technical and organizational aspects of integrated development and production of sports cars on the example of Porsche AG. The lecture begins with an introduction and discussion of social trends. The deepening of standardized development processes in the automotive practice and current development strategies follow. The management of complex development projects is a first focus of the lecture. The complex interlinkage between development, production and purchasing are a second focus. Methods of analysis of technological core competencies complement the lecture. The course is strongly oriented towards the practice and is provided with many current examples.
The main topics are:

- Introduction to social trends towards high performance cars
- Automotive Production Processes
- Integrative R&D strategies and holistic capacity management
- Management of complex projects
- Interlinkage between R&D, production and purchasing
- The modern role of manufacturing from a R&D perspective
- Global R&D and production
- Methods to identify core competencies

Workload
regular attendance: 21 hours
self-study: 99 hours

Media
Lecture notes will be provided in ilias (https://ilias.studium.kit.edu/).

Literature
Lecture Slides

Course: Integrated production planning [2150660]

Coordinators: G. Lanza
Part of the modules: Integrated Production Planning (p. 70)[TVWL3INGMB24]

ECTS Credits	Hours per week	Type	Term	Instruction language
9	4/2	lecture + exercise	Summer term	de

Learning Control / Examinations
The assessment is carried out as an written exam according §4(2), 1 SPO. The examination is offered every semester. Reexaminations are offered at every ordinary examination date.

Conditions
None

Recommendations
Attendance of the lecture 'Manufacturing Engineering' [21657] prior to attending this lecture is recommended.

Learning Outcomes
The students . . .

- can discuss basic questions of production technology.
- are able to apply the methods of integrated production planning they have learned about to new problems.
- are able to analyze and evaluate the suitability of the methods, procedures and techniques they have learned about for a specific problem.
- can apply the learned methods of integrated production planning to new problems.
- can use their knowledge targeted for efficient production technology.

Content
As part of this lecture further engineering aspects of production technology are taught. This includes content from the manufacturing technology, machine tools and handling techniques as well as the organization and planning.
Planning factories within the context of value networks and integrated production systems (Toyota etc.) requires an integrated perspective for the consideration of all functions included in the "factory" system. This includes the planning of manufacturing systems including the product, the value network and factory production, and the examination of SOPs, the running of a factory and maintenance. Content and theory covered by this lecture are completed with many examples from industry and exercises based on real-life situations and conditions.
Main topics covered by the lecture:

- The basic principles of production planning
- Links between product planning and production planning
- Integrating a production site into a production network
- Steps and methods of factory planning
- Approach to the integrated planning of manufacturing and assembly plants
- Layout of production sites
- Maintenance
- Material flow
- Digital factory
- Process simulation for material flow optimisation
- Start-up

Workload
regular attendance: 63 hours
self-study: 207 hours

Media
Lecture notes will be provided in ilias (https://ilias.studium.kit.edu/).

Literature
Lecture Notes

Course: International Marketing [2572155]

Coordinators: M. Klarmann
Part of the modules: Foundations of Marketing (p. 52)[TVWL3BWLMAR]

ECTS Credits	Hours per week	Type	Term	Instruction language
1,5	1	lecture	Winter 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
- know the characteristics of international marketing
- are familiar with the Hofstede's cultural dimensions theory
- understand basic concepts of cultural learning (the concept of acculturation, the psychic distance paradox)
- know different concepts that explain international buying behavior (e.g. country-of-origin effects)
- comprehend different concepts for market entries in an international context ("waterfall"-strategy, "sprinkler"-strategy, method of analogy, chain ratio method)
- understand what needs to be considered regarding international market research (dealing with ethical dilemmas, challenges regarding primary and secondary data sources, testing measurement equivalence, linguistic equivalence, differences in the response styles of questionnaires)
- know the particularities of international product policy (standardization vs. differentiation, challenge of branding, fight against product plagiarism, brand counterfeiting and product piracy, protection of intellectual property)
- are familiar with the particularities in the international price policy (BigMac Index, how to deal with price demand functions to achieve profit maximization, arbitrage, price corridor, standardization vs. differentiation of prices, how to deal with currency risks, inflation, exchange rates and different willingness to pay)
- know the characteristics of the international communication policy (different laws, problems regarding international standardized campaigns)
- know particularities of the international sales policy (international channels, differences of contract negotiations)
- are able to organize international marketing departments and subsidiaries
- know the problems of marketing in emerging markets

Content
Doing marketing abroad creates a number of significant new challenges for firms. This class is intended to prepare you for meeting these challenges. In the first session, we will discuss the peculiarities of international marketing. The next five sessions will then be dedicated to methods that can be used to address them. For instance, we will look at the following issues:

- Internationalization strategies

- Market entry strategies

- Standardization vs. individualization (e.g. regarding products, prices, and communication)

- Measurement equivalence in international market research

In the final session, we will apply this knowledge to the case of Wal Mart. In particular, Wal Mart, despite being the largest retailing company worldwide, failed to successfully enter the German Market. We will discuss Wal Mart's failure using the methods taught in the weeks before.

Workload
The total workload for this course is approximately 45.0 hours. For further information see German version.

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

Course: International Finance [2530570]

Coordinators: M. Uhrig-Homburg, Dr. Walter
Part of the modules: Topics in Finance I (p. 39)[TVWL3BWLFBV5], Topics in Finance II (p. 40)[TVWL3BWLFBV6], eFi-
                         nance (p. 44)[TVWL3BWLISM3]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	lecture	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.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Elective literature:

- Eiteman, D. et al., Multinational Business Finance, 13. edition, 2012.

- Solnik, B. and D. McLeavey, Global Investments, 6. edition, 2008.

Course: Cost and Management Accounting [2530210]

Coordinators: T. Lüdecke
Part of the modules: Topics in Finance I (p. 39)[TVWL3BWLFBV5], Topics in Finance II (p. 40)[TVWL3BWLFBV6]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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

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

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 Law [24354]

Coordinators: T. Dreier
Part of the modules: Intellectual Property Law (p. 83)[TVWL3JURA4]

ECTS Credits	Hours per week	Type	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.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

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: Investments [2530575]

Coordinators: M. Uhrig-Homburg
Part of the modules: Essentials of Finance (p. 38)[TVWL3BWLFBV1]

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

Learning Control / Examinations
The assessment consits of a written exam (75 min) according to Section 4(2), 1 of the examination regulation.
The examination takes place in every semester. Re-examinations are offered at eyery ordinary examination date.
By submitting the excercises (according to Section 4(2), 3 of the examination regulation) up to 4 bonus points can be aquired.

Conditions
None.

Recommendations
Knowledge of Business Administration: Finance and Accounting [2610026] is recommended.

Learning Outcomes
The objective of this course is to become familiar with the basics of investment decisions on stock and bond markets. Basic economic concepts and models are discussed and applied on introductionary level. Interlinkages between markets, different decision makings concepts and models are demonstrated.

Content
The lecture deals with investment decisions under uncertainty, where the main emphasis is on investment decisions on stock markets. After a discussion of the basic questions of corporate valuation, the lecture focuses on portfolio theory. After that, risk and return in equilibrium are derived using the Capital Asset Pricing Model and the Arbitrage Pricing Theory. The lecture concludes with investments on bond markets.

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

Literature
Elective literature:
Bodie/Kane/Marcus (2010): Essentials of Investments, Eighth Edition, McGraw-Hill Irwin, Boston

Course: Climatology [2501111]

Coordinators: P. Braesicke
Part of the modules: Understanding and Prediction of Disasters 2 (p. 80)[TVWL3INGINTER7], Understanding and Prediction of Disasters 1 (p. 79)[TVWL3INGINTER6]

ECTS Credits	Hours per week	Type	Term	Instruction language
5,5	3/1	lecture + exercise	Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam taking place in the recess period (according to §4 (2), 2 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
See German version.

Content

Workload
The total workload for this course is approximately 165.0 hours. For further information see German version.

Remarks
For further information, see http://www.imk.uni-karlsruhe.de/english/17.php.
See German version.

Course: Warehousing and distribution systems [2118097]

Coordinators: M. Schwab, J. Weiblen
Part of the modules: Introduction to Technical Logistics (p. 64)[TVWL3INGMB13]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam according to §4 (2), 2 of the examination regulation. It may be a written exam (according to §4 (2), 1 of the examination regulation) in the case of large number of participants.

Conditions
None.

Recommendations
None.

Learning Outcomes
Students are able to:

- Describe the areas of typical warehouse and distribution systems with the respective processes and can illustrate it with sketches,
- Use and choose strategies of warehouse and distribution systems according to requirements,
- Classify typical systsems using criteria discussed in the lecture, and
- Reson about the choice of appropriate technical solutions.

Content

- Introduction
- Yard management
- Receiving
- Storage and picking
- Workshop on cycle times
- Consoldiation and packing
- Shipping
- Added Value
- Overhead
- Case Study: DCRM
- Planning of warehouses
- Case study: Planning of warehouses
- Distribution networks
- Lean Warehousing

Workload
regular attendance: 21 hours
self-study: 99 hours

Media
presentations, black board

Literature
ARNOLD, Dieter, FURMANS, Kai (2005)
Materialfluss in Logistiksystemen, 5. Auflage, Berlin: Springer-Verlag
ARNOLD, Dieter (Hrsg.) et al. (2008)
Handbuch Logistik, 3. Auflage, Berlin: Springer-Verlag
BARTHOLDI III, John J., HACKMAN, Steven T. (2008)
Warehouse Science
GUDEHUS, Timm (2005)
Logistik, 3. Auflage, Berlin: Springer-Verlag

FRAZELLE, Edward (2002)
World-class warehousing and material handling, McGraw-Hill
MARTIN, Heinrich (1999)
Praxiswissen Materialflußplanung: Transport, Hanshaben, Lagern, Kommissionieren, Braunschweig, Wiesbaden: Vieweg
WISSER, Jens (2009)
Der Prozess Lagern und Kommissionieren im Rahmen des Distribution Center Reference Model (DCRM); Karlsruhe : Universitätsverlag
A comprehensive overview of scientific papers can be found at:
ROODBERGEN, Kees Jan (2007)
Warehouse Literature

Remarks

Course: Logistics and Supply Chain Management [2581996]

Coordinators: M. Wiens
Part of the modules: Industrial Production I (p. 36)[TVWL3BWLIIP]

ECTS Credits	Hours per week	Type	Term	Instruction language
3,5	2/0	lecture	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.

Recommendations
None.

Learning Outcomes

- The students know the central tasks and challenges of modern logistics management.
- The students apply key concepts in the area of logistics.
- The students apply methods of risk evaluation and risk management in supply chains.
- The students know key incentive-schemes and planning-tools relevant to supply chain management.
- The students apply exemplary methods to solve practical problems.

Content

- Introduction: Basic Terms and Concepts
- Logistics Systems and Supply Chain Management
- Supply Chain Risk Management
- Extensions and Applications

Workload
Toatl effort required will account for approximately 105h (3.5 credits).

Media
Medie will be provided on learning platform.

Literature
will be announced in the course

Course: Logistics - organisation, design and control of logistic systems [2118078]

Coordinators: K. Furmans
Part of the modules: Supply Chain Management (p. 49)[TVWL3BWLISM2]

ECTS Credits	Hours per week	Type	Term	Instruction language
6	3/1	lecture + exercise	Summer term	de

Learning Control / Examinations
The assessment consists of a written exam according to Section 4 (2), 1 of the examination regulation. The grade of the exam may be improved by passing case studies.

Conditions
None.

Recommendations
Requied are lectures on "Linear Algebra" and "Stochastic".

Learning Outcomes
Students are able to:

- Describe logistical tasks,

- Design logistical systems suitable to the respective task,

- Dimension stocastical stock models,

- Determine essential influencing parameters on the bullwhip effect and

- Use optimizing solution methods.

Content
multistage logistic process chains
transport chain in logistic networks
distribution processes
distribution centers
logistics of production systems
dependencies between production and road traffic
information flow
cooperative strategies (like kanban, just-in-time, supply chain management)

Workload
See German version.

Media
presentations, black board

Literature
None.

Remarks

Course: Automotive Logistics [2118085]

Coordinators: K. Furmans
Part of the modules: Introduction to Technical Logistics (p. 64)[TVWL3INGMB13]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam according to §4 (2), 2 of the examination regulation. It may be a written exam (according to §4 (2), 1 of the examination regulation) in the case of large number of participants.

Conditions
None.

Recommendations
None.

Learning Outcomes
Students are able to:

- Describe essential logistic questions, in a complex production network. As an example the automobile industry is used.
- Choose and apply solution possibilities for logistic problems in this area.

Content

- Logistic questions within the automobile industry
- basic model of automobile production and distribution
- relation with the suppliers
- Disposition and physical execution
- Vehicle production in the interaction of shell, paint shop and assembly
- Sequence planning
- Assembly supply
- vehicle distribution and linkage with selling processes
- Physical execution, planning and control

Workload
regular attendance: 21 hours
self-study: 99 hours

Media
presentations, black board

Literature
None.

Remarks

Course: Airport logistics [2117056]

Coordinators: A. Richter
Part of the modules: Introduction to Technical Logistics (p. 64)[TVWL3INGMB13]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Winter term	de

Learning Control / Examinations
The assessment consists of an oral exam according to §4 (2), 2 of the examination regulation. It may be a written exam (according to §4 (2), 1 of the examination regulation) in the case of large number of participants.

Conditions
none

Recommendations
None.

Learning Outcomes
Students are able to:

- Describe material handling and informations technology activities on airports,
- Evaluate processes and systems on airports as the law stands, and
- Choose appropriate processes and material handling systems for airports.

Content
Introduction
airport installations
luggage transport
passenger transport
security on the airport
legal bases of the air traffic
freight on the airport

Workload
regular attendance: 21 hours
self-study: 99 hours

Media
presentations

Literature
None.

Remarks
Limited number of participants: allocation of places in sequence of application (first come first served)
Application via "ILIAS" mandatory
personal presence during lectures mandatory

Course: Management Accounting 1 [2579900]

Coordinators: M. Wouters
Part of the modules: Management Accounting (p. 35)[TVWL3BWLIBU1]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/2	lecture + exercise	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.

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

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. 35)[TVWL3BWLIBU1]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/2	lecture + exercise	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.

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

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 of Business Networks [2590452]

Coordinators: C. Weinhardt
Part of the modules: Supply Chain Management (p. 49)[TVWL3BWLISM2], eBusiness and Service Management (p. 42)[TVWL3BWLISM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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). 65% of the final grade is based on the written exam and 35% 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

- indentifes the coordination problems in a business network,

- explains the theorie of strategic and operative management,

- analyses case studies in logistics considering the organization theory and network analysis,

- argues and constructs new solutions for the case studies by means of electronic tools.

Content
The significant and lasting impact of web-based business-to-business (B2B) networks has just recently become apparent. The exploratory phase during the first Internet hype bred a variety of approaches which were often bold in business nature, yet simple and unfounded in system architecture. Only very few survived and proved sustainable. Nowadays web-based B2B networks are increasingly reappearing and even promoted by major traditional companies and governments. However, this new wave of networks is more mature and more powerful in functionality than their predecessors. As such they provide not only auction systems but also facilities for electronic negotiation. This implies a shift from price-focused to relationship-oriented trading. But what motivates this shift? Why do firms enter business networks? How can these networks be best supported by IT? The course intends to resolve these questions. Firstly, an introduction in organization theory will be given. Secondly, the problems of networks will be addressed. Thirdly, an analysis of how IT can alleviate those problems will be undertaken.

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

Media

- PowerPoint

- E-learning platform ILIAS

- Recorded lecture available on the internet, if circumstances allow

Literature

- Milgrom, P., Roberts, J., Economics, Organisation and Management. Prentice-Hall, 1992.

- Shy, O., The Economics of Network Industries. Cambridge, Cambridge University Press, 2001.

- Bichler, M. The Future of e-Markets - Multi-Dimensional Market Mechanisms. Cambridge, Cambridge University Press, 2001.

Course: Management of Business Networks (Introduction) [2540496]

Coordinators: C. Weinhardt
Part of the modules: Supply Chain Management (p. 49)[TVWL3BWLISM2]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	lecture	Winter term	en

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 student

- indentifes the coordination problems in a business network,
- explains the theorie of strategic and operative management,
- analyses case studies in logistics considering the organization theory and network analysis,
- argues and constructs new solutions for the case studies by means of electronic tools.

Content
The significant and lasting impact of web-based business-to-business (B2B) networks has just recently become apparent. The exploratory phase during the first Internet hype bred a variety of approaches which were often bold in business nature, yet simple and unfounded in system architecture. Only very few survived and proved sustainable. Nowadays web-based B2B networks are increasingly reappearing and even promoted by major traditional companies and governments. However, this new wave of networks is more mature and more powerful in functionality than their predecessors. As such they provide not only auction systems but also facilities for electronic negotiation. This implies a shift from price-focused to relationship-oriented trading. But what motivates this shift? Why do firms enter business networks? How can these networks be best supported by IT? The course intends to resolve these questions. Firstly, an introduction in organization theory will be given. Secondly, the problems of networks will be addressed. Thirdly, an analysis of how IT can alleviate those problems will be undertaken.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Media

- PowerPoint
- E-learning platform ILIAS
- Recorded lecture available on the internet, if circumstances allow

Literature

- Milgrom, P., Roberts, J., Economics, Organisation and Management. Prentice-Hall, 1992.
- Shy, O., The Economics of Network Industries. Cambridge, Cambridge University Press, 2001.
- Bichler, M. The Future of e-Markets - Multi-Dimensional Market Mechanisms. Cambridge, Cambridge University Press, 2001.

Remarks
This version of the MBN course does not include the case study in the second part of the lecture, so that it is worth less credits.

Course: Brand Management [2572177]

Coordinators: B. Neibecker
Part of the modules: Foundations of Marketing (p. 52)[TVWL3BWLMAR]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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
None.

Learning Outcomes
Students have learned the following outcomes and competences:

- To specify the key terms in brand management
- To identify and define theoretical constructs in marketing management to build brand value
- 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 students should learn the essential scientific and practical principles of Marketing, especially branding. Branding consists of any name, design, style, words or symbols, singly or in any combination that distinguish one product from another in the eyes of the consumer. Brand positioning, brand loyalty and brand equity are discussed as important elements of a management concept. The focus of the course is not limited to short-term ROI, but also long-term benefits of communication strategies facing company's responsibilities to all of its stakeholders, e.g. consumers, investors and public. The strategies and techniques in branding are broaden by several case studies. English as an international technical language in marketing is practiced with course readings and scientific papers. Content:
The course brand management starts with the development of the corporate objectives as the heart of the brand planning process followed by definitions of brand. Setting up on the psychological and social bases of consumer behavior, aspects of an integrated marketing communication are discussed. The students should acquire the particular value of branding strategies. The concept of brand personality is considered in two perspectives, from a practical point of view and the challenging position of the theoretical construct. Methods for the measurement of a consumer-based brand equity are compared with the financial valuation of the brand. The information provided by this equity measurements are related to the equity drivers in brand management. The marketers perspective will be accomplish with the analysis of several case studies. Within the limits of a knowledge based system for advertising evaluation many of the issues accomplished in the course are summarized. At the same time it is discussed as a tool to use marketing knowledge systematically.

Workload
The total workload for this course is approximately 135 hours (4.5 credits).

Media
Slides, Powerpoint presentations, Website with Online Course Readings

Literature

- Aaker, J. L.: Dimensions of Brand Personality. In: Journal of Marketing Research 34, 1997, 347-356.
- BBDO-Düsseldorf (Hrsg.): Brand Equity Excellence. 2002.BBDO-Düsseldorf (Hrsg.): Brand Equity Drivers Modell. 2004.
- Bruhn, M. und GEM: Was ist eine Marke? Gräfelfing: Albrecht (voraussichtlich 2003).
- Esch, F.-R.: Strategie und Technik der Markenführung. München: Vahlen 2010.
- Himmel, H. und A. Krostewitz: Bewertung immaterieller Ressourcen als Teil der Unternehmenssteuerung: Herausforderungen für das Controlling. In: ZfCM: Controlling & Management, 2012, 30-39.
- Kotler, P.; V. Wong; J. Saunders und G. Armstrong: Principles of Marketing (European Edition). Harlow: Pearson 2005.
- Krishnan, H. S.: Characteristics of memory associations: A consumer-based brand equity perspective. In: Internat. Journal of Research in Marketing 13, 1996, 389-405.
- Management-Tools: 10 Grundsätze der monetären Markenbewertung. http://www.management-tools.ch (12.09.2012) (basierend auf Franzen: 2006)

- Meffert, H.; C. Burmann und M. Koers (Hrsg.): Markenmanagement. Grundfragen der identitätsorientierten Markenführung. Wiesbaden: Gabler 2002.

- Neibecker, B.: Tachometer-ESWA: Ein werbewissenschaftliches Expertensystem in der Beratungspraxis. In: Computer Based Marketing, H. Hippner, M. Meyer und K. D. Wilde (Hrsg.), Vieweg: 1998, 149-157.

- Riesenbeck, H. und J. Perrey: Mega-Macht Marke. McKinsey&Company, Frankfurt/Wien: Redline 2004.

- Solomon, M., G. Bamossy, S. Askegaard und M. K. Hogg: Consumer Behavior, 4rd ed., Harlow: Pearson 2010.

Course: Trademark and Unfair Competition Law [24136 / 24609]

Coordinators: Y. Matz
Part of the modules: Intellectual Property Law (p. 83)[TVWL3JURA4]

ECTS Credits	Hours per week	Type	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.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

Literature

   • Berlit, Wolfgang: Markenrecht, Verlag C.H.Beck, ISBN 3-406-53782-0, neueste Auflage.

Course: Managing the Marketing Mix [2571152]

Coordinators: M. Klarmann
Part of the modules: Foundations of Marketing (p. 52)[TVWL3BWLMAR]

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

Learning Control / Examinations

Conditions
This course is compulsory within or the module "Foundations of Marketing" and must be examined.

Learning Outcomes
See German version.

Content
The content of this course concentrates on the four elements of the marketing mix. Therefore the four main chapters are:

- Product management
- Pricing
- Promotion
- Sales management

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

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

Course: Material flow in logistic systems [2117051]

Coordinators: K. Furmans
Part of the modules: Introduction to Technical Logistics (p. 64)[TVWL3INGMB13]

ECTS Credits	Hours per week	Type	Term	Instruction language
6	3/1	lecture + exercise	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam according to Section 4 (2), 1 of the examination regulation. The grade of the exam may be improved by passing case studies.

Conditions
None.

Recommendations
None.

Learning Outcomes
Students are able to:

- describe material flow processes qualitativ and quantitativ,

- assign possibilities of technical solutions to a open operational task,

- plan material flow systems, illustrate them in simple models and analyse them regarding their performance,

- use methods to determine performance indicators like throughput, utilization, etc., and

- evaluate material flow systems regarding performance and availability.

Content

- elements of material flow systems (conveyor elements, fork, join elements)

- models of material flow networks using graph theory and matrices

- queueing theory, calculation of waiting time, utilization

- warehouseing and order-picking

- shuttle systems

- sorting systems

- simulation

- calculation of availability and reliability

- value stream analysis

Workload
The total workload for this course is approximately 180.0 hours. For further information see German version.

Media
presentations, black board, book

Literature
Arnold, Dieter; Furmans, Kai : Materialfluss in Logistiksystemen; Springer-Verlag Berlin Heidelberg, 2009

Remarks

Course: Materials and Processes for Body Lightweight Construction in the Automotive Industry [2149669]

Coordinators: D. Steegmüller, S. Kienzle
Part of the modules: Specialization in Production Engineering (p. 69)[TVWL3INGMB22]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Winter term	de

Learning Control / Examinations
The assessment consists of an oral exam taking place in the recess period (according to §4 (2), 2 of the examination regulation). The exam takes place in every semester. Reexaminations are offered at every ordinary examination date.

Conditions
None

Recommendations
None

Learning Outcomes
The students . . .

- are able to name the various lightweight approaches and identify possible areas of application.
- are able to identify the different production processes for manufacturing lightweight structures and explain their functions.
- are able to perform a process selection based on the methods and their characteristics.
- are able to evaluate the different methods against lightweight applications on the basis of technical and economic aspects.

Content
The objective of the lecture is to build up an overview of the relevant materials and processes for the production of a lightweight body. This includes both the actual production and the joining for the body. The lecture covers the different lightweight approaches and possible fields of application in the automotive industry. The methods are discussed with practical examples from the automotive industry.
The following topics will be covered:

- lightweight designs
- aluminum and steel for lightweight construction
- fibre-reinforced plastics by the RTM and SMC process
- joining of steel and aluminum (clinching, riveting, welding)
- bonding
- coating
- finishing
- quality assurance
- virtual factory

Workload
regular attendance: 21 hours
self-study: 99 hours

Media
Lecture notes will be provided in ilias (https://ilias.studium.kit.edu/).

Literature
Lecture Notes

Remarks
None

Course: Mathematics I [01350]

Coordinators: G. Last, M. Folkers, D. Hug, S. Winter
Part of the modules: Mathematics I (p. 23)[TVWL1MATH1]

ECTS Credits	Hours per week	Type	Term	Instruction language
7	4/2/2		Winter term	de

Learning Control / Examinations

The assessment of *Mathematics I* consists of two written partial exams (both acording to Section 4 (2), 1 of the examination regulation):

1. Midterm exam after half of the lecture time (60 min) without utilities

2. Final exam at the beginning of the following recess period (60 min) without utilities

A re-examination is offered at the beginning of the lecture period of the following summer term. Both re-examinations taking place at the same day.
For the re-examinations both types of candidates (candidates who failed the midterm or the final exam, as well as those candidates who do not yet have passed their first attempt) are admitted.
Oral re-examinations (according to Section 8 (2) of the examination regulation) take place as individual examinations (ca. 20 min).
Mid-term exam as well as final exam has to be passed separatley. The overall grade *of Mathematics 1* consists of the grade o the midterm exam (50 percent) and the final exam (50 percent).

Conditions

None.

Learning Outcomes

Content

Workload

The total workload for this course is approximately 210 hours. For further information see German version.

Literature
Elective literature:

• Henze, N., Last, G.: Mathematik für Wirtschaftsingenieure 1, 2. Auflage, Vieweg 2005.

• Sydsaeter, K., Hammond, P.: Mathematik für Wirtschaftswissenschaften, 2. Auflage, Pearson Studium 2006.

Course: Mathematics II [01830]

Coordinators: G. Last, M. Folkers, D. Hug, S. Winter
Part of the modules: Mathematics II (p. 24)[TVWL1MATH2]

ECTS Credits	Hours per week	Type	Term	Instruction language
7	4/2/2		Summer term	de

Learning Control / Examinations

The assessment of *Mathematics 2* consists of two written partial exams (both acording to Section 4 (2), 1 of the examination regulation):

1. Midterm exam after half of the lecture time (60 min) without utilities

2. Final exam at the beginning of the following recess period (60 min) without utilities

A re-examination is offered at the beginning of the lecture period of the following winter term. Both re-examinations take place at the same day.
For the re-examinations both types of candidates (candidates who failed the midterm or the final exam, as well as those candidates who do not yet have passed their first attempt) are admitted.
Oral re-examinations (according to Section 8 (2) of the examination regulation) take place as individual examinations (ca. 20 min).
Midterm exam as well as final exam has to be passed separatley. The overall grade *of Mathematics 2* consists of the grade o the mid-term exam (50 percent) and the final exam (50 percent).

Conditions

Good knowledge of the content of the course *Mathematics I* [01350].

Learning Outcomes

Content

Workload

The total workload for this course is approximately 210 hours. For further information see German version.

Literature
Elective literature:

- Henze, N., Last, G.: Mathematik für Wirtschaftsingenieure 1, 2. Auflage, Vieweg 2005.

- Sydsaeter, K., Hammond, P.: Mathematik für Wirtschaftswissenschaften, 2. Auflage, Pearson Studium 2006.

Course: Mathematics III [01352]

Coordinators: G. Last, M. Folkers, D. Hug, S. Winter
Part of the modules: Mathematics III (p. 25)[TVWL1MATH3]

ECTS Credits	Hours per week	Type	Term	Instruction language
7	4/2/2		Winter term	de

Learning Control / Examinations
The assessment consists of a written exam (75 min) at the beginning of the recess period (according to Section 4(2), 1 of the examination regulation.
A re-examination is offered at the beginning of the lecture period of the following summer term. For the re-examinations both types of candidates (candidates who failed the midterm or the final exam, as well as those candidates who do not yet have passed their first attempt) are admitted.

Conditions
Good knowledge of the content of the courses Mathematics I [01350] and Mathematics II [01830].

Learning Outcomes

Content

Workload
The total workload for this course is approximately 210 hours. For further information see German version.

Literature
Elective literature:

- Henze, N., Last, G.: Mathematik für Wirtschaftsingenieure Band 2, 2. Auflage, Vieweg 2010 (im Netz des KIT als Online-Ressource verfügbar).

- Sydsaeter, K., Hammond, P., Seierstad, A., Strom, A.: Further Mathematics for Economic Analysis, Prentice Hall 2005.

Course: Seminar in Mathematics [SemMath]

Coordinators: Fachvertreter der Fakultät für Mathematik
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced in the respective seminar.
Elective literature:
Will be announced in the seminar.

Course: Meteorological Natural Hazards [57535]

Coordinators: M. Kunz
Part of the modules: Understanding and Prediction of Disasters 2 (p. 80)[TVWL3INGINTER7], Understanding and Pre-
                          diction of Disasters 1 (p. 79)[TVWL3INGINTER6]

ECTS Credits	Hours per week	Type	Term	Instruction language
3,5	2	lecture	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
Students

- explain the theoretical basics and concepts, which explain the occurrence of different meteorological extreme events,
- apply the learned concepts and methods to understand the formation of meteorological extreme events,
- estimate the potential for extreme events depending on the region and season based on the learned concepts,
- assess the impact of extreme events.

Content

Workload
The total workload for this course is approximately 105.0 hours. For further information see German version.

Remarks
For further information, see http://www.imk.uni-karlsruhe.de/english/17.php

Course: Interpretative Social Research Methods [5011015]

Coordinators: M. Pfadenhauer
Part of the modules: Qualitative Social Research (p. 87)[TVWL3SOZ2]

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

Learning Control / Examinations
The assessment consists of a written exam (according to Section 4 (2), 1 of the examination regulation).

Conditions
The lecture is obligatory and has to be attended.

Learning Outcomes
The student

- gains a basic overview of the well-established and some of the advanced explorative methods of data collection and interpretative methods of data evaluation.

- acquires basic knowledge of methodology/the philosophy of science.

- is capable of choosing and applying appropriate explorative-interpretative methods according to a research question and arranging them in a conceptual research design.

Content
See lecture announcement.

Workload
The total workload for this course is approximately 120.0 hours. For further information see German version.

Media
Will be announced in the lecture.

Literature
Will be announced in the lecture.
Elective literature:
Will be announced in the lecture.

Course: Analysis tools for combustion diagnostics [2134134]

Coordinators: U. Wagner
Part of the modules: Combustion Engines II (p. 67)[TVWL3INGMB35]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2		Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam (30 min) according to §4 (2), 2 of the examination regulation.

Conditions
The course *Combustion Engines A / Combustion Engines I* has to be completed beforehand.

Recommendations
None.

Learning Outcomes
The students can name and explain state-of-the-art methods to analyse the process in combustion as well as special measuring techniques such as optical and laser analysis. They are able to thermodynamically model, analyse and evaluate the engine process.

Content
energy balance at the engine
energy conversion in the combustion chamber
thermodynamics of the combustion process

flow velocities

flame propagation

special measurement techniques

Workload
regular attendance: 24 hours
self-study: 96 hours

Literature
Lecture notes available in the lectures

Course: Microactuators [2142881]

Coordinators: M. Kohl
Part of the modules: Microsystem Technology (p. 73)[TVWL3INGMBIMT1]

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

Learning Control / Examinations
The assessment will consist of an oral exam (20 min) (following §4 (2), 2 of the examination regulation).

Conditions
None.

Recommendations
It is recommended to attend the lecture "Novel Actuators and Sensors" [2141865].

Learning Outcomes
The student

- knows the basics of the actuation principles
- has the required knowledge on the design, fabrication and operation of microactuators
- is familiar with important microactuators in use and their application areas
- knows typical specifications, advantages and disadvantages of the different microactuators

Content

- Microrobotics: linear actuators, micromotors
- Medical and Life Sciences: Mikrovalves, Micropumps, microfluidic Systems
- Information technology: Optical Switches, mirror systems, read/write heads
- Microelectromechanical systems: Microrelais

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Media
Script of ppt-slides

Literature

1. Technischer Einsatz Neuer Aktoren: Grundlagen, Werkstoffe, Designregeln und Anwendungsbeispiele, D. Jendritza, Expert-Verlag, 3. Auflage, 2008.
2. Microactuators, M. Tabib-Azar, Kluwer Academic Publishers London, 1998.
3. Shape Memory Microactuators, M. Kohl, Springer-Verlag Berlin, 2004.

Course: Model based Application Methods [2134139]

Coordinators: F. Kirschbaum
Part of the modules: Combustion Engines II (p. 67)[TVWL3INGMB35]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture + exercise	Summer term	

Learning Control / Examinations
take-home exam, short presentation with oral examination

Conditions
none

Recommendations
knowledge in Basics of combustion engines, vehicular systems, control theorie and statistics.

Learning Outcomes
The student can name the most important methods for model-based calibration of powertrain ECUs. Particulary he can choose and apply the correct approach for empirical modeling for a given powertrain calibration task (fuel consumption, emissions, air path, driveability, etc.) and type of plant (linear-nonlinear, static-dynamic, etc.). He is capable to solve typical Problems of a calibration engineer of automotive OEMs or suppliers.

Content
The efforts for the calibration of automotive powertrain ECUs are increasing due to new engine or powertrain technologies and tightening emission laws. From a present view only model based calibration methods are capable to handle this situation. The lecture presents a selection of practice-proofed model-based calibration methods.

Workload
regular attendance:
Lectures 2 SWS: approx. 22 h
Computer exercises 1 SWS: approx. 11 h
self study: approx. 87 h

Media
Lecture notes, blackboard, presentations and life demonstrations via projector

Course: Engine measurement techniques [2134137]

Coordinators: S. Bernhardt
Part of the modules: Combustion Engines II (p. 67)[TVWL3INGMB35]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2		Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam (30 min) according to Section 4 (2), 2 of the examination regulation.

Conditions
The course *Combustion Engines A /* Combustion Engines I has to be completed beforehand.

Recommendations
None.

Learning Outcomes
The students are able to explain the principles of modern measuring devices and are able to determin the right device for a certain measuring problem. The are able to analyse and evaluate the results.

Content
Students get to know state-of-the-art measurement techniques for combustion engines. In particular basic techniques for measuring engine operating parameters such as torque, speed, power and temperature.

Possible measurement errors and abberations are discussed.

Furthermore techniques for measuring exhaust emissions, air/fuel ratio, fuel consumption as well as pressure indication for thermodynamic analysis are covered.

Workload
regular attendance: 21 hours
self-study: 100 hours

Literature
Lecture notes available in the lectures or in the 'Studentenhaus'

1. Grohe, H.:Messen an Verbrennungsmotoren
2. Bosch: Handbuch Kraftfahrzeugtechnik
3. Veröffentlichungen von Firmen aus der Meßtechnik
4. Hoffmann, Handbuch der Meßtechnik
5. Klingenberg, Automobil-Meßtechnik, Band C

Course: Nanotechnology with Clusterbeams [2143876]

Coordinators: J. Gspann
Part of the modules: Microsystem Technology (p. 73)[TVWL3INGMBIMT1]

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

Learning Control / Examinations
The assessment will consist of a oral exam (30 min) (following §4 (2), 2 of the examination regulation).

Conditions
None.

Recommendations
None.

Learning Outcomes
Nanotechnology is presented on the basis of a technology for nano- and microstructuring by accelerated nanoparticles (clusters), mainly in view of nanomechanics.

Content
Nanotechnology in biology
Nanosystemstechnology
Cluster beam generation, ionisation and acceleration; cluster properties
Structure generation using accelerated metal clusters
Structuring via gas cluster impact; reactive accelerated cluster erosion (RACE)
Atomic force microscopy of impact structures; nanotribology
Comparison with femtosecond laser machining (Winter term only)
Simulations; Fullerene synthesis, impact structures, visionary nanomachinery

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Foil copies with short commentaries are distributed during the lectures.

Course: Novel Actuators and Sensors [2141865]

Coordinators: M. Kohl, M. Sommer
Part of the modules: Microsystem Technology (p. 73)[TVWL3INGMBIMT1]

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

Learning Control / Examinations
The assessment will consist of a oral exam (20 min) (following §4 (2), 2 of the examination regulation).

Conditions
None.

Learning Outcomes
The student

- knows physical principles and basics on novel actuators and sensors
- has the required knowledge on the design, fabrication and operation of novel actuators and sensors
- is familiar with important novel actuators and sensors in use
- can name typical fields of application
- knows typical specifications

Content
Topics of the first part:

- Piezo actuators
- Magnetostrictive actuators
- Shape memory actuators
- Electrorheological actuators

Topics of the second part:

- Nano sensors: materials, fabrication
- Nano fibres
- Examples: gas sensors, electronic nose
- Data processing /interpretation

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Media
Script / script of ppt foils (part 2)

Course: Nonlinear Optimization I [2550111]

Coordinators: O. Stein
Part of the modules: Methodical Foundations of OR (p. 60)[TVWL3OR6], Stochastic Methods and Simulation (p. 61)[TVWL3OR7]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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.

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

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: Methodical Foundations of OR (p. 60)[TVWL3OR6]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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.

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

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 Revenues [2560120]

Coordinators: B. Wigger, Assistenten
Part of the modules: Public Finance (p. 30)[TVWL3VWL9], Applied Microeconomics (p. 33)[TVWL3VWL13], Economic Policy I (p. 31)[TVWL3VWL10]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	Summer 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 *Public Revenues* lecture is concerned with the theory and policy of taxation and public dept. In the first chapter, fundamental concepts of taxation theory are introduced, whereas the second chapter deals with key elements of the German taxation system. The allocative and distributive effects of different taxation types are examined in chapter three and four. Chapter five integrates both allocative and distributive components in order to derive a theory of optimal taxation. The core of the sixth chapter is represented by international aspects of taxation. The debt part begins with a description of the extent and structure of public dept in chapter seven. In the following chapter, macroeconomic theories of national dept are evolved, while chapter nine is concerned with its long term consequences when employed as a regular instrument of budgeting. Finally, the tenth chapter deals with constitutional limits to public debt-incurring.

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

Literature
Elective literature:

- Homburg, S.(2000): *Allgemeine Steuerlehre,* Vahlen
- Rosen, H.S.(1995): *Public Finance*; 4th ed., Irwin
- Wellisch, D.(2000): *Finanzwissenschaft I* and *Finanzwissenschaft III*, Vahlen
- Wigger, B. U.(2006): *Grundzüge der Finanzwissenschaft*; 2nd ed*.,* Springer

Course: Public Media Law [24082]

Coordinators: C. Kirchberg
Part of the modules: Public Business Law (p. 85)[TVWL3JURA6]

ECTS Credits	Hours per week	Type	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).

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

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: Public Law I - Basic Principles [24016]

Coordinators: G. Sydow
Part of the modules: Constitutional and Administrative Law (p. 22)[TVWL1JURA3]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2/0		Winter term	de

Learning Control / Examinations
The assessment consists of a written exam concerning the courses *Public Law I* [24016] and *Public Law II* [24520] (according to Section 4(2), 1 of the examination regulation).

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 lecture covers the core principles of public law. Students shall become acquainted with the basics of constitutional law, the fundamental rights which route governmental actions and the entire legal system, as well as possibilities of actions and instruments (especially law, administrative act, public-private contract) of the public authority. Furthermore the distinction between public and private law will be clarified. Moreover, possibilities of legal protection regarding administrative behavior will be addressed. Students shall learn to classify problems in public law and to solve (simple) administrative and constitutional cases.

Content
The course covers core material of constitutional and administrative law. It begins with the differentiation between public and private law. In the constitutional law part, the course will concentrate on the rule of law and individual rights, especially those protecting communication and entrepreneurship. The administrative law part will explain the different legal instruments of the administration how to act (rule, order, contract, etc.) and their propositions. Also, court proceedings to sue the administrative will be discussed. Students will learn the technique how to solve (simple) administrative and constitutional cases

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

Media
extensive script with cases; content structure, further information in the lectures

Literature
tba in srciptum
Elective literature:
tba in scriptum

Course: Public Law II - Public Economic Law [24520]

Coordinators: G. Sydow
Part of the modules: Constitutional and Administrative Law (p. 22)[TVWL1JURA3]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2/0		Summer term	de

Learning Control / Examinations
The assessment consists of a written exam (60min) according to Section 4(2), 1 of the examination regulation.

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
Public economic law is of significant importance to supervise the German economy. In order to understand the functionality of mandatory interventions into market mechanisms in a thoroughly normed legal system, appropriate legal knowledge is required. This knowledge is to be provided in the lecture. In doing so, substantive law ought to be dealt with in a deepened way, while responsible authorities and institutions as well as possibilities of legal protection in the area of public commercial law will be taught at a glance. The lecture's primary aim is to exercise handling the corresponding legal norms. It proceeds the lecture *public law I.*

Content
In a first step legal basics of the economic system (such as financial system and freedom of property and profession) will be presented. In this context, interaction between the Basic Constitutional Law and presettings of European Community law will be elaborated on as well. Thereafter, regulatory instruments of the administrative law will be analysed extensively. As particular matters, we will deal with industrial code, further trade law (handicrafts code; law of gastronomy), basic principles of telecommunication law, state aid law and public procurement law. A last part is devoted to the institutional design of the economy's regulation.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

Media
extensive script with cases; content structure, further information in the lectures

Literature
Will be announced in the lecture.
Elective literature:
tba in lecture slides

Course: Operative CRM [2540520]

Coordinators: A. Geyer-Schulz
Part of the modules: CRM and Service Management (p. 45)[TVWL3BWLISM4], Specialization in Customer Relationship Management (p. 47)[TVWL3BWLISM5]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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.

Recommendations
The attendance of courses *Customer Relationship Management* [2540508] and *Analyitical CRM* [2540522] is advised.

Learning Outcomes
The Student

- understands the theory of methods for process and data analyses and applies them for the design and implementation of operative CRM-processes in the complex context of companies,

- takes privacy problems into account,

- evaluates existing operative CRM-processes in companies and gives recommendation for their improvement. This requires the knowledge of example processes and the ability to transform them according to the given setting.

- uses literature for the solution of case studies, communicates with professionals and summarizes his recommendations and drafts in precise and coherent texts.

Content
The Student should be able to understand and implement methods and applications within the operative CRM. This includes, but is not limited to the analysis of business processes, as a basis for improvements in CRM, and applications like call centers.

Workload
The total workload for this course is approximately 135 hours (4.5 credits).

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\begin{tabular}{lcr}
\hline
\textbf{Activity} & & \textbf{Workload} \\
\hline
Attendance time & & \\
Attendance of lecture & 15 x 90min & 22h 30m \\
Attendance of exercise & 7 x 90min & 10h 30m \\
\hline
Self-study & & \\
Preparation of lecture & & 22h 30m \\
Wrap-up of lecture & & 22h 30m \\
Preparation of excercise& & 25h 00m \\
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Preparation of assessment & & 31h 00m \\
\hline
Assessment & & 1h 00m \\
\hline
\hline
Sum & & 135h 00m \\
\end{tabular}

Literature

Jill Dyché. The CRM Handbook: A Business Guide to Customer Relationship Management. Addison-Wesley, Boston, 2 edition, 2002.

Ronald S. Swift. Accelerating Customer Relationships: Using CRM and RelationshipTechnologies. Prentice Hall, Upper Saddle River, 2001.

Elective literature:

Alex Berson, Kurt Thearling, and Stephen J. Smith. Building Data Mining Applications for CRM. Mc Graw-Hill, New York, 2000.

Stanley A. Brown. Customer Relationship Management: A Strategic Imperative in theWorld of E-Business. John Wiley, Toronto, 2000.

Dimitris N. Chorafas. Integrating ERP, CRM, Supply Chain Management, and SmartMaterials. Auerbach Publications, Boca Raton, Florida, 2001.

Keith Dawson. Call Center Handbook: The Complete Guide to Starting, Running, and Improving Your Call Center. CMP Books, Gilroy, CA, 4 edition, 2001.

Andreas Eggert and Georg Fassot. eCRM – Electronic Customer Relationship Management: Anbieter von CRM-Software im Vergleich. Schäffer-Poeschel, Stuttgart, 2001.

Seth Godin. Permission Marketing. Kunden wollen wählen können. FinanzBuch Verlag, München, 1999.

Paul Greenberg. CRM at the Speed of Light: Capturing and Keeping Customers in Internet Real Time. Osborne/McGraw-Hill, 3rd ed. edition, Aug 2004.

Philip Kotler. Marketing Management: Millennium Edition. Prentice Hall, Upper Saddle River, 10 edition, 2000.

Don Peppers and Martha Rogers. The One To One Future. Currency Doubleday, New York, 1997.

Duane E. Sharp. Customer Relationship Management Systems Handbook. Auerbach, 2002.

Len Silverston. The Data Model Resource Book: A Library of Universal Data Models for All Entreprises, volume 1. John Wiley & Sons, 2001.

Toby J. Teorey. Database Modeling and Design. Morgan Kaufmann, San Francisco, 3 edition, 1999.

Chris Todman. Designing a Data Warehouse : Supporting Customer Relationship Management.

Remarks

As of winter term 2014/15 this lecture is hold in alternation with "2540522 - Analytical CRM". The current schedule can be seen on the chair's website (http://www.em.uni-karlsruhe.de/studies/).

Course: Optoelectronic Components [23486 / 23487]

Coordinators: W. Freude
Part of the modules: Microsystem Technology (p. 73)[TVWL3INGMBIMT1]

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

Learning Control / Examinations
The assessment will consist of a oral exam (20 min) according to §4 (2), 1 of the examination regulation.

Conditions
This course can not be combined with the course Optical Sources and Detectors [23462 / 23463] and/or Optical Waveguides and Fibers [23464 / 23465.

Recommendations
Recommendations for lectures (but this is not mandatory for this course): "Electrodynamics and field calculations" or similar course on electrodynamics, "Semiconductor Devices" or similar course, "High-frequency Technology".
Minimal background required: Calculus, differential equations, Fourier transforms and p-n junction physics.

Learning Outcomes
The students understand the components of the physical layer of optical communication systems. To this end, the students

- acquire the knowledge of operation principles and impairments of optical waveguides,

- know the basics of laser diodes, luminescence diodes and semiconductor optical amplifiers,

- understand pin-photodiodes, and

- know the systems' sensitivity limits, which are caused by optical and electrical noise.

The knowledge presented is important in comprehending the physical layer of optical communication systems. It is this very basic understanding which enables a designer to read a device's data sheet, to make most of its favourite properties, and to avoid hitting its limitations.
Learning the working principles of key components in optical communications opens the road to understand design and performance aspects of modern transmission systems. The following components are discussed>

- Light waveguides: Wave propagation, slab waveguides, strip wave-guides, integrated optical waveguides, fibre waveguides

- Light sources and amplifiers: Luminescence and laser radiation, luminescent diodes, laser diodes, stationary and dynamic behavior, semiconductor optical amplifiers

- Receivers: pin photodiodes, electronic amplifiers, noise

Content
The course concentrates on the most basic optical communication components. Emphasis is on physical understanding, exploiting results from electromagnetic field theory, (light waveguides), solid-state physics (laser diodes, LED, and photodiodes), and communication theory (receivers, noise).

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

Media
Detailed textbook-style lecture notes, and lecture slides

Literature

- Grau, G.; Freude, W.: Optische Nachrichtentechnik, 3. Ed. Berlin: Springer-Verlag 1991. In German. Since 1997 out of print.
  Corrected reprint Karlsruhe 2005, available via W. F. (w.freude@kit.edu).

- Voges, E.; Petermann, K. (Eds.): Optischen Kommunikationstechnik Handbuch für Wissenschaft und Industrie. Springer-Verlag, Berlin 2002. In German

- Agrawal, G. P.: Lightwave technology. Hoboken: John Wiley & Sons 2004

- Iizuka, K.: Elements of photonics. Vol. I, especially Vol. II. Hoboken: John Wiley & Sons 2002

Course: Managing Organizations [2577902]

Coordinators: H. Lindstädt
Part of the modules: Strategy and Organization (p. 34)[TVWL3BWLUO1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3.5	2/0	lecture	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.

Workload
The total workload for this course is approximately 105.0 hours. For further information see German version.

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: Patent Law [24656]

Coordinators: P. Bittner
Part of the modules: Intellectual Property Law (p. 83)[TVWL3JURA4]

ECTS Credits	Hours per week	Type	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.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

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: Human Resource Management [253003]

Coordinators: P. Nieken
Part of the modules: Human Resources and Organizations (p. 54)[TVWL3BWLIAP2]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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
Completion of module Business Administration is recommended.
Basic knowledge of microeconomics, game theory, and statistics is recommended.

Learning Outcomes
The student

- understands the processes and instruments of human resource management.
- analyzes different methods of human resource planning and selection and evaluates their usefulness.
- analyzes different processes of talent management and evaluates the strengths and weaknesses.
- understands the challenges of human resource management and its link to corporate strategy.

Content
The students acquire basic knowledge in the fields of human resource planning, selection and talent management. Different processes and instruments and their link to corporate strategy are evaluated based on microeconomic and behavioral approaches. The results are tested and discussed based on empirical data.

Workload
The total workload for this course is approximately 135 hours.
Lecture 32h
Preparation of lecture 52h
Exam preparation 51h

Media
Slides

Literature

- Personnel Economics in Practice, Lazear & Gibbs, John Wiley & Sons, 2014
- Strategic Human Resources. Frameworks for General Managers, Baron & Kreps, John Wiley & Sons, 1999

Remarks
This course has been added summer 2015.

Course: Personnel Policies and Labor Market Institutions [2573001]

Coordinators: P. Nieken
Part of the modules: Human Resources and Organizations (p. 54)[TVWL3BWLIAP2]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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.

Conditions
None.

Recommendations
Completion of module Business Administration is recommended.
Basic knowledge of microeconomics, game theory, and statistics is recommended.

Learning Outcomes
The student

- understands the process and role of agents in collective wage bargaining.

- analyzes strategic decisions in the context of corporate governance.

- understands the concept of co-determination in Germany.

- challenges statements that evaluate certain personnel politics.

Content
The students acquire knowledge about the process and the strategic aspects of collective bargaining about wages. They analyze selected aspects of corporate governance and co-determination in Germany. The lecture also addresses questions of personnel politics and issue of labor market discrimination. Microeconomic and behavioral approaches as well as empirical data is used and evaluated critically.

Workload
The total workload for this course is approximately 135 hours.
Lecture 32h
Preparation of lecture 52h
Exam preparation 51h

Media
Slides

Literature
Arbeitsmarktökonomik, W. Franz, Springer, 2013

Remarks
This course has been added summer 2015.

Course: Physics for Engineers [2142890]

Coordinators: P. Gumbsch, A. Nesterov-Müller, D. Weygand, T. Förtsch
Part of the modules: Microsystem Technology (p. 73)[TVWL3INGMBIMT1]

ECTS Credits	Hours per week	Type	Term	Instruction language
6	2/2	lecture + exercise	Summer 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 bases in mechanics and optics are necessary.

Learning Outcomes
The student

- has the basic understanding of the physical foundations to explain the relationship between the quantum mechanical principles and the optical as well as electrical properties of materials
- can describe the fundamental experiments, which allow the illustration of these principles

Content
1) Foundations of solid state physics

- Wave particle dualism
- Tunnelling
- Schrödinger equation
- H-atom

2) Electrical conductivity of solids

- solid state: periodic potentials
- Pauli Principle
- band structure
- metals, semiconductors and isolators
- p-n junction / diode

3) Optics

- quantum mechanical principles of the laser
- linear optics
- non-linear optics

Workload
The total workload for this course is approximately 180.0 hours. For further information see German version.

Literature

- Tipler und Mosca: Physik für Wissenschaftler und Ingenieure, Elsevier, 2004
- Haken und Wolf: Atom- und Quantenphysik. Einführung in die experimentellen und theoretischen Grundlagen, 7. Aufl., Springer, 2000

Course: PLM for product development in mechatronics [2122376]

Coordinators: M. Eigner
Part of the modules: Product Lifecycle Management (p. 72)[TVWL3INGMB21]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2/0	lecture	Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam (20 min) taking place in the recess period (according to §4 (2), 2 of the examination regulation.

Conditions
None.

Learning Outcomes
Students have a basic overview about product data management and product lifecycle management.
Students know components and core functions of PLM solutions
Students can describe trends in research and practice in the environment of PLM

Content

Workload
The total workload for this course is approximately 120 hours. For further information see German version.

Course: PLM-CAD Workshop [2121357]

Coordinators: J. Ovtcharova
Part of the modules: Product Lifecycle Management (p. 72)[TVWL3INGMB21]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	4	practical course	Winter / Summer Term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Workload
The total workload for this course is approximately 120 hours. For further information see German version.

Course: Introduction to Microsystem Technology - Practical Course [2143875]

Coordinators: A. Last
Part of the modules: Microsystem Technology (p. 73)[TVWL3INGMBIMT1]

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

Learning Control / Examinations
The assessment consists of a written exam (60 minutes) (following §4(2), 1 SPO).

Conditions
None.

Recommendations
Courses Microsystem technology I [2141861] and II [2142874] are recommended.

Learning Outcomes

- Deepening of the contents of the lecture MST I resp. II
- Understanding the technological processes in the micro system technology
- Experience in lab-work at real workplaces where normally research is carried out

Content
In the practical training includes nine experiments:
1. Hot embossing of plastics micro structures
2. Micro electroforming
3. Mikro optics: „LIGA-micro spectrometer"
4. UV-lithography
5. Optical waveguides
6. Capillary electrophoresis on a chip
7. SAW gas sensor
8. Metrology
9. Atomic force microscopy
Each student takes part in only five experiments.
The experiments are carried out at real workstations at the IMT and coached by IMT-staff.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Course: Principles of Insurance Management [2550055]

Coordinators: U. Werner
Part of the modules: Risk and Insurance Management (p. 41)[TVWL3BWLFBV3]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	3/0	lecture	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.

Workload
The total workload for this course is approximately 135.0 hours. For further information 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: Exercises in Civil Law [24506]

Coordinators: T. Dreier
Part of the modules: Commercial Law (p. 82)[TVWL3JURA2]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2/0		Winter / Summer Term	de

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

Conditions
None.

Learning Outcomes
The students are able to solve legal cases by way of the appropriate legal technique (so-called Subsumtion). and to solve practical legal problems in a methodologically correct way.

Content
In 5 sessions the substantive law twhich students have been taught in the courses "Civil Law for Beginners", "Advanced Civil Law" and "Commercial and Corporation Law" will be repeated and the method for solving legal cases deepend. Moreover, 5 sessions ae reserved to written exam problems which cover the totality of what students have learned so far. Aditional sessions are reserved for the subsequent in-class discussion of the exam problems.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

Media
Slides

Literature
tba in the course.

Course: Problem solving, communication and leadership [2577910]

Coordinators: H. Lindstädt
Part of the modules: Strategy and Organization (p. 34)[TVWL3BWLUO1]

ECTS Credits	Hours per week	Type	Term	Instruction language
2	1/0	lecture	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.

Workload
The total workload for this course is approximately 60 hours. For further information see German version.

Media
Slides.

Literature
The relevant excerpts and additional sources are made known during the course.

Course: Product Lifecycle Management [2121350]

Coordinators: J. Ovtcharova
Part of the modules: Product Lifecycle Management (p. 72)[TVWL3INGMB21]

ECTS Credits	Hours per week	Type	Term	Instruction language
6	3/1	lecture + exercise	Winter term	de

Learning Control / Examinations
The assessment is carried out as a general written exam (90 min.) (according to Section 4 (2), 1 of the examination regulation) of the single course of this module. The examination is offered every semester. Re-examinations are offered at every ordinary examination date. The overall grade of the module is the grade of the written examination.

Conditions
This course Product Lifecycle Management [2121350] is compulsory for the module Product Lifecycle Management [WW4INGMB21] and must be examined.

Recommendations
None.

Learning Outcomes
The students can:

- clarify the management concept of PLM, its objectives and highlight the economic benefits of the PLM concept.
- illustrate the need for an integrated and cross-departmental business process - from planning, portfolio construction and return of customer information, from the use phase to maintenance and recycling of products.
- reason the processes and functions needed to support the entire product life cycle and discuss the main operating software systems (PDM, ERP, SCM, CRM) and their functions for supporting PLM.
- argue a method to successfully introduce the concept of Management PLM in companys.

Content
Product Lifecycle Management (PLM) is an approach to the holistic and cross-company management and control of all product-related processes and data throughout the life cycle along the extended supply chain - from design and production to sales, to the dismantling and recycling.
Product Lifecycle Management is a comprehensive approach for effective and efficient design of the product life cycle. Based on all product information, which comes up across the entire value chain and across multiple partners, processes, methods and tools are made available to provide the right information at the right time, quality and the right place.
The course covers:

- A consistent description of all business processes that occur during the product life cycle (development, production, sales, dismantling, ...)
- the presentation of methods for the performance of the PLM business processes,
- explaining the most important corporate information systems to support the life cycle (PDM, ERP, SCM, CRM systems) to sample the software manufacturer SAP

Workload
See German version.

Literature
Lecture slides.

V. Arnold et al: Product Lifecycle Management beherrschen, Springer-Verlag, Heidelberg, 2005.

J. Stark: Product Lifecycle Management, 21st Century Paradigm for Product Realisation, Springer-Verlag, London, 2006.

A. W. Scheer et al: Prozessorientiertes Product Lifecycle Management, Springer-Verlag, Berlin, 2006.

J. Schöttner: Produktdatenmanagement in der Fertigungsindustrie, Hanser-Verlag, München, 1999.

M.Eigner, R. Stelzer: Produktdaten Management-Systeme, Springer-Verlag, Berlin, 2001.

G. Hartmann: Product Lifecycle Management with SAP, Galileo press, 2007.

K. Obermann: CAD/CAM/PLM-Handbuch, 2004.

Course: Production Economics and Sustainability [2581960]

Coordinators: M. Fröhling
Part of the modules: Industrial Production I (p. 36)[TVWL3BWLIIP]

ECTS Credits	Hours per week	Type	Term	Instruction language
3,5	2/0	lecture	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
Students shall be aware of issues concerning industrial production and sustainability and shall apply strategies to resolve these issues.

Content
The analysis and management of material flows on the company level and above will be the focus of this lecture. Herein, the discussion will be about cost-effective and environmentally acceptable steps to avoid, abate and recycle emissions and waste as well as ways of efficient resources handling. As methods material flow analysis (MFA), life cycle assessment (LCA) and OR methods, e.g. for decision support, are introduced.
Topics:
- regulations related to materials and substances
- raw materials, reserves and their availabilities/lifetimes
- material and substance flow analysis (MFA/SFA)
- material related ecoprofiles, e.g. Carbon Footprint
- LCA
- resource efficiency
- emission abatement
- waste management and closed-loop recycling
- raw material oriented production systems
- environmental management (EMAS, ISO 14001, Ecoprofit), eco-controlling

Workload
Total effort required will account for approximately 105h (3.5 credits).

Media
Media will be provided on e-learning platform.

Literature
will be announced in the course

Course: Production and Logistics Controlling [2500005]

Coordinators: H. Wlcek
Part of the modules: Introduction to Technical Logistics (p. 64)[TVWL3INGMB13]

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

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
See German version.

Learning Outcomes
See German version.

Content
See German version.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Course: Production Technology and Management in Automotive [2149001]

Coordinators: V. Stauch, S. Peters
Part of the modules: Specialization in Production Engineering (p. 69)[TVWL3INGMB22]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture + exercise	Winter term	de

Learning Control / Examinations
The assessment is carried out as a written exam. The examination is offered every semester. Reexaminations are offered at every ordinary examination date.

Conditions
None

Recommendations
None

Learning Outcomes
The students . . .

- are capable to specify the current challenges in automotive industry and to explain approaches to solve them.
- are able to classify the main parts of an automotive plant and its key elements (production facilities).
- are qualified to identify interlinkages between development processes and production systems (such as lean production).
- have the ability to classify modern concepts of logistics and tasks in management and design of value added networks.
- are enabled to explain the importance of an integrated quality management in product development and production as well as related methods.
- are able to characterize methodical approaches of analytical assessment and optimization of production planning tasks.

Content
The lecture deals with the technical and organizational aspects of automotive production. The course starts with an introduction to the automotive industry, current trends in vehicle technology and integrated product development. A selection of manufacturing processes are subjects of the second lecture block. Experiences of the applications of the Mercedes Production System in production, logistics and maintenance are the subject of the third event. During the last block approaches to quality management, global networks and current analytical planning methods in research are discussed. The course is strongly oriented towards the practice and is provided with many current examples. Mr. Stauch was Head of Powertrain Production Mercedes Benz Cars and plant manager Untertürkheim until 2010.
The following topics will be covered:

- Introduction to Automotive Industry and Technology
- Basics of Product Development
- Selected Automotive Manufacturing Technologies
- Automotive Production Systems
- Logistics
- Quality Assurance
- Global Networks
- Analytical Approaches of Production Planning

Workload
regular attendance: 21 hours
self-study: 99 hours

Media
Lecture slides will be provided printed.

Literature
Lecture Slides

Remarks
The lecture will be offered in winter semester 2015/2016 for the last time. The last examination will be in August 2016. The last chance for a reexamination will be in March 2017. There are only written exams.

Course: Introduction to Programming with Java [2511000]

Coordinators: N. N.
Part of the modules: Introduction to Programming (p. 18)[TVWL1INFO1]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	3/1/2	lecture + exercise + tutorial	Winter term	de

Learning Control / Examinations
The assessment consists of a written resp. computer-based exam (60 min) according to Section 4 (2),1 of the examination regulation.
The successful completion of the compulsory tests in the computer lab is prerequisited for admission to the written resp. computer-based exam.
The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
see German version

Content
see German version

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

Literature
D. Ratz, J. Scheffler, D. Seese, J. Wiesenberger. Grundkurs Programmieren in Java. 6. aktualisierte und erweiterte Auflage, Hanser 2011.

Remarks
see German version

Course: Advanced Programming - Java Network Programming [2511020]

Coordinators: D. Seese, D. Ratz
Part of the modules: Emphasis Informatics (p. 55)[TVWL3INFO1]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	2/1/2	lecture + exercise + tutorial	Summer term	de

Learning Control / Examinations
The assessment consits of a written exam (90 min) according to Section 4(2), 1 of the examination regulation.
The successful completion of the compulsory tests in the computer lab is prerequisite for admission to the written exam. Further information about attendance to the exercises and practical terms will be announced in the first lecture and at the lecture homepage.
The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions
This course cannot be taken together with *Advanced Programming - Application of Business Software* [2511026].

Learning Outcomes
see German version

Content
see German version

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

Literature
D. Ratz, J. Scheffler, D. Seese, J. Wiesenberger. Grundkurs Programmieren in Java. 6. aktualisierte und erweiterte Auflage, Hanser 2011.
Elective literature:

- S. Zakhour, S. Hommel, J. Royal. Das Java Tutorial. Addison Wesley 2007
- W. Eberling, J. Lessner. Enterprise JavaBeans 3. Hanser Verlag 2007.
- R. Oechsle. Parallele und verteilte Anwendungen. 2. Auflage. Hanser Verlag 2007.
- Further references will be given in the lecture.

Course: Advanced Programming - Application of Business Software [2511026]

Coordinators: A. Oberweis, S. Klink
Part of the modules: Emphasis Informatics (p. 55)[TVWL3INFO1]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	2/1/2	lecture + exercise + tutorial	Winter term	de

Learning Control / Examinations
The assessment consists of a written examination of 2 hours (according to Section 4 (2), 1 of the examination regulation) and of assignments during the course (according to Section 4 (2), 3 of the examination regulation).
Successful participation to the computer lab is precondition for permission to the assessment. Further information will be given at the first lesson and via the homepage of the course.
The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions
This course cannot be taken together with *Advanced Programming - Java Network Programming* [2511020].

Recommendations
Knowledge of the course "Grundlagen der Informatik I und II" are helpful.

Learning Outcomes
Students

- explain basic concepts and principles of enterprise information systems,
- describe the components of enterprise information systems,
- assess economical aspects of such systems,
- asseapply standard software for modelling busines processes and for analysing them to given criteria.

Content
Business information systems enable, support, and accelerate new forms of business processes and forms of organisation. They are the central infrastucture of the economy in the age of eBusiness. Thus, basic knowledge is given in lectures, in excersises and in the computer lab which deals with installation, configuration and parameterization of busines information systems. The course communicates profund knowledge in following topics:

- Analysis of cooperation scenarios and business process scenarios
- Selection of modelling methods according to defined criteria
- Implementation of business process modells and cooperation modells with the help of standard software
- Identification and assessment of challenges during the installation of information systems
- Economical evaluation of business information systems.

Workload
Lecture 30h
Exercise course 17h
Review and preparation of lectures 30h
Review and preparation of exercises 15h
Computer Lab 30h
Exam preparation 29h
Exam 1h
Total 150 h
Exercise courses are done by student tutors (size about 50 students)

Media
Slides, access to internet resources.

Literature
Schönthaler, Vossen, Oberweis, Karle: Business Processes for Business Communities: Modeling Languages, Methods, Tools. Springer 2012.
Hasenkamp, Stahlknecht: Einführung in die Wirtschaftsinformatik. Springer 2012.
Hansen, Neumann: Wirtschaftsinformatik I. Grundlagen betrieblicher Informationsverarbeitung. UTB 2009.
Mertens et al.: Grundzüge der Wirtschaftsinformatik. Springer 2012.
Further literature will be given during the course.

Course: Project Management [6200106]

Coordinators: S. Haghsheno, H. Schneider
Part of the modules: Fundamentals of construction (p. 77)[TVWL3INGBGU3]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	lecture + exercise	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
See German version.

Content

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
DIETHELM, G.: Projektmanagement, Band 1: Grundlagen, Verlag Neue Wirtschafts-Briefe, Herne, 2000
HAHN, R.: Projektmanagement für Ingenieure, Wiley-VCH Verlag, Weinheim, 2002
KERZNER, H.: Project Management – A Systems Approach to Planning, Scheduling and Controlling, Wiley & Sons, 2006
KOCHENDÖRFER, B., LIEBCHEN, J.: Bau-Projekt-Management, Verlag B. G. Teubner, Stuttgart, 2001

Course: Projectseminar [SozSem]

Coordinators: G. Nollmann, Kunz, Haupt, Grenz, Eisewicht, Enderle, Dukat, Albrecht
Part of the modules: Sociology/Empirical Social Research (p. 86)[TVWL3SOZ]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	seminar	Winter / Summer Term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
The student:

- Is able to develop sociological analyses based on the topic of the seminar
- Is able to organize a small survey or to evaluate a given data set on the research problem

Content
In this class, students will conduct small empirical projects.

Workload
The total workload for this course is approximately 120 hours. For further information see German version.

Course: Explorative-interpretative Project Seminar [n.n.]

Coordinators: M. Pfadenhauer, Kunz, Grenz, Eisewicht, Dukat, Enderle, Albrecht
Part of the modules: Qualitative Social Research (p. 87)[TVWL3SOZ2]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2/0	lecture	Winter / Summer Term	de

Learning Control / Examinations
The form of the assessment will be announced at the beginning of the course by the resp. lecturer. Usually at 2 Credit Points i twill be an oral presentation, at 4 LP there has to be passed a term paper as well.
The modality of grading will be announced at the beginning of the course by the lecturer. Usually at 2 Credit Points the overall grade consists of the oral presentation and the active participation in the project - at 4 Credit Points it consists of the active parcticipation and the term paper.

Conditions
Succssesful completion of the lecture *Interpretative Social Research Methods* [n.n.].
Knowledge of this lecture is required.
The lecture is compulsory in the module and has to be attended.

Learning Outcomes
The student

- is, based on the lecture 'Interpretative Social Research Methods', capable of choosing and applying appropriate explorative-interpretative methods according to a research question and arranging them in a conceptual research design.
- uses this capability to concretise a scientific question and to collect, fixate and evaluate suitable data.

Content
See seminar announcement.

Workload
The total workload for this course is approximately 120.0 hours. For further information see German version.

Media
Will be announced in the lecture.

Literature
Will be announced in the lecture.
Elective literature:
Will be announced in the lecture.

Course: Quality Management [2149667]

Coordinators: G. Lanza
Part of the modules: Specialization in Production Engineering (p. 69)[TVWL3INGMB22]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Winter term	de

Learning Control / Examinations
Performance is assessed in the form of one written examination (as per §4(2), 1 SPO [study and examination regulations]) during the lecture-free period. The examination will take place once every semester and can be retaken at every official examination date.

Conditions
None

Recommendations
None

Learning Outcomes
The students . . .

- are capable to comment on the content covered by the lecture.
- are capable of substantially quality philosophies.
- are able to apply the QM tools and methods they have learned about in the lecture to new problems from the context of the lecture.
- are able to analyze and evaluate the suitability of the methods, procedures and techniques they have learned about in the lecture for a specic problem.

Content
Based on the quality philosophies Total Quality Management (TQM) and Six Sigma, the lecture deals with the requirements of modern quality management. Within this context, the process concept of a modern enterprise and the process-specic elds of application of quality assurance methods are presented. The lecture covers the current state of the art in preventive and non-preventive quality management methods in addition to manufacturing metrology, statistical methods and service-related quality management. The content is completed with the presentation of certication possibilities and legal quality aspects.
Main topics of the lecture:

- The term "quality"
- Total Quality Management (TQM) and Six Sigma
- Universal methods and tools
- QM during early product stages – product denition
- QM during product development and in procurement
- QM in production – manufacturing metrology
- QM in production – statistical methods
- QM in service
- Quality management systems
- Legal aspects of QM

Workload
regular attendance: 21 hours
self-study: 99 hours

Media
Lecture notes will be provided in ilias (https://ilias.studium.kit.edu/).

Literature
Lecture Notes

Remarks
None

Course: Spatial Planning and Planning Law [6200404]

Coordinators: W. Jung
Part of the modules: Mobility and Infrastructure (p. 76)[TVWL3INGBGU1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2/0	lecture + exercise	Summer term	de

Learning Control / Examinations
See module description.

Conditions
None.

Recommendations
None.

Learning Outcomes
The educational aim of the lecture is to give a first view on spatial planning and its main tasks. At the end of the semester the participants should be able to work on modest issues of spatial planning on the local level. This is due to assess quantitative aspects like temporal processes and display spatial data.

Content

- Tasks and strategies of spatial planning

- Spaces, uses and conflicts of local planning

- Spatial planning on the local level: Properties and buildings including the public technical and social infrastructure

- Planning on municipality level

- Sustainable settlement structure and land use management

- Historic view on urbanism and regional development

- Planning on different levels: Regional plans, structure plans and zoning plans

- Spatial planning and the European Dimension

- Real estate economy

- Exercise: Urban Planning in Karlsruhe Nordstadt

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Elective literature:

- W. Müller: Städtebau

- W. Braam: Stadtplanung

- D. Bökemann (1982): Theorie der Raumplanung

- Hotzan, Jürgen (1994): dtv-Atlas zur Stadt

Course: Real Estate Management I [2586400]

Coordinators: T. Lützkendorf
Part of the modules: Real Estate Management (p. 51)[TVWL3BWLOOW2]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/2	lecture + exercise	Winter 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 two times only in the semester in which the lecture is takes place (winter semester). Re-examinations are offered at every ordinary examination date.

Conditions
None.

Recommendations
A combination with the module *Design Construction and Assessment of Green Buildings I* [TVWL3BWLOOW1] is recommended.
Furthermore it is recommended to choose courses of the following fields

- Finance and Banking
- Insurance
- Civil Engineering and Architecture (building physics, structural design, facility management)

Learning Outcomes
The student

- has a basic understanding of the specific characteristics of real estate and real estate markets
- is able to transfer and apply in-depth knowledge in the field of business administration to construction and real estate
- is able to analyze, evaluate or to meet decisions in the life cycle of real estate

Content
The course Real Estate Management I deals with questions concerning the economy of a single building througout its lifecycle. Among other topics this includes project development, location and market studies, german federal building codes as well as finance and assessment of economic efficiency.
The tutorial recesses the contents of the course by means of practical examples and, in addition to that, goes into the possible use of software tools.

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

Media
Presentation slides and supplementary material is provided partly as printout, partly online for download.

Literature
Elective literature:

- Gondring (Hrsg.): „Immobilienwirtschaft: Handbuch für Studium und Praxis". ISBN 3-8006-2989-5. Vahlen 2004
- Kühne-Büning (Hrsg.): „Grundlagen der Wohnungs- und Immobilienwirtschaft". ISBN 3-8314-0706-1. Knapp & Hammonia-Verlag 2005
- Schulte (Hrsg.): „Immobilienökonomie Bd. I". ISBN 3-486-25430-8. Oldenbourg 2000

Remarks
The course is replenished by excursions and guest lectures by practicioners out of the real estate business.

Course: Real Estate Management II [2585400]

Coordinators: T. Lützkendorf
Part of the modules: Real Estate Management (p. 51)[TVWL3BWLOOW2]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/2	lecture + exercise	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 two times only in the semester in which the lecture is takes place (summer semester). Reexaminations are offered at every ordinary examination date.

Conditions
None.

Recommendations
A combination with the module *Design Construction and Assessment of Green Buildings I* [TVWL3BWLOOW1] is recommended.
Furthermore it is recommended to choose courses of the following fields

- Finance and Banking
- Insurance
- Civil Engineering and Architecture (building physics, structural design, facility management)

Learning Outcomes
The student

- has an in-depth knowledge on the economic classification and significance of the real estate industry
- has a critical understanding of essential theories, methods and instruments of the real estate industry
- is able to analyze and evaluate activity areas and functions in real estate companies as well as to prepare or to take decisions

Content
The course Real Estate Management II gives special attention to topics in connection to the management of large real estate portfolios. This especially includes property valuation, market and object rating, maintenance and modernization, as well as real estate portfolio and risk management. The tutorial provides examples in order to practice the application of theoretical knowledge to practical problems.

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

Media
Presentation slides and supplementary material is provided partly as printout, partly online for download.

Literature
Elective literature:
See german version.

Remarks
The course is replenished by excursions and guest lectures by practicioners out of the real estate business.

Course: Computer Integrated Planning of New Products [2122387]

Coordinators: R. Kläger
Part of the modules: Product Lifecycle Management (p. 72)[TVWL3INGMB21]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2		Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam (30 min) according to §4 (2), 2 of the examination regulation.
The grade corresponds to the grade of the oral exam.

Conditions
Limited number of participants, for selection procedure and registration see course homepage.

Recommendations
None.

Learning Outcomes
The students got a basic understanding of relations, procedures and structure elements of standard processes in product planning and are capable of using these as guidelines for planning of new products.
They acquired knowledge of requirements and options in choosing and applying the right methods and tools for an efficient and reasonable assistance for specific use cases.
The students are familiar with elements and methods of computer aided idea and innovation management. They acquired knowledge of simultaneous assistance to the product planning process by using the technologies of rapid prototyping during development phases.

Content
The increase in creativity and the strength of innovation for the planning and development of new products has become a key factor for the competitiveness of the industry. Shorter innovation cycles, an overwhelming flood of information and an increasing demand for information and communication makes the use of computer absolutely necessary. Against this background this lecture discusses the success factors for new products, and introduces a product innovation process in conjunction with planning of new products based on the concepts of system engineering. In the following the methodological assistance to this process is being discussed by introducing innovation management, idea management, problem solving strategies, creativity and rapid prototyping for instance.

Workload
The total workload for this course is approximately 120.0 hours. For further information see German version.

Literature
Handouts during lecture

Course: Financial Accounting and Cost Accounting [2600002]

Coordinators: J. Strych
Part of the modules: Fundamentals of Business Administration 2 (p. 17)[TVWL1BWL3]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2/2	lecture + exercise	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam following §4, Abs. 2, 1 of the examination regulation.
The examination takes place in every semester. Re-examinations are offered at eyery ordinary examination date.

Conditions
None.

Recommendations
It is recommended to have some skills about financial accounting on an introductory level.

Learning Outcomes
Students

- are able to understand IFRS annual reports,

- know differences between HGB and IFRS,

- are able to understand and implement selected IFRS rules,

- can analyse how liquid the firm is,

- can analyse and assess financial reports,

- are able to measure the value added in firms,

- have skills about budgeting and benchmarking, and

- can understand and implement reporting systems.

Content
1. Introduction to accounting standards (IFRS, HGB)
2. Annual report and financial statements
3. Selected topics in financial accounting
4. Operational efficiency analysis
5. Financial Statement Analysis
6. Value-based management
7. Taxes
8. Creative accounting and compliance
9. Budgeting and benchmarking
10. Reporting

Workload
The total workload for this course is approximately 120 hours. For further information see German version.

Media
slides

Course: Renewable Energy – Resources, Technology and Economics [2581012]

Coordinators: R. McKenna
Part of the modules: Energy Economics (p. 37)[TVWLIIP2]

ECTS Credits	Hours per week	Type	Term	Instruction language
3,5	2/0	lecture	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:

- understands the motivation and the global context of renewable energy resources.

- gains detailed knowledge about the different renewable resources and technologies as well as their potentials.

- understands the systemic context and interactions resulting from the increased share of renewable power generation.

- understands the important economic aspects of renewable energies, including electricity generation costs, political pro-
  motion and marketing of renewable electricity.

- is able to characterize and where required calculate these technologies.

Content
1. General introduction: Motivation, Global situation
2. Basics of renewable energies: Energy balance of the earth, potential definition
3. Hydro
4. Wind
5. Solar
6. Biomass
7. Geothermal
8. Other renewable energies
9. Promotion of renewable energies
10. Interactions in systemic context
11. Excursion to the "Energieberg" in Mühlburg

Workload
The total workload for this course is approximately 105.0 hours. For further information see German version.

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

Literature
Elective literature:

- Kaltschmitt, M., 2006, Erneuerbare Energien : Systemtechnik, Wirtschaftlichkeit, Umweltaspekte, aktualisierte, korrigierte
  und ergänzte Auflage Berlin, Heidelberg : Springer-Verlag Berlin Heidelberg.

- Kaltschmitt, M., Streicher, W., Wiese, A. (eds.), 2007, Renewable Energy: Technology, Economics and Environment,
  Springer, Heidelberg.

- Quaschning, V., 2010, Erneuerbare Energien und Klimaschutz : Hintergründe - Techniken - Anlagenplanung –
  Wirtschaftlichkeit München : Hanser, Ill.2., aktualis. Aufl.

- Harvey, D., 2010, Energy and the New Reality 2: Carbon-Free Energy Supply, Eathscan, London/Washington.

- Boyle, G. (ed.), 2004, Renewable Energy: Power for a Sustainable Future, 2nd Edition, Open University Press, Oxford.

Course: Applied Econometrics [semSTAT1]

Coordinators: M. Schienle
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations
Alternative exam assessment according to § 4(2), 3 SPO.

Conditions
None.

Learning Outcomes

Content

Workload
The total workload for this course is approximately 90 hours.
Lecture 30h
Preparation of lecture 45h
Exam preparation 15h

Course: Seminar in Enterprise Information Systems [SemAIFB1]

Coordinators: R. Studer, A. Oberweis, T. Wolf, R. Kneuper
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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

Workload

Literature
Literature will be given individually in the specific seminar.

Course: Seminar Data Mining I [2521388]

Coordinators: G. Nakhaeizadeh
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations
Alternative exam assessment according to § 4(2), 3 SPO.

Conditions
None.

Learning Outcomes

Content

Workload
The total workload for this course is approximately 90 hours.
Lecture 30h
Preparation of lecture 45h
Exam preparation 15h

Course: Seminar Efficient Algorithms [SemAIFB2]

Coordinators: H. Schmeck
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

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: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Course: Seminar Public Finance [2560130]

Coordinators: B. Wigger, Assistenten
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations

Conditions
See module description.
Adequate for students in an advanced stage of their studies.

Learning Outcomes
See German version.

Content
Preparation, presentation, and discussion of recent research papers on varying Public Finance issues. The current seminar subject, including the exact topics to work on, will be announced under http://fiwi.iww.kit.edu and on the notice board prior to the start of semester.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced at the beginning of the seminar.

Course: Seminar Conveying Technology and Logistics [SemIFL]

Coordinators: K. Furmans
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations
Participation during the information presentation. The performance review is based on the written paper and the two presentations. Active participation during the presentations is required.

Conditions
See module.

Recommendations
See German version.

Learning Outcomes
Students are able to work on scientific subjects under guidance, which includes:

- the self driven outline of the inquired subject,
- investigating and argumenting in the context of logistics and material handling,
- the presentation of the results in front of professionals and
- the written work.

Thereby presentation technique is used and enlarged.

Content
The topics of the seminar will be published under http://www.ifl.kit.edu/seminare.php one semester before. To participate it is necessary to sign in the semester before.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Course: Entrepreneurship Seminar [SemTuE1]

Coordinators: O. Terzidis
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3		seminar		

Learning Control / Examinations
See German version.

Conditions
None.

Learning Outcomes
The scope is depending on the seminars summarised hereunder.

Content

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Course: Seminar Human Resource Management [2573011]

Coordinators: P. Nieken
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations
The assessment is done according to §4(2), 3 of the examination regulation.
Students write a seminar paper on an assigned topic (10 to 12 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. The weighting depends on the respective seminar.

Conditions
None.

Learning Outcomes
The student

- looks critically into current research topics in the fields of Human Resource Management and Personnel Economics.
- trains his / her presentation skills.
- learns to get his / her ideas and insights across in a focused and concise way, both in oral and written form, and to sum up the crucial facts.
- cultivates the discussion of research approaches.

Content
The topics are redefined each semester on basis of current research topics. The topics will be announced on the website of the Chair.

Workload
The total workload for this course is approximately 90 hours.
Lecture 30h
Preparation of lecture 45h
Exam preparation 15h

Literature
Selected journal articles and books.

Remarks
This course has been added summer 2015.

Course: Seminar in Behavioral and Experimental Economics [n.n.]

Coordinators: P. Reiss
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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).

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

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: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations

Conditions
None.

Recommendations
Knowledge of the content of the module *Essentials of Finance* [TVWL3BWLFBV1] 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.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced at the end of the foregoing semester.

Course: Seminar Financial Economics and Risk Management [2530353]

Coordinators: M. Ulrich
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Course: Seminar in International Economy [SemIWW2]

Coordinators: J. Kowalski
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2/0	seminar	Winter / Summer Term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes
The student gets aquianted with various modern doctrines and theories pertinent to international economic policy. They shoud understand the structure of the institutional framework relevant for the global economy and the way it functions. They should be able to form their own jugement on the strategies, measures and outcomes of actions of various actors dealing with the international economic policy.

Content

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Course: Seminar in Marketing and Sales (Bachelor) [SemETU1]

Coordinators: M. Klarmann, S. Feurer
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations
Grading system: written seminar paper (weighting 60%), presentation of the seminar paper (weighting 30%), oral participation (weighting 10%).

Conditions
None.

Learning Outcomes
Students
- are able to deal with academic marketing papers
- are capable to obtain literature in relevant databases
- know how academic marketing papers are structured
- comprehend statistic approaches and interpret their results
- are able to relate scientific results to practice
- know how to categorize academic papers under a research field
- are able to quote sources correctly
- are capable to present scientific findings and their results in a clear and transparent way

Content

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Remarks
Students interested in bachelor thesis positions at the chair of marketing should participate in the marketing seminar.
For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

Course: Seminar in Economic Policy [SemIWW3]

Coordinators: I. Ott
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations
The assessment is carried out through a term paper within the range of 12 to 15 pages, a presentation of the results of the work in a seminar meeting, and active participation in the discussions of the seminar meeting (§ 4 (2), 3 SPO).

The final grade is composed of the weighted graded examinations. (Essay 50%, 40% oral presentation, active participation 10%).

The seminar is intended for students both of bachelor and master degree program. They are differentiated by different assessment criteria for term paper and presentation grading.

Conditions
At least one of the lectures "Theory of Endogenous Growth" or "Innovation Theory and Policy" should be attended in advance, if possible.

Learning Outcomes
Students are able to

- work on an economic policy question based the scientific literature by employing fundamental methods from economics

- conduct a thorough literature research and (if applicable) illustrate their results with e.g. Mathematica

- present their results in a term paper that satisfies the requirements of a scientific publication

- give a presentation of their results together with another participant of the seminar

- discuss the term papers and presentations of the other participants

Content
The current topic of the seminar including the subjects treated will be announced before the semester begins at http://wipo.iww.kit.edu.
Previous Topics:

- Economic Aspects of General Purpose Technologies (SS 2010)

- Questions of Modern Economic Growth Theories (WS 2010/2011)

- Beans or fully automated machines? Determinants of Developement and Growth in a globalized World (SS 2011)

- Technology Assessment and strategic Patent Analyses (WS 2011/2012)

- Innovation Potentials and Spatial Dimension in Cultural and Creative Industries (WS 2011/2012)

- Quantitative Methods in Economics with Mathematica (SS 2012)

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Course: Seminar in Industrial Production [SemIIP2]

Coordinators: F. Schultmann, M. Fröhling
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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" [TVWL3BWLIIP], „Industrial Production II" [WW4BWLIIP2] 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.

Workload
Total effort required will sum up to approximately 90h.

Course: Seminar Information Engineering and Management [SemIW]

Coordinators: C. Weinhardt
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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.

Recommendations
At least one module offered by the institute should have been chosen before attending this seminar.

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.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

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: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

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: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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.

Workload
The total workload for this course is approximately 120 hours. For further information see German version.

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: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

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: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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).

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

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: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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 athttp://polit.econ.kit.edu

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
A selection of published papers and books.

Remarks
The seminar will be held in English.

Course: Seminar Human Resources and Organizations [2573010]

Coordinators: P. Nieken
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations
The assessment is done according to §4(2), 3 of the examination regulation.
Students write a seminar paper on an assigned topic (10 to 12 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. The weighting depends on the respective seminar.

Conditions
None.

Learning Outcomes
The student

- looks critically into current research topics in the fields of human resources and organizations.

- trains his / her presentation skills.

- learns to get his / her ideas and insights across in a focused and concise way, both in oral and written form, and to sum up the crucial facts.

- cultivates the discussion of research approaches.

Content
The topics are redefined each semester on basis of current research topics. The topics will be announced on the website of the Chair.

Workload
The total workload for this course is approximately 90 hours.
Lecture 30h
Preparation of lecture 45h
Exam preparation 15h

Literature
Selected journal articles and books.

Remarks
This course has been added summer 2015.

Course: Seminar Risk and Insurance Management [SemFBV1]

Coordinators: U. Werner
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations
Oral presentation and written report of about 10 pages on the same topic, as well as active participation in discussion and working groups (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* ([TVWL3BWLFBV3], [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* [TVWL3BWLFBV3] as well as with the master modules *Insurance Management I* [WW4BWLFBV6] and *Insurance Management* II [WW4BWLFBV7]. 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.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

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: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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

Workload
The total workload for this course is approximately 120 hours. For further information see German version.

Literature
The student will receive the necessary literature for his research topic.

Course: Seminar Statistics [SemSTAT]

Coordinators: N.N.
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar		

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes

Content

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Course: Seminar Stochastic Models [SemWIOR1]

Coordinators: K. Waldmann
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

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: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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.

Workload
The total workload for this course is approximately 120.0 hours. For further information see German version.

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: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

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: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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
Successful completion of the module *Introduction to Operations Research* [TVWL1OR].

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.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Literature and relevant sources will be announced at the beginning of the seminar.

Remarks
The seminar is offered in each term.

Course: Seminar in Experimental Economics [SemWIOR3]

Coordinators: N. N.
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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/).

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

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: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
References and relevant sources are announced at the beginning of the seminar.

Course: Seminar on Macroeconomic Theory [SemETS3]

Coordinators: M. Hillebrand
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar		

Learning Control / Examinations

Conditions
None.

Recommendations
At least one of the courses *Theory of Business Cycles[25549]* and *Theory of Economic Growth [2520543]* should have been attended beforehand.

Learning Outcomes
See German version.

Content

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced at the end of the recess period.

Remarks
for details see German version.

Course: Seminar on Network Economics [2560263]

Coordinators: K. Mitusch
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations
The assessment consists of a seminar paper of 15-20 pages, a presentation of results and active participation in the diskussion during the seminar (according to §4(2), 3 ERSC)
The grading is carried out primarily in reference to the seminar paper, however, divergent performance in the presentation will be accounted for by a corresponding adjustment. In particular, there is the chance to improve grades through good participation during the seminar.

Conditions
See module description.
Basic knowledge of network economics is required. The course *Competition in Networks* [26240] should be completed.

Learning Outcomes
The students

- will deepen their knowledge in network economics

- will be able to familiarize oneself with network economic topics and to examine and discuss a specific question

- will be able to present his/her results

- will get inspiration for a potential master thesis.

Content
The current theme of the seminar including the suggestion of topics for the seminar papers will be announced in KIM and on the notice board at the institute (http://netze.iww.kit.edu).
(The title of the seminar may change from term to term depending on the topic)

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Course: Seminar Transport Economics [2561209]

Coordinators: K. Mitusch, E. Szimba
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes
The students

- have learnt how to deal with a selected aspect of European transport planning, transport policy or transport modelling and to prepare a written summary on it (potentially in team work, depending on the subject)

- are able to present and discuss their work

- acquire competent knowledge on selected aspects of European transport planning, transport policy or transport modelling

- get inspiration for a potential master thesis

Content
This seminar is about current challenges in transport planning and transport politics in the European context.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Course: Seminar: Legal Studies [RECHT]

Coordinators: Inst. ZAR
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations
alternative exam assessment (following §4(2), 3 of the examination regulation).

Conditions
None.

Learning Outcomes

Content

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Course: Seminar: Management and Organization [2577915]

Coordinators: H. Lindstädt
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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.

- apply the basics of scientific work.

- present selected topics to a group.

Content
The subjects are redefined each semester on the basis of current issues.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Media
Slides.

Literature
The relevant sources are made known during the course.

Course: Seminar paper "Production Engineering" [21690sem]

Coordinators: V. Schulze, G. Lanza, J. Fleischer
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

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

Learning Control / Examinations
The following work and performance is required for the successful completion of the seminar:

- active participation in the seminar,
- completion of a seminar paper on the topic of the seminar (minimum input: 80 h) and
- a presentation given after completion of the seminar paper.

The seminar paper can be submitted:

- for the module: *seminar module* [SemING] OR
- to improve the module grade of modules: *Manufacturing Engineering* [TVWL3INGMB23], *Integrated Production Planning* [TVWL3INGMB24] or *Vertiefung der Produktionstechnik* [WI4INGMB22].

Each seminar paper can be submitted only once. One paper cannot be submitted for both the seminar module and the improvement of the grade.

The score of the seminar paper can be used to improve the grade of one of the above-mentioned modules. The module grade can be improved by three tenths maximum. Only seminar papers written at wbk Institute of Production Science qualify for an improvement of the module grade.

One seminar paper can be used for the improvement of one module grade (named above) maximum. For the improvement of a grade, no more than one seminar paper can be submitted.

Conditions
None.

Learning Outcomes
The students are able to

- find appropriate data sources, evaluate and extract information.
- apply a predetermined citation style correctly.
- summarize information and results shortly and concisely in a written form.
- to design visual preparations of scientific problems or results and to make an oral presentation.
- to work in task-oriented cooperation as a team.

Content
Students independently deal with production engineering related problems from the fields of manufacturing engineering, machine tools and handling technology and organisation, planning and logistics with tutorial assistance. The results are aggregated in the form of a seminar paper and are then illustrated in the form of a presentation.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Media
Lecture notes of the Institute of Production Science.

Course: Simulation I [2550662]

Coordinators: K. Waldmann
Part of the modules: Stochastic Methods and Simulation (p. 61)[TVWL3OR7], Applications of Operations Research (p. 58)[TVWL3OR5]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1/2	lecture + exercise + tutorial	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 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.

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

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 Methods and Simulation (p. 61)[TVWL3OR7]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1/2	lecture + exercise + tutorial	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.

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

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: Software Engineering [2511206]

Coordinators: A. Oberweis
Part of the modules: Emphasis Informatics (p. 55)[TVWL3INFO1], Electives in Informatic (p. 57)[TVWL3INFO2]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2/1	lecture + exercise	Summer term	de

Learning Control / Examinations
The assessment consists of an 1h written exam in the first week after lecture period.

Conditions
None.

Learning Outcomes
Students

- are familiar with the concepts and principles of software engineering and can discuss it,
- know common software development process models and their strengths and weaknesses and can discuss it,
- know methods for requirements analysis and can use it and can model and evaluate use case models,
- know models for systems structuring and controling as well as architecture principles of software systems and can discuss it.
- can model and evaluate component diagrams
- are familiar with basic concepts of software quality management and are able to apply software test and evaluation methods in concrete situations.

Content
The course deals with fundamental aspects of the systematically development of huge software systems. The course covers topics such as:

- software developing process models
- methods and tools for the development phases: requirements analysis, system specification, system design, programming and testing.

Workload
Lecture 30h
Exercise 15h

Review und Preparation of lectures 30h
Review and Preparation of exercises 15h
Exam preparation 29h
Exam 1h

Total: 120h

Media
Slides, access to internet resources.

Literature
Elective literature:

- H. Balzert. Lehrbuch der Software-Technik. Spektrum Verlag 2008.
- I. Sommerville. Software Engineering. Pearson Studium 2012.

Further literature is given in the course.

Course: Software Laboratory: OR Models I [2550490]

Coordinators: S. Nickel
Part of the modules: Applications of Operations Research (p. 58)[TVWL3OR5]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	1/2	lecture + exercise	Winter 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
Firm knowledge of the contents from the lecture *Introduction to Operations Research I* [2550040] of the module *Operations Research* [WI1OR].

Learning Outcomes
The student

- evaluates the possibilities of computer usage in practical applications of Operations Research,

- is capable of classifying and utilizing the general possibilities and fields of usage of modeling and implementation software for solving OR models in practice,

- models and solves problems arising in industry applications with the aid of computer-supported optimization methods.

Content
After an introduction to general concepts of modelling tools (implementation, data handling, result interpretation, . . .), the software IBM ILOG CPLEX Optimization Studio and the corresponding modeling language OPL will be discussed which can be used to solve OR problems on a computer-aided basis.
Subsequently, a broad range of exercises will be discussed. The main goals of the exercises from literature and practical applications are to learn the process of modeling optimization problems as linear or mixed-integer programs, to efficiently utilize the presented tools for solving these optimization problems and to implement heuristic solution procedures for mixed-integer programs.

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

Remarks
Due to capacity restrictions, registration before course start is required. For further information see the webpage of the course.
The lecture is offered in every winter term. The planned lectures and courses for the next three years are announced online.

Course: Social structures of modern societies [11005]

Coordinators: G. Nollmann
Part of the modules: Sociology/Empirical Social Research (p. 86)[TVWL3SOZ]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Winter term	de

Learning Control / Examinations
The assessment consists of a written test according to Setion 4 (2), 1 of the examination regulation. The test will be graded. The test takes place in the last lecture. Generally re-examinations are offered six weeks later.

Conditions
The lecture is obligatorily in the module and has to be completed.

Learning Outcomes
The student:

- Gains knowledge on social structures of modern societies

- Describes and explains current societal processes

- Gets to know selected research, problems and data.

Content
The lecture begins with definitions of social structures and their relation to the culture of human behaviour. Furthermore, important research, current debates, and controversies will be presented as well as continuity and change of German social structures in comparative fashion.

Important topics will be modernisation, individualisation, class structures, education and job market, social mobility, life courses and cohorts, distributions of income and wealth, family, marriage market, fertility.

The lecture stresses knowledge about data sources, official statistics, and relevant results of survey research.

Workload
The total workload for this course is approximately 120 hours. For further information see German version.

Course: Special Topics in Management Accounting [2579905]

Coordinators: M. Wouters, F. Stadtherr
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar		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.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

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: eBusiness and Service Management (p. 42)[TVWL3BWLISM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	3	practical seminar	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.

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

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 Applied Informatics [Platzhalter]

Coordinators: A. Oberweis, H. Schmeck, R. Studer
Part of the modules: Emphasis Informatics (p. 55)[TVWL3INFO1], Electives in Informatic (p. 57)[TVWL3INFO2]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	2/1	other	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 "Applied computer science",

- apply methods and instruments in a subarea of "Applied computer science",

- 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 applied informatics.

Workload
Lecture 30h
Exercise 15h

Preparation of lecture 30h
Preparation of exercises 30h
Exam preparation 44h
Exam &1h

Total: 150h

Media
Will be announced at the beginning of the course.

Literature
Will be announced at the beginning of the course.

Remarks
This course can be used in particular for the acceptance of external courses whose content is in the broader area of applied informatics, but is not equivalent to another course of this topic.

Course: Special Sociology [spezSoz]

Coordinators: G. Nollmann, Pfadenhauer, Haupt, Grenz, Eisewicht, Kunz, Dukat, Albrecht, Enderle
Part of the modules: Sociology/Empirical Social Research (p. 86)[TVWL3SOZ], Qualitative Social Research (p. 87)[TVWL3SOZ2]

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

Learning Control / Examinations
Module *Sociology/Empirical Social Research* [TVWL3SOZ]: The assessment conists of lecture minutes (graded) and an oral presentation (according to Section 4 (2), 3 of the examination regulation.
Modul *Qualitative Social Research* [TVWL3SOZ2]: The assessment consists of an oral exam according to Section 4(2), 2 of the examination regulation.

Conditions
The form of the lecture has to be attended and must be completed with 2 Credit Points. The form of the lecture must not be swapped by a seminar according sociological theory, according techniques of social research or any other lecture.

Learning Outcomes
The student

- gains basic knowledge of a Special Sociology.

- gains knowledge of a specific problem in the Social Sciences.

- accordingly is capable of questioning further phenomena of the Social Sciences.

- is able to specify, pursue and explain own scientific questions.

Content
The student has the choice of the broad range of course offerings at the institute. In the course specific scientific problems and their debate will be introduced and dicussed.

Workload
The total workload for this course is approximately 60.0 hours. For further information see German version.

Media
Will be announced in the lecture.

Literature
Will be announced in the lecture.
Elective literature:
Will be announced in the lecture.

Course: Specific Aspects in Taxation [2560129]

Coordinators: B. Wigger, Armin Bader
Part of the modules: Public Finance (p. 30)[TVWL3VWL9], Topics in Finance II (p. 40)[TVWL3BWLFBV6], Topics in Finance I (p. 39)[TVWL3BWLFBV5]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	3	lecture	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
None.

Recommendations
Knowledge of the collection of public revenues is assumed. Therefore it is recommended to attend the course "Öffentliche Einnahmen" beforehand.

Learning Outcomes
See German version.

Content
The lecture „Special Aspects of Taxation" focuses on the effects of different taxes. The main emphasis is on German tax legislation. In addition to that, international aspects of taxation, in particular with respect to the European integration, will be discussed.
The lecture consists of four parts: First specific tax problems of corporate, income and consumption taxes are treated. Part two introduces the advantages and disadvantages of each of these taxes, in particular their incidence ("Who actually carries the tax burden?") and their effects within the value chain. The third part then deals with the question how the different taxes contribute to public revenues. Finally, the last part compares tax systems within and outside Europe.
As a special feature, guest lecturers will provide insight into practical aspects of taxation.

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

Literature
Elective literature:

- Andel, N. (1998): *Finanzwissenschaft*, 4th ed., Mohr Siebeck.

- Betsch, O., Groh, A.P. und Schmidt, K. (2000): *Gründungs- und Wachstumsfinanzierung innovativer Unternehmen*, Oldenbourg.

- Cloer, A. und Lavrelashvili, N. (2008): *Einführung in das Europäische Steuerrecht*, Schmidt Erich.

- Homburg, S.(2007) : *Allgemeine Steuerlehre*, 5th ed.,Vahlen.

- Kravitz, N. (Ed.) (2010) : *Internationale Aspekte der Unternehmensbesteuerung,* Journal of Business Economics, Special Issue 2/2010

- Scheffler, W. (2009) : *Besteuerung von Unternehmen I – Ertrags- Substanz- und Verkehrssteuern*, 11th ed., Müller Jur..

- Scheffler, W. (2009): *Besteuerung von Unternehmen II – Steuerbilanz*, 11th ed., Müller Jur..

- Wigger, B.U. (2006): *Grundzüge der Finanzwissenschaft*; 2nd ed., Springer.

Course: Facility Location and Strategic Supply Chain Management [2550486]

Coordinators: S. Nickel
Part of the modules: Supply Chain Management (p. 49)[TVWL3BWLISM2], Methodical Foundations of OR (p. 60)[TVWL3OR6], Applications of Operations Research (p. 58)[TVWL3OR5]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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
Prerequisite for admission to examination is the succesful completion of the online assessments.

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.

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

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: Statistics and Econometrics in Business and Economics [2521325/2521326]

Coordinators: W. Heller
Part of the modules: Econometrics and Economics (p. 29)[TVWL3VWL7], Statistical Applications of Financial Risk Management (p. 62)[TVWL3STAT]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/2	lecture + exercise	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.

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

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: Statistics I [2600008]

Coordinators: W. Heller
Part of the modules: Statistics (p. 26)[TVWL1STAT]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	4/0/2	lecture	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 at the end of the lecture period or at the beginning of the recess period. The re-examination takes place in the following semester.

Conditions
None.

Learning Outcomes
The Student understands and applies

- the basic concepts of statistical data exploration,
- the basic definitions and theorems of probability theory.

Content
A. Descriptive Statistics: univariate und bivariate analysis
B. Probability Theory: probability space, conditional and product probabilities

Workload
150 hours (5.0 Credits).

Media
lecture notes

Literature
Skriptum: Kurzfassung Statistik I
Elective literature:
Bamberg, G., Baur, F. und Krapp, M.: Statistik, 15. überarb. Auflage. Oldenbourg, München 2009, ISBN 978-3486590883.
Bol, G.: Deskriptive Statistik, 6. überarb. Auflage, Oldenbourg, München 2004, ISBN 978-3486576122.
Bol, G.: Wahrscheinlichkeitstheorie, 6. überarb. Auflage, Oldenbourg, München 2007, ISBN 978-3486584356.
Mosler, K. und Schmid, F.: Beschreibende Statistik und Wirtschaftsstatistik, 4. akt. und verb. Auflage, Springer, Berlin 2009, ISBN 978-3642015564.
Mosler, K. und Schmid, F.: Wahrscheinlichkeitsrechnung und schließende Statistik, 4. verb. Aufl., Springer, Berlin 2010, ISBN 978-3642150098.
Rinne, H.: Taschenbuch der Statistik, 4. überarb. u. erw. Auflage., Harri Deutsch, Frankfurt a. M. 2008, ISBN 978-3817118274.
Schwarze, J.: Grundlagen der Statistik, Beschreibende Verfahren, 11. vollst. überarbeitete Auflage, NWB, Herne 2009, ISBN 978-3482594816.
Schwarze, J.: Grundlagen der Statistik 2: Wahrscheinlichkeitsrechnung und induktive Statistik, 9. vollst. überarb. Aufl., NWB, Herne 2009, ISBN 978-3482568695.
Taleb: The Black Swan: The Impact of the Highly Improbable, Penguin 2008.

Course: Statistics II [2610020]

Coordinators: W. Heller
Part of the modules: Statistics (p. 26)[TVWL1STAT]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	4/0/2	lecture	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 at the end of the lecture period or at the beginning of the recess period. The re-examination takes place in the following semester.

Conditions
None.

Recommendations
It ist recommended to attend the course *Statistics I* [2600008] before the course *Statistics II* [2610020].

Learning Outcomes
The student

- understands and applies the basic definitions and theorems of probability theory,
- transfers these theoretical foundations to problems in parametrical mathematical statistics.

Content
B. Probability Theory:

- transformation of probabilities,
- parameters of location and dispersion,
- most importand discrete and continuous distributions,
- covariance and correlation,
- convolution and limit distributions

C. Theory of estimation and testing:

- suffiency of statistics,
- point estimation (optimality, ML-method),
- internal estimations,
- theory of tests (optimality, most important examples of tests)

Workload
150 hours (5.0 Credits).

Media
lecture notes

Literature
Script: Kurzfassung Statistik II
Elective literature:
Bamberg, G., Baur, F. und Krapp, M.: Statistik, 16. überarb. Auflage. Oldenbourg, München 2011, ISBN 978-3486702583.
Bol, G.: Induktive Statistik, 3. überarb. Auflage, Oldenbourg, München 2003, ISBN 978-3486-272765.
Bol, G.: Wahrscheinlichkeitstheorie, 6. überarb. Auflage, Oldenbourg, München 2007, ISBN 978-3486584356.
Mosler, K. und Schmid, F.: Wahrscheinlichkeitsrechnung und schließende Statistik, 4. verb. Aufl., Springer, Berlin 2010, ISBN 978-3642150098.
Rinne, H.: Taschenbuch der Statistik, 4. überarb. u. erw. Auflage, Harri Deutsch, Frankfurt a. M. 2008, ISBN 978-3817118274.
Schwarze, J.: Grundlagen der Statistik 2: Wahrscheinlichkeitsrechnung und induktive Statistik, 9. vollst. überarb. Aufl., NWB, Herne 2009, ISBN 978-3482568695.

Course: Statistical Modeling of generalized regression models [2521350]

Coordinators: W. Heller
Part of the modules: Statistics and Econometrics (p. 63)[TVWL3STAT1]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/2	lecture + exercise	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

Workload
The total workload for this course is approximately 135 hours (4.5 credits).
regular attendance: 30 hours
self-study: 65 hours
exam preparation: 40 hours

Media
Slides

Literature
Provided in the lecture

Course: Tax Law I [24168]

Coordinators: D. Dietrich
Part of the modules: Private Business Law (p. 84)[TVWL3JURA5]

ECTS Credits	Hours per week	Type	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.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

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. 84)[TVWL3JURA5]

ECTS Credits	Hours per week	Type	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.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

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: Control Technology [2150683]

Coordinators: C. Gönnheimer
Part of the modules: Specialization in Production Engineering (p. 69)[TVWL3INGMB22]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam taking place during the recess period (according to Section 4(2), 2 of the examination regulation).
The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None

Recommendations
None

Learning Outcomes
The students . . .

- are able to name the electrical controls which occur in the industrial environment and explain their function.
- can explain fundamental methods of signal processing. This involves in particular several coding methods, error protection methods and analog to digital conversion.
- are able to choose and to dimension control components, including sensors and actors, for an industrial application, particularly in the field of plant engineering and machine tools. Thereby, they can consider both, technical and economical issues.
- can describe the approach for projecting and writing software programs for a programmable logic control named Simatic S7 from Siemens. Thereby they can name several programming languages of the IEC 1131.

Content
The lecture control technology gives an integral overview of available control components within the field of industrial production systems. The first part of the lecture deals with the fundamentals of signal processing and with control peripherals in the form of sensors and actors which are used in production systems for the detection and manipulation of process states. The second part handles with the function of electric control systems in the production environment. The main focus in this chapter is laid on programmable logic controls, computerized numerical controls and robot controls. Finally the course ends with the topic of cross-linking and decentralization with the help of bus systems.
The lecture is very practice-oriented and illustrated with numerous examples from different branches.
The following topics will be covered

- Signal processing
- Control peripherals
- Programmable logic controls
- Numerical controls
- Controls for industrial robots
- Process control systems
- Field bus
- Trends in the area of control technology

Workload
regular attendance: 21 hours
self-study: 99 hours

Media
Lecture notes will be provided in ilias (https://ilias.studium.kit.edu/).

Literature
Lecture Notes

Remarks
None

Course: Markov Decision Models I [2550679]

Coordinators: K. Waldmann
Part of the modules: Stochastic Methods and Simulation (p. 61)[TVWL3OR7], Methodical Foundations of OR
                          (p. 60)[TVWL3OR6]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	2/1/2	lecture + exercise + tutorial	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

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

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 Methods and Simulation (p. 61)[TVWL3OR7]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1/2	lecture + exercise + tutorial	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 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

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

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: Tactical and Operational Supply Chain Management [2550488]

Coordinators: S. Nickel
Part of the modules: Supply Chain Management (p. 49)[TVWL3BWLISM2], Stochastic Methods and Simulation (p. 61)[TVWL3OR7], Applications of Operations Research (p. 58)[TVWL3OR5]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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
Successful completion of the module *Introduction to Operations Research* [TVWL1OR].

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.

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

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: Telecommunications Law [24632]

Coordinators: G. Sydow
Part of the modules: Public Business Law (p. 85)[TVWL3JURA6]

ECTS Credits	Hours per week	Type	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.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

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: Theory of Business Cycles [25549]

Coordinators: M. Hillebrand
Part of the modules: Econometrics and Economics (p. 29)[TVWL3VWL7]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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
The courses *Economics I: Microeconomics* [2600012] and *Economics II: Macroeconomics* [2600014] have to be completed beforehand.
According the focus of the course quantitativ-mathematical modelling should be in participiant's interest.

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.

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

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: Metal Forming [2150681]

Coordinators: T. Herlan
Part of the modules: Specialization in Production Engineering (p. 69)[TVWL3INGMB22]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Summer term	de

Learning Control / Examinations
The assessment consists of an oral exam taking place during the recess period (according to Section 4(2), 2) of the examination regulation).
The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None

Recommendations
None

Learning Outcomes
The students

- are able to reflect the basics, forming processes, tools, Machines and equipment of metal forming in an integrated and systematic way.

- are capable to illustrate the differences between the forming processes, tools, machines and equipment with concrete examples and are qualified to analyze and assess them in terms of their suitability for the particular application.

- are also able to transfer and apply the acquired knowledge to other metal forming problems.

Content
At the beginning of the lecture the basics of metal forming are briefly introduced. The focus of the lecture is on massive forming (forging, extrusion, rolling) and sheet forming (car body forming, deep drawing, stretch drawing). This includes the systematic treatment of the appropriate metal forming Machines and the corresponding tool technology.
Aspects of tribology, as well as basics in material science and aspects of production planning are also discussed briefly. The plastic theory is presented to the extent necessary in order to present the numerical simulation method and the FEM computation of forming processes or tool design. The lecture will be completed by product samples from the forming technology.
The topics are as follows:

- Introduction and basics
- Hot forming
- Metal forming machines
- Tools
- Metallographic fundamentals
- Plastic theory
- Tribology
- Sheet forming
- Extrusion
- Numerical simulation

Workload
regular attendance: 21 hours
self-study: 99 hours

Media
Lecture notes will be provided in ilias (https://ilias.studium.kit.edu/).

Literature
Lecture Notes

Remarks
None

Course: Environmental Law [24140]

Coordinators: G. Sydow
Part of the modules: Public Business Law (p. 85)[TVWL3JURA6]

ECTS Credits	Hours per week	Type	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.

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

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: Corporate Governance in Energy Economics [2581005]

Coordinators: H. Villis
Part of the modules: Energy Economics (p. 37)[TVWLIIP2]

ECTS Credits	Hours per week	Type	Term	Instruction language
3,5	2/0	lecture	Summer 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.

Conditions
None.

Learning Outcomes
See German version.

Content

Workload
The total workload for this course is approximately 105.0 hours. For further information see German version.

Course: Management and Strategy [2577900]

Coordinators: H. Lindstädt
Part of the modules: Strategy and Organization (p. 34)[TVWL3BWLUO1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3.5	2/0	lecture	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.

Workload
The total workload for this course is approximately 105.0 hours. For further information see German version.

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: Copyright [24121]

Coordinators: T. Dreier
Part of the modules: Intellectual Property Law (p. 83)[TVWL3JURA4]

ECTS Credits	Hours per week	Type	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.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

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: Combustion Engines I [2133113]

Coordinators: H. Kubach, T. Koch
Part of the modules: Combustion Engines I (p. 66)[TVWL3INGMB34]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	2/1	lecture + exercise	Winter term	de

Learning Control / Examinations
See module description.

Conditions
None.

Recommendations
None.

Learning Outcomes
The student can name and explain the working princile of combustion engines. He is able to analyse and evaluate the combustion process. He is able to evaluate influences of gas exchange, mixture formation, fuels and exhaust gas aftertreatment on the combustion performance. He can solve basic research problems in the field of engine development.

Content
Introduction, History, Concepts
Working Principle and Termodynamics
Characteristic Parameters
Air Path
Fuel Path
Energy Conversion
Fuels
Emissions
Exhaust Gas Aftertreatment

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

Course: Combustion Engines II [2134151]

Coordinators: H. Kubach, T. Koch
Part of the modules: Combustion Engines II (p. 67)[TVWL3INGMB35]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	2/1	lecture + exercise	Summer term	de

Learning Control / Examinations
oral examination, duration: 25 minutes, no auxiliary means

Conditions
None.

Recommendations
Fundamentals of Combustion Engines I helpful

Learning Outcomes
The students deepen and complement their knowledgement from the lecture combustion engines A. they can name and explain construction elements, development tools and latest development trends. They are be able to analyse and evaluate powertrain concepts which are subject of the lecture.

Content
Emissions
Fuels
Drive Train Dynamics
Engine Parts
Boosting
Alternative Powertrain Concepts

Special Engine Concepts

Power Transmission

Workload
The total workload for this course is approximately 150.0 hours. For further information see German version.

Course: Transportation [6200405]

Coordinators: P. Vortisch
Part of the modules: Mobility and Infrastructure (p. 76)[TVWL3INGBGU1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	lecture + exercise	Summer term	de

Learning Control / Examinations
In the module Fundamentals of Transportation [WI4INGBGU15] the assessment consists of an oral exam according to §4(2), 2 of the examination regulation. For other modules and more information, see the corresponding module description.

Conditions
See module description.

Recommendations
None.

Learning Outcomes

Content

Workload

Course: Civil Law for Advanced [24650]

Coordinators: Z. (ZAR)
Part of the modules: Private Business Law (p. 84)[TVWL3JURA5]

ECTS Credits	Hours per week	Type	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.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

Literature
Tba at the beginning of the course.

Course: Law of Contracts [24671]

Coordinators: Z. (ZAR)
Part of the modules: Private Business Law (p. 84)[TVWL3JURA5]

ECTS Credits	Hours per week	Type	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.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

Literature
Tba at the beginning of the course.

Course: Computer Contract Law [VGE]

Coordinators: M. Bartsch
Part of the modules: Intellectual Property Law (p. 83)[TVWL3JURA4]

ECTS Credits	Hours per week	Type	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.

Workload
The total workload for this course is approximately 90.0 hours. For further information see German version.

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: Gear Cutting Technology [2149655]

Coordinators: M. Klaiber
Part of the modules: Specialization in Production Engineering (p. 69)[TVWL3INGMB22]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2	lecture	Winter term	de

Learning Control / Examinations
The assessment consists of an oral exam taking place during the recess period (according to Section 4(2), 2) of the examination regulation).
The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None

Recommendations
None

Learning Outcomes
The students . . .

- can describe the basic terms of gearings and are able to explain the imparted basics of the gearwheel and gearing theory.
- are able to specify the different manufacturing processes and machine technologies for producing gearings. Furthermore they are able to explain the functional principles and the dis-/advantages of these manufacturing processes.
- can apply the basics of the gearing theory and manufacturing processes on new problems.
- are able to read and interpret measuring records for gearings.
- are able to make an appropriate selection of a process based on a given application
- can describe the entire process chain for the production of toothed components and their respective influence on the resulting workpiece properties.

Content
Based on the gearing theory, manufacturing processes and machine technologies for producing gearings, the needs of modern gear manufacturing will be discussed in the lecture. For this purpose, various processes for various gear types are taught which represent the state of the art in practice today. A classification in soft and hard machining and furthermore in cutting and non-cutting technologies will be made. For comprehensive understanding the processes, machine technologies, tools and applications of the manufacturing of gearings will be introduced and the current developments presented. For assessment and classification of the applications and the performance of the technologies, the methods of mass production and manufacturing defects will be discussed. Sample parts, reports from current developments in the field of research and an excursion to a gear manufacturing company round out the lecture.
The following topics will be covered:

- Sample applications
- Basics of gearing geometry
- Need of gearboxes
- Soft machining processes
- Hardening processes
- Hard machining processes
- Bevel gear production
- Measurement and testing
- Manufacturing of gearbox components
- Special gearings

Workload
regular attendance: 21 hours
self-study: 99 hours

Media
Lecture slides will be provided in ilias (https://ilias.studium.kit.edu/).

Literature
Lecture Slides

Remarks
None

Course: Economics I: Microeconomics [2610012]

Coordinators: C. Puppe, P. Reiss
Part of the modules: Economics (p. 15)[TVWL1VWL]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	3/0/2	lecture + tutorial	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam (120 min) following §4, Abs. 2, 1 of the examination regulation.
There may be offered a practice exam in the middle of the semester. The results of this exam may be used to improve the grade of the main exam. A detailed descritpion of the examination modalities will be given by the respective lecturer.
The main exam takes place subsequent to the lectur. The re-examination is offered at the same examination period. Only repeating candidates are entitled for taking place the re-examination. For a detailed description on the exam regulations see the information of the respective chair.

Conditions
None.

Learning Outcomes
It is the main aim of this course to provide basic knowledge in economic modelling. In particular, the student should be able to analyze market processes and the determinants of market results. Furthermore, she should be able to evaluate the effects of economic policy measures on market behavior and propose alternative, more effective policy measures.
In particular, the student should learn

- to apply simple microeconomic concepts,
- to analyze the structure of real world economic phenomena,
- to judge the possible effects of economic policy measures on the behavior of economic agents (in simple decision problems),
- to suggest alternative policy measures,
- to analyze as a participant of a tutorial simple economic problems by solving written exercises and to present the results of the exercises on the blackboard,
- to become familiar with the basic literature on microeconomics.

The student should gain basic knowledge in order to help in practical problems

- to analyze the structure of microeconomics relationships and to present own problem solutions,
- solve simple economic decision problems.

Content
The students learn the basic concepts in Microeconomics and some basics in game theory. The student will understand the working of markets in modern economies and the role of decision making. Furthermore, she should be able to understand simple game theoretic argumentation in different fields of Economics.
In the two main parts of the course, problems of microeconomic decision making (household behavior, firm behavior) and problems of commodity allocation on markets (market equilibria and efficiency of markets) are discussed. In the final part of the course, basics of imperfect competition (oligopolistic markets) and of game theory as well as welfare economics are presented.

Workload
see German version.

Media
downloadable from IT server

Literature

- H. Varian, Grundzüge der Mikroökonomik, 5. edition (2001), Oldenburg Verlag
- Pindyck, Robert S./Rubinfeld, Daniel L., Mikroökonomie, 6. Aufl., Pearson. Münschen, 2005
- Frank, Robert H., Microeconomics and Behavior, 5. Aufl., McGraw-Hill, New York, 2005

Elective literature:

- Offer for interested and top students: detailed top articles with proofs, algorithms, ... state-of-the-art surveys, industrial magazines and scientific journals, pointers to recent developments related to the course.
- Tutorials and perhaps simpler literature alternatives for students to fill in gaps in prerequisites (or to fresh up their memory). Alternatives with a different mode of explanation to help students understand ...

Course: Economics II: Macroeconomics [2600014]

Coordinators: B. Wigger
Part of the modules: Economics (p. 15)[TVWL1VWL]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	3/0/2	lecture + tutorial	Summer 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 assessment takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions
None.

Learning Outcomes
See German version.

Content
The lecture deals with the following topics:
Chapter 1: Macroeconomic targets
Chapter 2: Gross domestic product: a classical model
Chapter 3: Economic growth
Chapter 4: Money and inflation
Chapter 5: The open economy
Chapter 6: IS-LM model and business cycles
Chapter 7: Mundell-Fleming Model
Chapter 8: Macroeconomic equilibrium
Chapter 9: Unemployment

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

Literature
Elective literature:
Sieg, G. (2008): *Volkswirtschaftslehre*; 2nd ed., Oldenbourg.

Course: Economics III: Introduction in Econometrics [2520016]

Coordinators: M. Schienle
Part of the modules: Economics (p. 15)[TVWL1VWL]

ECTS Credits	Hours per week	Type	Term	Instruction language
5	2/2	lecture + exercise	Summer term	de

Learning Control / Examinations
The assessment consists of an 1h written exam according to Section 4(2), 1 of the examination regulation.

Conditions
Knowledge of the lectures Statistics I + II is required.

Learning Outcomes
Familiarity with the basic concepts and methods of econometrics
Preparation of simple econometric surveys

Content
Simple and multiple linear regression (estimating parameters, confidence interval, testing, prognosis, testing assumptions)
Multi equation models
Dynamic models

Workload
180 hours (6.0 Credits)

Literature

- Von Auer: Ökonometrie ISBN 3-540-00593-5

- Goldberger: A course in Econometrics ISBN 0-674-17544-1

- Gujarati. Basic Econometrics ISBN 0-07-113964-8

- Schneeweiß: Ökonometrie ISBN 3-7908-0008-2

Elective literature:
Additional literature will be suggested in course

Course: Hydraulic Engineering and Water Management [6200509]

Coordinators: F. Nestmann
Part of the modules: Understanding and Prediction of Disasters 1 (p. 79)[TVWL3INGINTER6], Understanding and Pre-
                           diction of Disasters 2 (p. 80)[TVWL3INGINTER7]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	Winter term	de

Learning Control / Examinations
The assessment consists of a written exam (50 minutes) (following §4(2), 1 of the examination regulation).

Conditions
None.

Learning Outcomes

Content

- Motivation and visit to the Theodor-Rehbock-Water engineering laboratory
- Fundamentals of Hydrology
- Hydraulic calculations in stream water systems
- Numeric flow simulation
- Floodwater and measurement of flood protection structures
- Constructions in water management; their sizing and handling

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

Course: Machine Tools and Industrial Handling [2149902]

Coordinators: J. Fleischer
Part of the modules: Machine Tools and Industrial Handling (p. 71)[TVWL3INGMB32]

ECTS Credits	Hours per week	Type	Term	Instruction language
9	4/2	lecture + exercise	Winter term	de

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 students . . .

- are capable to explain the use and application of machine tools and handling devices as well as differentiate their characteristics and structure.
- are able to name and describe the essential components (frame, main spindles, feed axis, peripheral equipment, control) of machine tools.
- Are capable to distinguish and select and describe the essential components regarding structure, characteristics advantages and disadvantages.
- are enabled to dimension the main components of machine tools.
- are able to name and describe the control principles of machine tools.
- are capable to name examples of machine tools and industrial handling as well as to deduce compare the essential components. Additionally they can allocate manufacturing processes.
- are enabled to identify drawbacks as well as derive and asses measures for improvements.
- are qualified to apply methods for selection and evaluation of machine tools.
- are experienced to deduce the particular failure characteristics of a ball screw.

Content
The lecture provides an overview of machine tool and handling devices structures, use and application areas. Within the lecture based and industrially oriented knowledge for selection, dimensioning and evaluation is conveyed. First the components of machine tools are explained systematically. Here the distinctive features of dimensioning machine tools are deduced followed by the integral dimensioning of machine tools. Subsequently the use of machine tools is shown in exemplary application areas e.g. turning, milling, grinding, metal forming, sheet metal forming and gear cutting.
The lecture provides an inside view of industrial application and is illustrated with current examples.
The topics are as follows:

- Frame and frame components
- Main drives and main spindles
- Requirements for feed axes
- Electro-mechanical feed axis
- Fluidic feed axes
- Control technologies
- Peripheral components
- Metrological assessment
- Machine maintenance
- Process-diagnosis
- Machinery Directiv
- Machine tool examples

Workload
regular attendance: 63 hours
self-study: 207 hours

Media
Lecture notes will be provided in ilias (https://ilias.studium.kit.edu/).

Literature
Lecture Notes

Remarks
None

Course: Competition in Networks [2561204]

Coordinators: K. Mitusch
Part of the modules: Economic Policy I (p. 31)[TVWL3VWL10], Specialization in Customer Relationship Management
                          (p. 47)[TVWL3BWLISM5], Applied Microeconomics (p. 33)[TVWL3VWL13]

ECTS Credits	Hours per week	Type	Term	Instruction language
4,5	2/1	lecture + exercise	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
Basics of microeconomics obtained within the undergraduate programme (B.Sc) of economics are required. Useful, but not necessary, are basic knowledge of industrial economics, prinicpal agent theory, and contract theory.

Learning Outcomes
The Students

- will get a vivid idea of the special characteristics of network industries like telecom, utilities, IT and transport sectors.
- will acquire the basic economic understanding of network industries concerning competition, competitive distortion, state intervention, pricing and financing
- will be able to apply abstract concepts and formal methods to use in these fields

Content
Network or infrastructure industries like telecommunication, transport, and utilities form the backbone of modern economies. The lecture provides an overview of the economic characteristics of network industries. The planning of networks is complicated by the multitude of aspects involved (like spatial differentiation and the like). The interactions of different companies – competition or cooperation or both – are characterized by complex interdependencies within the networks: network effects, economies of scale, effects of vertical integration, switching costs, standardization, compatibility etc. appear increasingly in these sectors and even tend to appear in combination. Additionally, government interventions can often be observed, partly driven by the aims of competition policy and partly driven by the aims of industrial policy. All these issues are brought up, analyzed formally (in part) and illustrated by several examples in the lecture.

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

Literature
Will be announced in the lecture.

Course: Seminar Economic Theory [SemWIOR2]

Coordinators: C. Puppe
Part of the modules: Seminar Module (p. 88)[TVWL3SEM1]

ECTS Credits	Hours per week	Type	Term	Instruction language
3	2	seminar	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

Workload
The total workload for this course is approximately 90 hours. For further information see German version.

Literature
Will be announced at the end of the recess period.

Remarks
see German version.

Course: Knowledge Management [2511300]

Coordinators: R. Studer
Part of the modules: Emphasis Informatics (p. 55)[TVWL3INFO1], Electives in Informatic (p. 57)[TVWL3INFO2]

ECTS Credits	Hours per week	Type	Term	Instruction language
4	2/1	lecture + exercise	Winter term	de

Learning Control / Examinations
Written Examination (60 min) according to §4, Abs. 2, 1 of the examination regulations or oral examination of 20 minutes according to §4, Abs. 2, 2 of the examination regulations. The exam takes place every semester and can be repeated at every regular examination date.

Conditions
Basics in logic, e.g. from lecture Foundations of Informatics 1.

Learning Outcomes
Students

- know different application domains of knowledge management
- know different (specifically semantic and social) technologies of knowledge management
- are able to judge the applicability of business software with regard to aspects of knowledge management
- are able to judge the long term value of knowledge management in organisations and compare it to possible costs

Content
In modern companies, knowledge is increasingly important for fullfilling central tasks (such as continuous business process improvement, increasing innovation, increasing customer satisfaction, strategic planning etc). Therefore, knowledge management has become a critical success factor.
The lecture covers different types of knowledge that play a role in knowledge management, the corresponding knowledge processes (generation, capture, access and usage of knowledge) as well as methodologies for the introduction of knowledge management solutions.
The lecture will emphasize computer-based support for knowledge management, such as:

- Ontology-based Knowledge Management
- Communities of Practice, Collaboration Tools, Social Software
- Business-process Oriented Knowledge Management
- Personal Knowledge Management
- Case Based Reasoning (CBR)
- Linked Open Data

Workload
The total workload for this course is approximately 120 hours. For further information see German version.

Media
Slides and scientific publications as reading material.

Literature

- I. Nonaka, H. Takeuchi: The Knowledge Creating Company. Oxford University Press 1995.
- G. Probst, S. Raub, K. Romhardt: Wissen managen: Wie Unternehmen ihre wertvollste Ressource optimal nutzen. Gabler, Wiesbaden, 5. überarb. Auflage, 2006.
- S. Staab, R. Studer (eds.): Handbook on Ontologies, ISBN 3-540-70999-1, Springer Verlag, 2009.
- A. Back, N. Gronau, K. Tochtermann: Web 2.0 in der Unternehmenspraxis - Grundlagen, Fallstudien und Trends zum Einsatz von Social Software. Oldenbourg Verlag München 2008.
- C. Beierle, G. Kern-Isberner: Methoden wissensbasierter Systeme, Vieweg, Braunschweig/Wiesbaden, 2. überarb. Auflage, 2005

Elective literature:

1. P. Hitzler, M Krötzsch, S. Rudolph, Y. Sure: Semantic Web: Grundlagen, ISBN 3-540-33993-0, Springer Verlag, 2008
2. Abecker, A., Hinkelmann, K., Maus, H., Müller, H.J., (Ed.): Geschäftsprozessorientiertes Wissensmanagement, Mai 2002.VII, 472 S. 70 Abb. Geb. ISBN 3-540-42970-0, Springer Verlag
3. Dieter Fensel. Spinning the Semantic Web. 2003 (ISBN 0262062321).
4. Tim Berners-Lee. Weaving the Web. Harper 1999 geb. 2000 Taschenbuch.

Course: Welfare Economics [252517]

Coordinators: C. Puppe
Part of the modules: Economic Theory (p. 32)[TVWL3VWL12]

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

Learning Control / Examinations
The assessment consists of a written exam at the end of the semester (according to Section 4 (2), 1 or 2 of the examination regulation).

Conditions
The courses *Economics I: Microeconomics* [2610012] and *Economics II: Macroeconomics* [2600014] have to be completed beforehand.

Learning Outcomes
See German version.

Content
The lecture "Welfare economics" deals with the question of efficiency and distributional properties of economic allocations, in particular allocations of market equilibria. The lecture is based on the two welfare theorems: The first welfare theorem (under weak preconditions) says that every competitive equilibrium is efficient.
According to the second welfare theorem (under stronger preconditions), every efficient allocation can be preserved as a competetive equilibrium through adequate choices of initial endowments. Afterwards, the terms and definitions of envy-freeness and the related concept of egalitarian equivalence in the context of the general theory of equilibrium will be discussed.
The second part of the lecture deals with the principle of "social justice" (i.e. distributational justice).The fundamental principles of utilitarism, Rawl's theory of justice as well as John Roemer's theory of equality of opportunity are explained and critically analyzed.

Workload
The total workload for this course is approximately 135 hours. For further information see German version.

Literature
Elective literature:

- J. Rawls: *A Theory of Justice*. Harvard University Press (1971)
- J. Roemer: *Theories of Distributive Justice*. Harvard University Press (1996)

Remarks
The next course will be held in the summer 2015 and afterwards every two years in the summer.

8 Appendix: Qualification objectives of the Bachelor's degree in Economics Engineering

Graduates of the Bachelor's degree in Economics Engineering are equipped with strategically oriented knowledge in economics, science, law, mathematics and information technology acquired during the three-semester core program.

The economics section includes economic-related topics from microeconomics, macroeconomics and econometrics as well as finance, business management, information industry, production management, marketing and accounting.

The math section is divided into mathematics, statistics and operations research. It includes analysis and linear algebra, descriptive and inductive statistics, elementary probability theory and optimization methods.

In the engineering field, the focus is either on the physical or chemical field.

Under law, the topics of private law and public law are covered.

The technological area is covered by the Applied and Theoretical Informatics.

Through the comprehensive methodological basis, the graduates are in a position to acknowledge and apply specialized basic concepts, methods, models and approaches. They are also able to analyze and review economic, legal and technological structures as well as situations and processes.

They can apply the relevant mathematical and scientific concepts and methods as well as legal knowledge to solve concrete tasks.

The graduates have deeper knowledge in economics, business administration and selectively in statistics, informatics, operations research, law, sociology and engineering.

They are able to react based on this knowledge from the different subjects and disciplines. They thereby largely operate independently and can review, analyze, interpret and evaluate economic, legal, scientific and technical topics systematically. They can model and classify specialized problems and then come up with appropriate methods and procedures for solving the given tasks and derive improvement potentials.

The know how to validate, illustrate and interpret the obtained results.

This practical use of their know-how also takes into account the social, scientific and ethical aspects.

Graduates of the Bachelor's degree in Economics Engineering can assume responsibility in interdisciplinary teams, technically argue and defend their position before both expert representatives and laypersons.

They have the ability to apply the acquired information to career-related activities in the industry, service sector or in the public management as well as take up a Master's degree program in Economics Engineering or any other related course.

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