

## Business Engineering (M.Sc.)

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## 1 Structure of the Master Programme in Business Engineering (M.Sc.)

The master programme in Business Engineering (M.Sc.) has 4 terms and consists of 120 credits (CP) including Master's thesis. The master programme further deepens or complements the scientific qualifications acquired in the bachelor programme. The students should be made capable of independently applying scientific knowledge and methods and evaluate their implications and scope concerning solutions of complex scientific and social problems. Furthermore, the student has to attend two seminars with a minimum of six CP within the seminar module. In addition to the key skills gained in the seminars (3 CP), the student has to acquire additional key skills totalling at least 3 credits.

Business Engineering (M.Sc.)										
Semester	Compulsory								Elective	
1	BA	BA	EC	INFO	OR	ENG	ENG	Seminar + KS	Elective	Elective
2										
3	9 CP	9 CP	9 CP	9 CP	9 CP	9 CP	9 CP	6 + 3 CP	9 CP	9 CP
4	Master Thesis 30 CP									
<b>120 CP</b> (8 compulsory modules + 2 elective modules + Master Thesis)										

Figure 1: Structure of the Master Programme (Recommendation)

Figure 1 shows the structure of the subjects and the credits allocated to the subjects. The student has to choose two elective modules of the following disciplines: Business science, economics, informatics, operations research, engineering science, statistics, law and sociology. In principle, both elective modules are also available in one discipline. Thereby it is only allowed to choose either one module in law or in sociology.

It is left to the student's individual curriculum (taking into account the examination and module regulations), in which terms the chosen modules will be started and completed. However, it is highly recommended to complete all courses and seminars before beginning the Master's thesis.



## 2 Key Skills

The master programme Business Engineering (M.Sc.) at the Faculty of Economics and Business Engineering 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, the seminar courses in the master degree programme contribute significantly to the development of key skills by practicing to elaborate and write scientifically sound papers and presentations about special topics. 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

### Orientalional 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 obligatory courses during the master programme, namely

1. Seminar module
2. Mentoring of the Master's thesis
3. Business science, economics and informatics modules

Figure 2 shows the classification of key skills within the master program at a glance.

Besides the integrated key skills, the additive acquisition of key skills, which are totalling at least three credits within the seminar module, is scheduled. A list of recommended courses and seminars will be published online for the additive acquisition. This list is coordinated with the House of Competence. Students may choose freely among the offered courses of HoC. Note that within the elective area Culture-Politics-Science-Engineering no course can be taken with its contents too close to the lectures of your own study programme.

Art der Schlüsselqualifikation	Masterstudium				
	BWL	VWL	INFO	Seminar	Materarbeit
<b>Basiskompetenzen (soft skills)</b>					
Teamarbeit, soziale Kommunikation und Kreativitätstechniken			x		
Präsentationserstellung und -techniken				x	
Logisches und systematisches Argumentieren und Schreiben				x	x
Strukturierte Problemlösung und Kommunikation				x	x
<b>Praxisorientierung (enabling skills)</b>					
Handlungskompetenz im beruflichen Kontext					(x)*
Kompetenzen im Projektmanagement					(x)*
Betriebswirtschaftliche Grundkenntnisse	x				
Englisch als Fachsprache	x	x			
<b>Orientierungswissen</b>					
Interdisziplinäres Wissen	x	x	x	x	(x)*
Institutionelles Wissen über Wirtschafts- und Rechtssysteme		x			
Wissen über internationale Organisationen		x			
Medien, Technik und Innovation		x	x		

(x)\*.....ist nicht zwingend SQ-vermittelnd; hängt von der Art der Aktivität ab (z.B. Auslandspraktikum, thematische Ausrichtung der Masterarbeit)

Figure 2: Key Skills

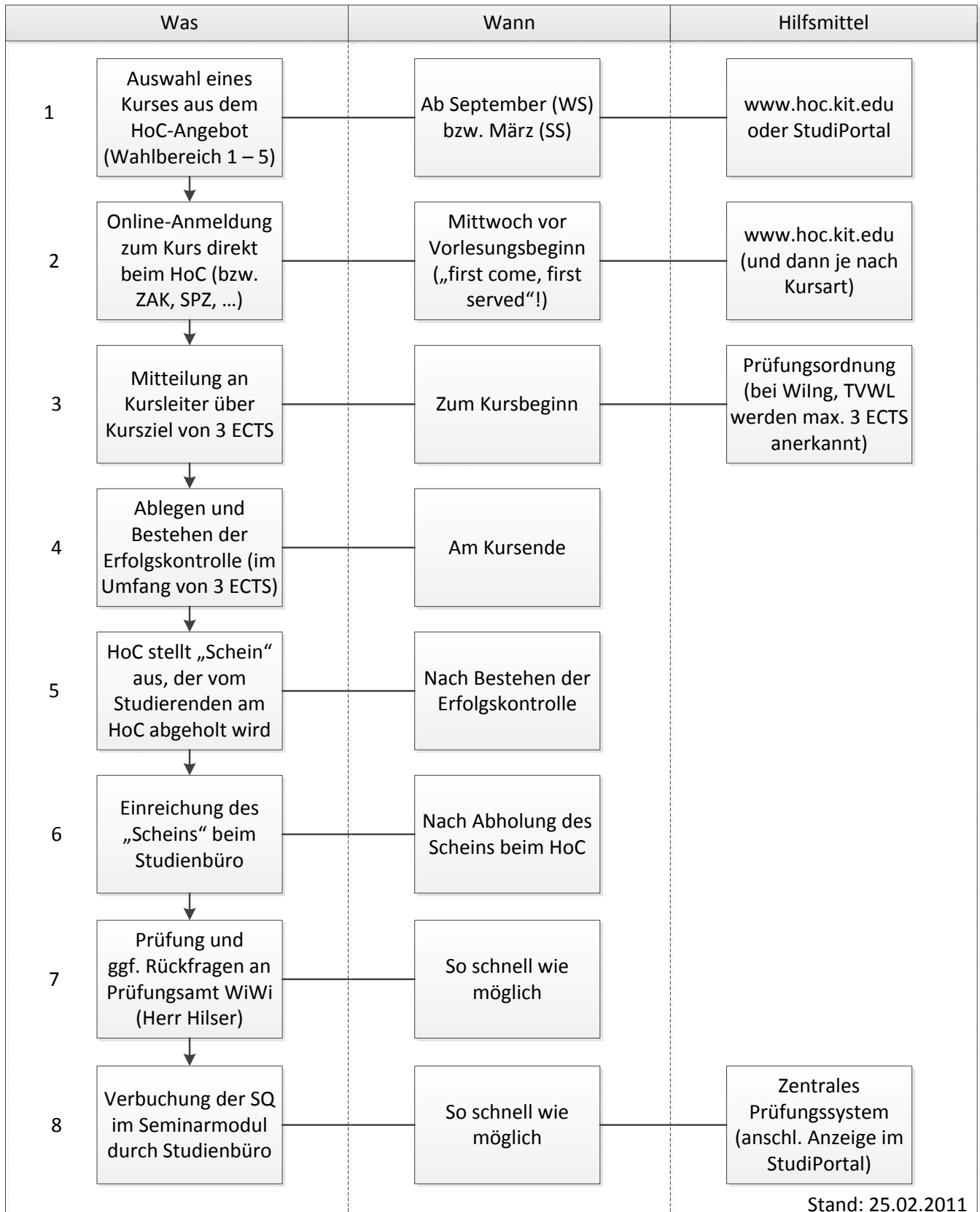


Figure 3: Process of gaining additive key skills

### 3 Module Handbook - a helpful guide throughout the studies

The programme 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 programme, 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 programme according to personal needs, interest and job perspective. The **module handbook** describes the modules belonging to the programme. It describes:

- 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://zvwgate.zvw.uni-karlsruhe.de/download/leitfaden\\_studierende.pdf](https://zvwgate.zvw.uni-karlsruhe.de/download/leitfaden_studierende.pdf)

#### Repeating exams

Principally, a failed exam 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. Requests for a second repetition of an exam require the approval of the examination committee. A request for a second repetition has to be made without delay after losing the examination claim. A counseling interview is mandatory. For further information see <http://www.wiwi.kit.edu/serviceHinweise.php>.

## Bonus accomplishments and additional accomplishments

**Bonus accomplishments** can be achieved on the basis of entire modules or within modules, if there are alternatives at choice. Bonus accomplishments can improve the module grade and overall grade by taking into account only the best possible combination of all courses when calculating the grades. The student has to declare a Bonus accomplishment as such at the time of registration for the exams. Exams, which have been registered as Bonus accomplishments, are subject to examination regulations. Therefore, a failed exam has to be repeated. Failing the repeat examination implies the loss of the examination claim.

**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. Up to 2 modules with a minimum of 9 CP may appear additionally in the certificate. After the approval of the examination committee, it is also possible to include modules in the certificate, which are not defined in the module handbook. Single additional courses will be recorded in the transcript of records. Courses and modules, which have been declared as bonus accomplishments, can be changed to additional accomplishments.

## Further information

More detailed information about the legal and general conditions of the programme can be found in the examination regulation of the programme (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	exercise 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](http://www.wiwi.kit.edu/lehreMHB.php#mhb_aktuell).

### WI4BWLISM1 - Advanced CRM (S. 31)

#### Anmerkungen

The course *Service Analytics* [2595501] has been added to the module.  
The course *Social Network Analysis in CRM* [2540518] is currently not offered.

### 2540518 - Social Network Analysis in CRM (S. 509)

#### Anmerkungen

The course is currently not offered.

### VGE - Computer Contract Law (S. 579)

#### Anmerkungen

The course is lectured in the winterterm 2011/12.  
Until winter term 2010/11 the course was entitled "Vertragsgestaltung im EDV-Bereich".

### GPR - Basic Principles of Patent Law (S. 292)

#### Anmerkungen

This course was previously announced as *Aktuelle Fragen des Patentrechts*.



## 5 Modules

### 5.1 Business Administration

#### Module: Finance 1 [WI4BWLFBV1]

**Coordination:** M. Uhrig-Homburg, M. Ruckes  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

#### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2530550	Derivatives (p. 210)	2/1	S	4,5	M. Uhrig-Homburg
2530212	Valuation (p. 563)	2/1	W	4,5	M. Ruckes
2530555	Asset Pricing (p. 157)	2/1	S	4,5	M. Uhrig-Homburg, M. Ruckes

#### Learning Control / Examinations

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

#### Learning Outcomes

The student

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

#### Content

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

**Module: Finance 2 [WI4BWLFBV2]**

**Coordination:** M. Uhrig-Homburg, M. Ruckes  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2530260	Fixed Income Securities (p. 259)	2/1	W	4,5	M. Uhrig-Homburg
2530214	Corporate Financial Policy (p. 202)	2/1	S	4,5	M. Ruckes
2530240	Market Microstructure (p. 351)	2/0	W	3	T. Lüdecke
2530565	Credit Risk (p. 331)	2/1	W	4,5	M. Uhrig-Homburg
2530210	Cost and Management Accounting (p. 324)	2/1	S	4,5	T. Lüdecke
2530555	Asset Pricing (p. 157)	2/1	S	4,5	M. Uhrig-Homburg, M. Ruckes
2530212	Valuation (p. 563)	2/1	W	4,5	M. Ruckes
2530550	Derivatives (p. 210)	2/1	S	4,5	M. Uhrig-Homburg
2530570	International Finance (p. 322)	2	S	3	M. Uhrig-Homburg, Walter
2530299	Business Strategies of Banks (p. 268)	2	W	3	W. Müller
2530296	Exchanges (p. 186)	1	S	1,5	J. Franke
2530232	Financial Intermediation (p. 260)	3	W	4,5	M. Ruckes
2540454	eFinance: Information Engineering and Management for Securities Trading (p. 219)	2/1	W	4,5	R. Riordan

**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 the credits and truncated after the first decimal.

**Conditions**

It is only possible to choose this module in combination with the module *Finance 1* [WI4BWLFBV1]. The module is passed only after the final partial exam of *Finance 1* is additionally passed.

**Learning Outcomes**

The student has advanced skills in economics and methodology in the field of modern finance.

**Content**

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

**Remarks**

**Only in the winter term 2011/2012 the lecture Market Microstructure [2530240] could be replaced by the lecture eFinance: Information Engineering and Management for Securities Trading [2540454] within the corresponding module. Who wanted to replace it in this way had to make the first attempt at passing the examination at the regular examination dates of this winter term 2011/2012. The general regulation concerning the second attempt at passing the examination remains unchanged. The lecture eFinance: Information Engineering and Management for Securities Trading [2540454] must not be chosen in all other cases within this module.**

**Module: Finance 3 [WI4BWLFBV11]**

**Coordination:** M. Uhrig-Homburg, M. Ruckes  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2530555	Asset Pricing (p. 157)	2/1	S	4,5	M. Uhrig-Homburg, M. Ruckes
2530212	Valuation (p. 563)	2/1	W	4,5	M. Ruckes
2530550	Derivatives (p. 210)	2/1	S	4,5	M. Uhrig-Homburg
2530260	Fixed Income Securities (p. 259)	2/1	W	4,5	M. Uhrig-Homburg
2530565	Credit Risk (p. 331)	2/1	W	4,5	M. Uhrig-Homburg
2530214	Corporate Financial Policy (p. 202)	2/1	S	4,5	M. Ruckes
2530240	Market Microstructure (p. 351)	2/0	W	3	T. Lüdecke
2530210	Cost and Management Accounting (p. 324)	2/1	S	4,5	T. Lüdecke
2530232	Financial Intermediation (p. 260)	3	W	4,5	M. Ruckes
2530296	Exchanges (p. 186)	1	S	1,5	J. Franke
2530299	Business Strategies of Banks (p. 268)	2	W	3	W. Müller
2530570	International Finance (p. 322)	2	S	3	M. Uhrig-Homburg, Walter
2540454	eFinance: Information Engineering and Management for Securities Trading (p. 219)	2/1	W	4,5	R. Riordan

**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 the credits and truncated after the first decimal.

**Conditions**

It is only possible to choose this module in combination with the module *Finance 1*[WI4BWLFBV1] and *Finance 2* [WI4BWLFBV2]. The module is passed only after the final partial exams of *Finance 1* and *Finance 2* are additionally passed.

**Learning Outcomes**

The student has advanced skills in economics and methodology in the field of finance.

**Content**

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

**Remarks**

**Only in the winter term 2011/2012 the lecture Market Microstructure [2530240] could be replaced by the lecture eFinance: Information Engineering and Management for Securities Trading [2540454] within the corresponding module. Who wanted to replace it in this way had to make the first attempt at passing the examination at the regular examination dates of this winter term 2011/2012. The general regulation concerning the second attempt at passing the examination remains unchanged. The lecture eFinance: Information Engineering and Management for Securities Trading [2540454] must not be chosen in all other cases within this module.**

**Module: Insurance Management I [WI4BWLFBV6]**

**Coordination:** U. Werner  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2550055	Principles of Insurance Management (p. 416)	3/0	S	4,5	U. Werner
2530323	Insurance Marketing (p. 314)	3/0	S	4,5	E. Schwake
2530320	Insurance Accounting (p. 313)	3/0	W	4,5	E. Schwake
2530324	Insurance Production (p. 315)	3/0	W/S	4,5	U. Werner
26327	Service Management (p. 494)	3/0	W/S	4,5	U. Werner
2530050	Private and Social Insurance (p. 417)	2/0	W	2,5	W. Heilmann, K. Besserer
2530350	Current Issues in the Insurance Industry (p. 203)	2/0	S	2,5	W. Heilmann
2530335	Insurance Risk Management (p. 316)	2/0	S	2,5	H. Maser
INSGAME	Insurance Management Game (p. 561)	0/2	W	3	U. Werner

**Learning Control / Examinations**

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

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

**Conditions**

None.

**Learning Outcomes**

See German version.

**Content**

See German version.

**Remarks**

The courses *Insurance Production* [2530324], and *Service Management* [26327] are offered on demand, according to the students' wishes. For further information, see: <http://insurance.fbv.kit.edu>

**Module: Insurance Management II [WI4BWLFBV7]**

**Coordination:** U. Werner  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2530323	Insurance Marketing (p. 314)	3/0	S	4,5	E. Schwake
2530320	Insurance Accounting (p. 313)	3/0	W	4,5	E. Schwake
2530324	Insurance Production (p. 315)	3/0	W/S	4,5	U. Werner
26327	Service Management (p. 494)	3/0	W/S	4,5	U. Werner
2530050	Private and Social Insurance (p. 417)	2/0	W	2,5	W. Heilmann, K. Besserer
2530350	Current Issues in the Insurance Industry (p. 203)	2/0	S	2,5	W. Heilmann
2530335	Insurance Risk Management (p. 316)	2/0	S	2,5	H. Maser

**Learning Control / Examinations**

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

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

**Conditions**

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

**Recommendations**

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

**Learning Outcomes**

See German version.

**Content**

See German version.

**Remarks**

The courses *Insurance Production* [2530324], and *Service Management* [26327] are offered on demand, according to the students' wishes. For further information, see: <http://insurance.fbv.uni-karlsruhe.de>

The module is offered as an extension module to *Insurance Management I* since summer term 2010 .

**Module: Operational Risk Management I [WI4BWLFBV9]**

**Coordination:** U. Werner  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2530326	Enterprise Risk Management (p. 240)	3/0	W	4,5	U. Werner
2530328	Multidisciplinary Risk Research (p. 368)	3/0	S	4,5	U. Werner
2530353	International Risk Transfer (p. 321)	2/0	S	2,5	W. Schwehr
2530395	Risk Communication (p. 440)	3/0	W	4,5	U. Werner
26354	Risk Management of Microfinance and Private Households (p. 442)	3/0	W/S	4,5	U. Werner
2530393	Project Work in Risk Research (p. 423)	3	W/S	4,5	U. Werner
2530355	Seminar Public Sector Risk Management (p. 465)	2	S	3	U. Werner, S. Hochrainer

**Learning Control / Examinations**

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

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

**Conditions**

At least 50% of the assessment has to be carried out as a general oral exam or a general written exam (not as seminars).

**Recommendations**

Interest in interdisciplinary research is assumed. Good complements to this module are the engineering science modules *Understanding and Prediction of Disasters I* [WI4INTER1] and *Safety Science I* [WI4INTER4].

**Learning Outcomes**

See German version.

**Content**

Operational risk management strategies for different types of risk owners such as private and public households, small and larger business enterprises are introduced. Risks considered may derive from the interaction of human, technical, and organisational factors (internal risks) as well as from external natural, technical, social or political incidents. Aside from classical risk management strategies (risk control and loss financing), self insurance instruments such as captives or risk transfers into reinsurance and capital markets are considered. Additionally, risk communication is studied as a risk management instrument since it seems to become more and more important.

**Remarks**

The courses *Risk Management of Microfinance and Private Households* [26354] and *Project Work in Risk Research* [2530393] are offered on demand. For further information, see: <http://insurance.fbv.kit.edu>



**Module: Operational Risk Management II [WI4BWLFBV10]**

**Coordination:** U. Werner  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2530326	Enterprise Risk Management (p. 240)	3/0	W	4,5	U. Werner
2530328	Multidisciplinary Risk Research (p. 368)	3/0	S	4,5	U. Werner
2530353	International Risk Transfer (p. 321)	2/0	S	2,5	W. Schwehr
2530395	Risk Communication (p. 440)	3/0	W	4,5	U. Werner
26354	Risk Management of Microfinance and Private Households (p. 442)	3/0	W/S	4,5	U. Werner
2530393	Project Work in Risk Research (p. 423)	3	W/S	4,5	U. Werner
2530355	Seminar Public Sector Risk Management (p. 465)	2	S	3	U. Werner, S. Hochrainer

**Learning Control / Examinations**

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

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

**Conditions**

It is only possible to choose this module in combination with the module *Operational Risk Management I* [WI4BWLFBV9]. The module is passed only after the final partial exam of *Operational Risk Management I* has been passed.

At least 50% of the assessment has to be carried out as a general oral exam or a general written exam (not as seminars).

**Recommendations**

Interest in interdisciplinary research is assumed. Good complements to this module are the engineering science modules *Understanding and Prediction of Disasters I* [WI4INTER1] and *Safety Science I* [WI4INTER4].

**Learning Outcomes**

See German version.

**Content**

See German version.

**Remarks**

The courses *Insurance Production* [2530324], and *Service Management* [26327] are offered on demand, according to the students' wishes. For further information, see: <http://insurance.fbv.kit.edu>

**Module: Strategic Corporate Management and Organization [WI4BWL01]**

**Coordination:** H. Lindstädt  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2577904	Organization Theory (p. 391)	2	W	4,5	H. Lindstädt
2577902	Managing Organizations (p. 390)	2/0	W	4	H. Lindstädt
2577908	Modeling Strategic Decision Making (p. 363)	2	S	4,5	H. Lindstädt
2577900	Management and Strategy (p. 560)	2/0	S	4	H. Lindstädt
2577907	Special Topics in Management: Man- agement and IT (p. 520)	1/0	W/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 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.

**Learning Outcomes****Content**

**Module: Strategic Decision Making and Organization Theory [WI4BWL03]**

**Coordination:** H. Lindstädt  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2577904	Organization Theory (p. 391)	2	W	4,5	H. Lindstädt
2577908	Modeling Strategic Decision Making (p. 363)	2	S	4,5	H. Lindstädt
2561127	Public Management (p. 426)	2/1	W	6	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 examinations are offered every semester. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately.

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

**Conditions**

None.

**Learning Outcomes****Content**

**Module: Management Accounting [WI4BWLIBU1]**

**Coordination:** M. Wouters  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2579900	Management Accounting 1 (p. 343)	2/2	S	4,5	M. Wouters
2579902	Management Accounting 2 (p. 344)	2/2		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**

The examination "Business Administration and Management Science C" must have been completed before starting this course.

**Learning Outcomes**

Students have knowledge about various management accounting techniques through study of literature and practice.

**Content**

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

**Remarks**

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

- 2530216 Financial Management
- 2530210 Management Accounting

**Module: Advanced CRM [WI4BWLISM1]**

**Coordination:** A. Geyer-Schulz  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
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. 204)	2/1	W	4,5	A. Geyer-Schulz
2540506	Personalization and Recommender Systems (p. 395)	2/1	S	4,5	A. Geyer-Schulz
2540518	Social Network Analysis in CRM (p. 509)	2/1	S	4,5	A. Geyer-Schulz
2540531	Business Dynamics (p. 190)	2/1	W	4,5	A. Geyer-Schulz, P. Glenn
2595501	Service Analytics (p. 491)	2/1	S	4,5	T. Setzer, H. Fromm

**Learning Control / Examinations**

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

**Learning Outcomes**

The student

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

**Content**

Besides the foundations of modern customer oriented and service oriented management, developments of CRM systems are lectured together with tools for analysis and optimization of such systems.

An overview of general aspects and concepts of personalization and their importance for service provider and customers is given. Then, different categories of recommendation systems are presented: Ranging from explicit recommendation services like reviews to implicit services like the calculation of recommendations based on the historic data about products and/or customers.

There exist a trend towards viewing economic systems and social systems as networks. This approach allows for the application of different methods from mathematics, economic sciences, sociology and physics. In CRM, net work analyses may provide benefits calculating customer network values.

CRM processes and marketing campaigns are just two examples of dynamic systems that are characterized by feedback loops between different process steps. By means of the tools of business dynamics such processes can be modelled. Simulations of complex systems allow the analysis and optimization of business processes, marketing campaigns, and organizations.

**Remarks**

The course *Service Analytics* [2595501] has been added to the module.

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

**Module: Electronic Markets [WI4BWLISM2]**

**Coordination:** A. Geyer-Schulz  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540502	Electronic Markets (Principles) (p. 224)	2/1	W	4,5	A. Geyer-Schulz
2540460	Market Engineering: Information in Institutions (p. 349)	2/1	S	4,5	C. Weinhardt, M. Adam
2561232	Telecommunication and Internet Economics (p. 545)	2/1	W	4,5	K. Mitusch
2540531	Business Dynamics (p. 190)	2/1	W	4,5	A. Geyer-Schulz, P. Glenn

**Learning Control / Examinations**

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

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

**Conditions**

None.

**Learning Outcomes**

The student

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

**Content**

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

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

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

Topics include:

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



**Module: Market Engineering [WI4BWLISM3]**

**Coordination:** C. Weinhardt  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540460	Market Engineering: Information in Institutions (p. 349)	2/1	S	4,5	C. Weinhardt, M. Adam
2590408	Auction Theory (p. 162)	2/1	W	4,5	K. Ehrhart
2540454	eFinance: Information Engineering and Management for Securities Trading (p. 219)	2/1	W	4,5	R. Riordan
2590458	Computational Economics (p. 200)	2/1	W	4,5	P. Shukla, S. Caton
2520373	Experimental Economics (p. 248)	2/1	W	4,5	M. Adam, Ch. Weinhardt
2540464	eEnergy: Markets, Services, Systems (p. 215)	2/1	S	4,5	C. van Dinther, C. Weinhardt

**Learning Control / Examinations**

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

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

**Conditions**

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

**Learning Outcomes**

The students

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

**Content**

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

**Module: Business & Service Engineering [WI4BWLISM4]**

**Coordination:** C. Weinhardt  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540456	Business Models in the Internet: Planning and Implementation (p. 267)	2/1	S	4,5	C. Weinhardt
2540478	Special Topics in Information Engineering & Management (p. 512)	3	W/S	4,5	C. Weinhardt
2540506	Personalization and Recommender Systems (p. 395)	2/1	S	4,5	A. Geyer-Schulz
2540468	Service Innovation (p. 493)	2/1	S	5	G. Satzger, A. Neus, M. Kohler
2595477	Practical Seminar Service Innovation (p. 488)	3		5	G. Satzger, A. Neus, M. Kohler, H. Fromm

**Learning Control / Examinations**

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

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

**Conditions**

None.

**Learning Outcomes**

The student should

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

**Content**

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

**Remarks**

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

**Module: Communications & Markets [WI4BWLISM5]**

**Coordination:** C. Weinhardt  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540462	Communications Economics (p. 197)	2/1	S	4,5	J. Kraemer
2540460	Market Engineering: Information in Institutions (p. 349)	2/1	S	4,5	C. Weinhardt, M. Adam
2590408	Auction Theory (p. 162)	2/1	W	4,5	K. Ehrhart
2540478	Special Topics in Information Engineering & Management (p. 512)	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 core course and further single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately.

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

**Conditions**

The course *Communications Economics* [2540462] is compulsory and must be examined.

**Learning Outcomes**

The student is able to

- understand the game theoretic basics of Industrial Economics
- understand the relationship between incentive mechanisms and the network economy
- analyse and evaluate markets and auction mechanisms using methods from game theory
- elaborate solutions in a team

**Content**

The module has a focus on applied game-theoretic analysis of information exchange and incentive mechanisms. Single participants in a market make decisions concerning their products, the price determination and competitive position, which can change the situation in a market. These changes inflict a change in corporate policy. Approaches from game-theory in industrial economics and mechanism design are offering analytic tools by which one can systematically deduce strategic decisions for businesses, given a certain market situation.

**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](http://www.iism.kit.edu/im/lehre).

**Module: Service Management [WI4BWLISM6]**

**Coordination:** C. Weinhardt, H. Fromm  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2590484	Business and IT Service Management (p. 189)	2/1	W	5	G. Satzger, J. Kunze von Bishhoffshausen
2540468	Service Innovation (p. 493)	2/1	S	5	G. Satzger, A. Neus, M. Kohler
2595501	Service Analytics (p. 491)	2/1	S	4,5	T. Setzer, H. Fromm

**Learning Control / Examinations**

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

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

**Conditions**

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

**Learning Outcomes**

The students

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

**Content**

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

**Remarks**

In the summer term fo 2012, the lectures eServices and Management of Business Networks were taken out of this module. They will be continued to be offerd exclusively in the Bachelor modules. Modules correctly opened before the summer term, are not affected by this change.

**Module: Information Engineering [WI4BWLISM7]**

**Coordination:** C. Weinhardt  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540450	Principles of Information Engineering and Management (p. 300)	2/1	W	5	C. Weinhardt
2540462	Communications Economics (p. 197)	2/1	S	4,5	J. Kraemer
2540460	Market Engineering: Information in Institutions (p. 349)	2/1	S	4,5	C. Weinhardt, M. Adam
2540478	Special Topics in Information Engineering & Management (p. 512)	3	W/S	4,5	C. Weinhardt
2540464	eEnergy: Markets, Services, Systems (p. 215)	2/1	S	4,5	C. van Dinther, C. Weinhardt

**Learning Control / Examinations**

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

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

**Conditions**

The course *Principles of Information Engineering and Management* [2540450] is compulsory and must be examined.

**Learning Outcomes**

The student

- understands and analyzes the central role of information as an economic good, a production factor, and a competitive factor,
- identifies, evaluates, prices, and markets information goods,
- analyze and evaluate existing markets regarding the missing incentives and the optimal solution of a given market mechanism, respectively,
- develop solutions in teams.

**Content**

In the lecture *Principles of Information Engineering and Management*, a clear distinction of information as a production, competitive, and economic good is introduced. The central role of information is explained through the concept of the "information lifecycle". The single phases from existence/generation through allocation and evaluation until the distribution and usage of information are analyzed from the business administration perspective and the microeconomic perspective.

In a second course the student can deepen his knowledge on the one hand on the design and operation of markets and on the other hand on the impact of digital goods in network industries regarding the pricing policies, business strategies and regulation issues. If chosen, the course *Special Topics in Information Engineering & Management* additionally provides an opportunity of practical research in the aforementioned range of subjects.

**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](http://www.iism.kit.edu/im/lehre).

**Module: Industrial Production II [WI4BWLIIIP2]**

**Coordination:** F. Schultmann  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every 2nd term, Winter Term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2581952	Planning and Management of Industrial Plants (p. 150)	2/2	W	5,5	F. Schultmann
2581962	Emissions into the Environment (p. 227)	2/0	W	3,5	U. Karl
2581995	Material Flow Analysis and Life Cycle Assessment (p. 531)	2/0	W	3,5	L. Schebek

**Learning Control / Examinations**

The examination will be in form of individual written exams acc. to §4(2), 1 ER, covering the chosen courses which sum up to minimum requirements. Exams are offered in every semester and can be re-examined at every ordinary examination date. The overall modular grade is calculated by weighing the individual grades with the according credit points. The grade will be truncated after the first decimal. Additional results may be considered on request.

**Conditions**

The course "Planning and Management of Industrial Plants" [2581952] has to be chosen.

**Recommendations**

Skills learned in the compulsory B.Sc. modules of business administration, engineering, operations research and informatics. The courses are set up in a way that they can be taken independently from each other; therefore it is possible to start this module at any time.

We recommend combining this module with "Industrial Production I" [WW3BWLIIIP] (Bachelor) and "Industrial Production III" [WI4BWLIIIP6] (Master).

**Learning Outcomes**

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

**Content**

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

**Module: Industrial Production III [WI4BWLIP6]**

**Coordination:** F. Schultmann  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every 2nd term, Summer Term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2581954	Production and Logistics Management (p. 421)	2/2	S	5,5	M. Fröhling, F. Schultmann
2581975	Computer-based Production Planning and Control, Process Simulation and Supply Chain Management (p. 201)	2/0	S	2	M. Fröhling, F. Schultmann
2581963	The Management of R&D Projects with Case Studies (p. 250)	2/2	W/S	3,5	H. Schmied
2581961	Supply Chain Management with Advanced Planning Systems (p. 538)	2	S	2	M. Göbelt, C. Sürle
2581992	Risk Management in Industrial Supply Chain Networks (p. 441)	2/0		3,5	T. Comes

**Learning Control / Examinations**

The examination will be in form of individual written exams acc. to §4(2), 1 ER, covering the chosen courses which sum up to minimum requirements. Exams are offered in every semester and can be re-examined at every ordinary examination date. The overall modular grade is calculated by weighing the individual grades with the according credit points. The grade will be truncated after the first decimal.

**Conditions**

The course *Production and Logistics Management* [2581954] has to be chosen.

**Recommendations**

The courses are set up in a way that they can be taken independently from each other; therefore it is possible to start this module at any time.

We recommend combining this module with "Industrial Production I" [WW3BWLIP] (Bachelor) and "Industrial Production II" [WI4BWLIP2] (Master).

Skills learned in the compulsory B.Sc. modules of business administration, engineering, operations research and informatics.

**Learning Outcomes**

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

**Content**

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

**Module: Energy Economics and Energy Markets [WI4BWLIIIP4]**

**Coordination:** W. Fichtner  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2581998	Basics of Liberalised Energy Markets (p. 170)	2/1	W	3,5	W. Fichtner
2581020	Energy Trade and Risk Management (p. 235)	2/1	S	3,5	K. Hufendiek
2581959	Energy Policy (p. 236)	2/0	S	3,5	M. Wietschel
2581022	Gas-Markets (p. 244)	2/0	W	3	A. Pustisek
2581025	Simulation Game in Energy Economics (p. 400)	2/0	W	3	W. Fichtner
2560234	Regulation Theory and Practice (p. 435)	2/1	S	4,5	K. Mitusch
2540464	eEnergy: Markets, Services, Systems (p. 215)	2/1	S	4,5	C. van Dinther, C. 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 single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The examinations take place every semester. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal. Additional courses might be accredited upon request.

**Conditions**

None.

**Learning Outcomes****Content**



**Module: Energy Economics and Technology [WI4BWLIIIP5]**

**Coordination:** W. Fichtner  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2581003	Energy and Environment (p. 231)	2/1	S	4,5	U. Karl, n.n.
2581958	Strategical Aspects of Energy Economy (p. 532)	2/0	W	3,5	A. Ardone
2581000	Technological Change in Energy Eco- nomics (p. 544)	2/0	W	3	M. Wietschel
2581001	Heat Economy (p. 588)	2/0	S	3	W. Fichtner
2581002	Energy Systems Analysis (p. 237)	2/0	W	3	A. Eßer-Frey
2581006	Efficient Energy Systems and Electric Mobility (p. 216)	2/0	S	3,5	R. McKenna, P. Jochem

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes****Content**

**Module: Marketing Management [WI4BWL MAR5]**

**Coordination:** M. Klarmann  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9		

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2571154	Product and Innovation Marketing (p. 419)	2/0	S	3	M. Klarmann
2571150	Market Research Methods (p. 350)		S	4,5	M. Klarmann
2572167	Behavioral Approaches in Marketing (p. 567)	2/1	W	4,5	B. Neibecker
2571165	Strategic and Innovative Decision Making in Marketing (p. 533)	2/1	S	4,5	B. Neibecker
2572155	International Marketing (p. 320)		W	1,5	M. Klarmann

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Module: Sales Management [WI4BWL MAR6]**

**Coordination:** M. Klarmann  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9		

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2572156	Sales Management and Retailing (p. 580)		W	3	M. Klarmann
2572157	Pricing (p. 415)		W	3	M. Klarmann
2572158	Services Marketing and B2B Marketing (p. 212)		W	3	M. Klarmann
2571150	Market Research Methods (p. 350)		S	4,5	M. Klarmann

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Module: [WI4BWL MAR7]**

**Coordination:** B. Neibecker  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9		

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2572167	Behavioral Approaches in Marketing (p. 567)	2/1	W	4,5	B. Neibecker
2571165	Strategic and Innovative Decision Making in Marketing (p. 533)	2/1	S	4,5	B. Neibecker
2571162	Information Technology and Business Information (p. 309)	2/1	S	4,5	B. Neibecker
2572157	Pricing (p. 415)		W	3	M. Klarmann
2572155	International Marketing (p. 320)		W	1,5	M. Klarmann

**Learning Control / Examinations**

The assessment is carried out as partial exams (according to Section 4 (2), 13 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**

None.

**Learning Outcomes**

Beyond the learning outcomes given with the individual courses the module open the possibility for a systematic consolidation in marketing.

**Content**

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

**Module: EnTechnon [WI4BWLENT1]**

**Coordination:** O. Terzidis, A. Presse  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Business Administration

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9		2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2545001	Lecture „Entrepreneurship“ (p. 586)	2/1	W/S	4,5	O. Terzidis, A. Presse
2545008	Seminar „From Invention to Innovation“ (p. 482)	2	W	3	O. Terzidis, Presse, André, Fahrenberg, Jens, Blattner, Rolf
2545005	Seminar „Business Planning“ (p. 479)	2	S	3	O. Terzidis, A. Presse
2545006	Seminar „Innovation Management“ (p. 480)	2	S	3	O. Terzidis, B. Kneisel, A. Presse
2545007	Service-oriented Innovation Systems (p. 481)	2	S	3	O. Terzidis, R. Eichin, A. Presse
2545003	Managing New Technologies (p. 345)	2/1	S	5	T. Reiß

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes****Content**

## 5.2 Economics

### Module: Applied Strategic Decisions [WI4VWL2]

**Coordination:** C. Puppe  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Economics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

#### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520525	Game Theory I (p. 522)	2/2	S	4,5	N.N.
2590408	Auction Theory (p. 162)	2/1	W	4,5	K. Ehrhart
2540460	Market Engineering: Information in Institutions (p. 349)	2/1	S	4,5	C. Weinhardt, M. Adam
2520373	Experimental Economics (p. 248)	2/1	W	4,5	M. Adam, Ch. Weinhardt
2520365	Decision Theory (p. 241)	2/1	S	4,5	K. Ehrhart

#### 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.

#### Conditions

The course *Game Theory I* [2520525] is obligatory. Exception: This lecture was completed in the Bachelor study programme.

#### Recommendations

The student should have basic knowledge of game theory.

#### Learning Outcomes

The student

- knows and analyzes complex strategic decisions, knows advanced formal solution concepts and how to apply them,
- knows basic solution concepts for simple strategic decisions and is able to apply them to concrete problems,
- knows the experimental method from design of an experiment to evaluation of data and applies them.

#### Content

The module offers various possibilities of application of game theoretic methods. The main focus is on strategic bargaining and behavior in auctions. Also empirical aspects are taken into account.

**Module: Allocation and Equilibrium [WI4VWL7]**

**Coordination:** C. Puppe  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Economics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520527	Advanced Topics in Economic Theory (p. 141)	2/1	S	4,5	C. Puppe, M. Hillebrand, K. Mitusch
2520517	Welfare Economics (p. 607)	2/1	S	4,5	C. Puppe
25549	Theory of Business Cycles (p. 329)	2/1	W	4,5	M. Hillebrand

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

**Conditions**

None.

**Recommendations**

Micro- and macroeconomical knowledge corresponding to the content of the economical courses of the Bachelor Programme is assumed.

**Learning Outcomes****Content**

**Module: Macroeconomic Theory [WI4VWL8]**

**Coordination:** M. Hillebrand  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Economics

<b>ECTS Credits</b> 9	<b>Cycle</b> Every term	<b>Duration</b> 2
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**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520543	Theory of Economic Growth (p. 587)	2/1	S	4,5	M. Hillebrand
25549	Theory of Business Cycles (p. 329)	2/1	W	4,5	M. Hillebrand

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

**Conditions**

None.

**Recommendations**

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

**Learning Outcomes****Content**



**Module: Social Choice Theory [WI4VWL9]**

**Coordination:** C. Puppe  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Economics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520517	Welfare Economics (p. 607)	2/1	S	4,5	C. Puppe
2520525	Game Theory I (p. 522)	2/2	S	4,5	N.N.
25537	Decision Theory and Objectives in Applied Politics (p. 242)	2/1	W	4,5	A. Melik-Tangyan
25539	Mathematical Theory of Democracy (p. 355)	2/1	S	4,5	A. Melik-Tangyan

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

**Conditions**

None.

**Recommendations**

Micro- and macroeconomical knowledge corresponding to the content of the economical courses of the Bachelor Programme is assumed.

**Learning Outcomes****Content**

**Module: Economic Policy [WI4VWL6]**

**Coordination:** J. Kowalski  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Economics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2560280	Economic Policy (p. 604)	2/1	S	5	A. Schaffer
2561257	Economic integration in Europe (p. 246)	2	W	4	J. Kowalski
2560236	Innovationtheory and -policy (p. 312)	2/1	S	5	I. Ott

**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 offered at every ordinary examination date. The assessment procedures are described for each course of the module separately. The overall grade for the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

**Conditions**

None.

**Learning Outcomes**

The students

- obtain comprehensive knowledge and competence in various aspects of economic policy
- obtain comprehensive knowledge and competence in issues connected with the European economic integration

**Content****Remarks**

The module is not offered any more. Please see German version for details.

**Module: Economic Policy II [WW4VWL3]**

**Coordination:** J. Kowalski  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Economics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2561257	Economic integration in Europe (p. 246)	2	W	4	J. Kowalski
2560236	Innovationtheory and -policy (p. 312)	2/1	S	5	I. Ott
2560254	International Economic Policy (p. 323)	2/1	S	5	J. Kowalski

**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 offered at every ordinary examination date. The assessment procedures are described for each course of the module separately. The overall grade for the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

**Conditions**

None.

**Learning Outcomes****Content**

**Module: Network Economics [WI4VWL4]**

**Coordination:** K. Mitusch  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Economics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
26240	Competition in Networks (p. 601)	2/1	W	4,5	K. Mitusch
2560234	Regulation Theory and Practice (p. 435)	2/1	S	4,5	K. Mitusch
2560230	Transport Economics (p. 548)	2/1	S	4,5	G. Liedtke, E. Szimba
2561232	Telecommunication and Internet Economics (p. 545)	2/1	W	4,5	K. Mitusch
2520527	Advanced Topics in Economic Theory (p. 141)	2/1	S	4,5	C. Puppe, M. Hillebrand, K. Mitusch

**Learning Control / Examinations**

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

The exams are offered at the beginning of the recess period about the subject matter of the latest held lecture. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module separately.

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

**Conditions**

In this module the lecture *Competition in Networks* [26240] (Prof. Mitusch) has to be attended and the test passed, unless it has been passed during the Bachelor studies.

**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, principal agent theory, and contract theory.

**Learning Outcomes**

The student

- recognizes the specific characterizations of Network Economics
- understands the interaction of infrastructures, control systems and users and he/she can simulate exemplary applications
- is able to evaluate actions in networks, e.g. investment, price and regulation politics
- perceives the necessity of regulations of natural monopolies and he/she identifies regulation procedures that are important for networks.

**Content**

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

**Module: Environmental Economics [WI4VWL5]**

**Coordination:** K. Mitusch  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Economics

<b>ECTS Credits</b> 9	<b>Cycle</b> Every term	<b>Duration</b> 1
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**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2521547	Environmental Economics and Sustainability (p. 556)	2/1	W	5	R. Walz
2560548	Environmental and Ressource Policy (p. 553)	2	S	4	R. Walz
2581003	Energy and Environment (p. 231)	2/1	S	4,5	U. Karl, n.n.
24140	Environmental Law (p. 557)	2	W	3	I. Spiecker genannt Döhmann
2560230	Transport Economics (p. 548)	2/1	S	4,5	G. Liedtke, E. Szimba

**Learning Control / Examinations**

The assessment is carried out as partial exams (according to Section 4(2), 1 or 2 of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The exams are offered at the beginning of the recess period about the subject matter of the latest held lecture. Re-examinations are offered at every ordinary examination date. The assessment procedures are described for each course of the module 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 in the area of microeconomics and of the content of the course *Economics I: Microeconomics* [2600012], respectively, is required.

**Learning Outcomes****Content**

**Module: Telecommunications Markets [WI4VWL10]**

**Coordination:** K. Mitusch  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Economics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9		

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2561232	Telecommunication and Internet Economics (p. 545)	2/1	W	4,5	K. Mitusch
2540462	Communications Economics (p. 197)	2/1	S	4,5	J. Kraemer

**Learning Control / Examinations**

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

**Conditions**

none

**Learning Outcomes**

The module shall provide students with a general understanding of the economic correlations and structures of modern telecommunications markets. A broad overview over market structures, actors and relations of the different markets will be given and students shall acquire the means to analyze the interactions between different actors both qualitatively and by applying methods of industrial economics. On this basis students are able to examine practical issues from different perspectives and to assess the different practices.

**Content**

Accompanied by rapid technological developments the telecommunications markets have undergone substantial changes since their liberalization in the late 90s. Besides the former state-owned monopoly incumbents, a large number of new actors has established on different levels of the industry. While particularly on the service level, intensive competition has developed, some infrastructure elements still qualify as natural monopolies and are subject to regulation. With the rising number of actors, services and applications the economic correlations of these markets are getting more and more complex. Growing data volumes and technological developments give rise to new infrastructure investments. Actors have to consider direct and indirect network effects as they operate on several markets simultaneously and regulators need to keep the balance between fostering competition and incentivizing investments. The rapidly developing markets pose many issues that are worth to be discussed.

The two sector specific courses are complementary and address the most relevant aspects and economic effects that have influenced the development of telecommunications markets in the recent past and will most probably influence them in the future. For some topics the methods of industrial economics are applied, which makes the third course of the module, *Industrial Organization*, a perfect supplement to either of the two courses.

## Module: Transport infrastructure policy and regional development [WI4VWL11]

**Coordination:** K. Mitusch  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Economics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9		

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2560230	Transport Economics (p. 548)	2/1	S	4,5	G. Liedtke, E. Szimba
	Spatial Economics (p. 511)	2/1	W	4,5	I. Ott
2561220	Assessment of Public Policies and Projects 1 (p. 179)	2	W	3	A. Kopp
2560220	Assessment of Public Policies and Projects 2 (p. 180)	2	S	3	A. Kopp

### Learning Control / Examinations

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

### Conditions

none

### Learning Outcomes

The module shall provide interested students with a broad understanding of the economic issues related to transport and regional development. A main focus will be laid on economic policy issues generated by the relationship of transport and regional development with the public sector. After finishing the module, students shall be able to compare the different considerations of politics, regulation and the private sector and to analyze and assess the respective decision problems both qualitatively and by applying appropriate methods from economic theory. The successful participation in the module shall prepare students particularly for careers in the public sector, partially public companies, politics, regulatory agencies or related consultancies. The module also targets future employees of mayor construction companies and infrastructure project corporations.

### Content

The development infrastructure (e.g. transport, energy, telecommunications) has always been one of the most relevant factors for economic development and particularly influences the development of the regional economy. From the repertoire of state actions, investments into transport infrastructure are often regarded the most important measure to foster regional economic growth. Besides the direct effects of transport policy on passenger and freight transport, a variety of individual economic activities is significantly dependent on the available or potential transport options. Decisions on the planning, financing and realization of mayor infrastructure projects require a solid and far-reaching consideration of direct and indirect growth effects with the occurring costs.

Through its combination of lectures the module reflects the complex interdependencies between infrastructure policy, transport industry and regional policy and provides its participants with a comprehensive understanding of the functionalities of one of the most important sectors of the economy and its relevance for economic policy.

### Remarks

The course *Assessment of Public Policies and Projects I* (winter term) and *Assessment of Public Policies and Projects II* (summer term) are both held as block courses. Dates will be announced at the beginning of each semester.

**Module: Concentration, convergence, and divergence [WI4VWL12]**

**Coordination:** I. Ott  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Economics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9		

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2561503	Theory of endogenous growth (p. <a href="#">230</a> )	2/1	W	4,5	I. Ott
	Spatial Economics (p. <a href="#">511</a> )	2/1	W	4,5	I. Ott

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

**Content**



**Module: Innovation and growth [WW4VWLIWW1]**

**Coordination:** I. Ott  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Economics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520543	Theory of Economic Growth (p. 587)	2/1	S	4,5	M. Hillebrand
2560236	Innovationtheory and -policy (p. 312)	2/1	S	5	I. Ott
2561503	Theory of endogenous growth (p. 230)	2/1	W	4,5	I. Ott

**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 offered at every ordinary examination date. The assessment procedures are described for each course of the module separately.

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

**Conditions**

None.

**Recommendations**

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

**Learning Outcomes**

Students shall be given the ability to

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

**Content**

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

## 5.3 Informatics

**Module: Informatics [WI4INFO1]**

**Coordination:** H. Schmeck, A. Oberweis, D. Seese, R. Studer, S. Tai  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Informatics

<b>ECTS Credits</b> 9	<b>Cycle</b> Every term	<b>Duration</b> 1
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**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2511102	Algorithms for Internet Applications (p. 143)	2/1	W	5	H. Schmeck
2511030	Applied Informatics I - Modelling (p. 147)	2/1	W	5	A. Oberweis, R. Studer, S. Agarwal
2511032	Applied Informatics II - IT Systems for e-Commerce (p. 148)	2/1	S	5	S. Tai
2511400	Complexity Management (p. 198)	2/1	S	5	D. Seese
2511200	Database Systems (p. 206)	2/1	S	5	A. Oberweis, Dr. D. Sommer
2511206	Software Engineering (p. 506)	2/1	S	5	A. Oberweis, D. Seese
2511500	Service Oriented Computing 1 (p. 495)	2/1	W	5	S. Tai
2511300	Knowledge Management (p. 606)	2/1	W	5	R. Studer
2511504	Cloud Computing (p. 195)	2/1	W	5	S. Tai, Kunze
2511202	Database Systems and XML (p. 207)	2/1	W	5	A. Oberweis
2511212	Document Management and Groupware Systems (p. 213)	2	S	4	S. Klink
2511100	Efficient Algorithms (p. 217)	2/1	S	5	H. Schmeck
2511600	Enterprise Architecture Management (p. 239)	2/1	W	5	T. Wolf
2511402	Intelligent Systems in Finance (p. 318)	2/1	S	5	D. Seese
2511404	IT Complexity in Practice (p. 347)	2/1	W	5	D. Seese, Kreidler
2511302	Knowledge Discovery (p. 328)	2/1	W	5	R. Studer
2511214	Management of IT-Projects (p. 346)	2/1	S	5	R. Schätzle
2511210	Business Process Modelling (p. 364)	2/1	W	5	A. Oberweis
2511106	Nature-inspired Optimisation Methods (p. 373)	2/1	W	5	S. Mostaghim, P. Shukla
2511104	Organic Computing (p. 388)	2/1	S	5	H. Schmeck, S. Mostaghim
2590458	Computational Economics (p. 200)	2/1	W	4,5	P. Shukla, S. Caton
2511216	Capability maturity models for software and systems engineering (p. 436)	2	S	4	R. Kneuper
2511304	Semantic Web Technologies I (p. 448)	2/1	W	5	R. Studer, S. Rudolph, E. Simperl
2511306	Semantic Web Technologies II (p. 449)	2/1	S	5	E. Simperl, A. Harth, S. Rudolph, Daniel Oberle
2511308	Service Oriented Computing 2 (p. 496)	2/1	S	5	R. Studer, S. Agarwal, B. Norton
2511208	Software Technology: Quality Management (p. 508)	2/1	S	5	A. Oberweis
25700sp	Special Topics of Efficient Algorithms (p. 514)	2/1	W/S	5	H. Schmeck
SBI	Special Topics of Enterprise Information Systems (p. 513)	2/1	W/S	5	A. Oberweis
KompMansp	Special Topics of Complexity Management (p. 515)	2/1	W/S	5	D. Seese
SSEsp	Special Topics of Software- and Systemsengineering (p. 516)	2/1	W/S	5	A. Oberweis, D. Seese
25860sem	Special Topics of Knowledge Management (p. 517)	2/1	W/S	5	R. Studer
2511602	Strategic Management of Information Technology (p. 534)	2/1	S	5	T. Wolf

2511502	Web Service Engineering (p. 597)	2/1	S	5	C. Zirpins
2511204	Workflow-Management (p. 608)	2/1	S	5	A. Oberweis
25810	Practical Seminar Knowledge Discovery (p. 487)	2	S	4	R. Studer
PraBl	Computing Lab Information Systems (p. 405)	2	W/S	4	A. Oberweis, D. Seese, R. Studer
25700p	Advanced Lab in Efficient Algorithms (p. 406)	3	W/S	4	H. Schmeck
25762p	Computing Lab in Intelligent Systems in Finance (p. 407)	3	W/S	4	D. Seese
25818	Computing Lab in Complexity Management (p. 408)	3	W/S	4	D. Seese
25820	Lab Class Web Services (p. 411)	2	W	4	S. Tai
25740p	Exercises in Knowledge Management (p. 412)	3	W/S	4	R. Studer
2511218	Requirements Analysis and Requirements Management (p. 146)	2/0	W	4	R. Kneuper
2511506	Business Activity Management (p. 188)	2/1		5	C. Janiesch

### 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. 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

One course has to be chosen from the core courses.

Core courses are: *Algorithms for Internet Applications* [2511102], *Applied Informatics I - Modelling* [2511030], *Applied Informatics II - IT Systems for e-Commerce* [2511032], *Complexity Management* [2511400], *Database Systems* [2511200], *Software Engineering* [2511206], *Service-oriented Computing I* [2511500] and *Knowledge Management* [2511300].

It is only allowed to choose one lab.

### Learning Outcomes

The student

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

### Content

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

### Remarks

The course "Web Service Engineering" will not be offered any more from summer term 2012 on. The examination will be offered latest until summer term 2013 (repeaters only).

## Module: Emphasis in Informatics [WI4INFO2]

**Coordination:** H. Schmeck, A. Oberweis, D. Seese, R. Studer, S. Tai  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Informatics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2511102	Algorithms for Internet Applications (p. 143)	2/1	W	5	H. Schmeck
2511030	Applied Informatics I - Modelling (p. 147)	2/1	W	5	A. Oberweis, R. Studer, S. Agarwal
2511032	Applied Informatics II - IT Systems for e-Commerce (p. 148)	2/1	S	5	S. Tai
2511400	Complexity Management (p. 198)	2/1	S	5	D. Seese
2511200	Database Systems (p. 206)	2/1	S	5	A. Oberweis, Dr. D. Sommer
2511500	Service Oriented Computing 1 (p. 495)	2/1	W	5	S. Tai
2511206	Software Engineering (p. 506)	2/1	S	5	A. Oberweis, D. Seese
2511300	Knowledge Management (p. 606)	2/1	W	5	R. Studer
2511202	Database Systems and XML (p. 207)	2/1	W	5	A. Oberweis
2511212	Document Management and Groupware Systems (p. 213)	2	S	4	S. Klink
2511100	Efficient Algorithms (p. 217)	2/1	S	5	H. Schmeck
2511600	Enterprise Architecture Management (p. 239)	2/1	W	5	T. Wolf
2511402	Intelligent Systems in Finance (p. 318)	2/1	S	5	D. Seese
2511404	IT Complexity in Practice (p. 347)	2/1	W	5	D. Seese, Kreidler
2511302	Knowledge Discovery (p. 328)	2/1	W	5	R. Studer
2511214	Management of IT-Projects (p. 346)	2/1	S	5	R. Schätzle
2511210	Business Process Modelling (p. 364)	2/1	W	5	A. Oberweis
2511106	Nature-inspired Optimisation Methods (p. 373)	2/1	W	5	S. Mostaghim, P. Shukla
2511104	Organic Computing (p. 388)	2/1	S	5	H. Schmeck, S. Mostaghim
2590458	Computational Economics (p. 200)	2/1	W	4,5	P. Shukla, S. Caton
2511216	Capability maturity models for software and systems engineering (p. 436)	2	S	4	R. Kneuper
2511304	Semantic Web Technologies I (p. 448)	2/1	W	5	R. Studer, S. Rudolph, E. Simperl
2511306	Semantic Web Technologies II (p. 449)	2/1	S	5	E. Simperl, A. Harth, S. Rudolph, Daniel Oberle
2511308	Service Oriented Computing 2 (p. 496)	2/1	S	5	R. Studer, S. Agarwal, B. Norton
2511208	Software Technology: Quality Management (p. 508)	2/1	S	5	A. Oberweis
SBI	Special Topics of Enterprise Information Systems (p. 513)	2/1	W/S	5	A. Oberweis
25700sp	Special Topics of Efficient Algorithms (p. 514)	2/1	W/S	5	H. Schmeck
KompMansp	Special Topics of Complexity Management (p. 515)	2/1	W/S	5	D. Seese
SSEsp	Special Topics of Software- and Systemsengineering (p. 516)	2/1	W/S	5	A. Oberweis, D. Seese
25860sem	Special Topics of Knowledge Management (p. 517)	2/1	W/S	5	R. Studer
2511602	Strategic Management of Information Technology (p. 534)	2/1	S	5	T. Wolf
2511502	Web Service Engineering (p. 597)	2/1	S	5	C. Zirpins
2511204	Workflow-Management (p. 608)	2/1	S	5	A. Oberweis

PraBl	Computing Lab Information Systems (p. 405)	2	W/S	4	A. Oberweis, D. Seese, R. Studer
25700p	Advanced Lab in Efficient Algorithms (p. 406)	3	W/S	4	H. Schmeck
25762p	Computing Lab in Intelligent Systems in Finance (p. 407)	3	W/S	4	D. Seese
25818	Computing Lab in Complexity Management (p. 408)	3	W/S	4	D. Seese
25810	Practical Seminar Knowledge Discovery (p. 487)	2	S	4	R. Studer
25820	Lab Class Web Services (p. 411)	2	W	4	S. Tai
25740p	Exercises in Knowledge Management (p. 412)	3	W/S	4	R. Studer
2511504	Cloud Computing (p. 195)	2/1	W	5	S. Tai, Kunze
2511218	Requirements Analysis and Requirements Management (p. 146)	2/0	W	4	R. Kneuper
2511506	Business Activity Management (p. 188)	2/1		5	C. Janiesch

### 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

One course has to be chosen from the core courses.

Core courses are: *Algorithms for Internet Applications* [2511102], *Applied Informatics I - Modelling* [2511030], *Applied Informatics II - IT Systems for e-Commerce* [2511032], *Complexity Management* [2511400], *Database Systems* [2511200], *Service-oriented Computing I* [2511500], *Software Engineering* [2511206] and *Knowledge Management* [2511300].

It is only allowed to choose one lab.

### Learning Outcomes

The student

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

### Content

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

### Remarks

The course "Web Service Engineering" will not be offered any more from summer term 2012 on. The examination will be offered latest until summer term 2013 (repeaters only).

**Module: Electives in Informatic [WI4INFO3]**

**Coordination:** H. Schmeck, A. Oberweis, D. Seese, R. Studer, S. Tai  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Informatics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2511102	Algorithms for Internet Applications (p. 143)	2/1	W	5	H. Schmeck
2511030	Applied Informatics I - Modelling (p. 147)	2/1	W	5	A. Oberweis, R. Studer, S. Agarwal
2511032	Applied Informatics II - IT Systems for e-Commerce (p. 148)	2/1	S	5	S. Tai
2511400	Complexity Management (p. 198)	2/1	S	5	D. Seese
2511200	Database Systems (p. 206)	2/1	S	5	A. Oberweis, Dr. D. Sommer
2511500	Service Oriented Computing 1 (p. 495)	2/1	W	5	S. Tai
2511206	Software Engineering (p. 506)	2/1	S	5	A. Oberweis, D. Seese
2511300	Knowledge Management (p. 606)	2/1	W	5	R. Studer
2511202	Database Systems and XML (p. 207)	2/1	W	5	A. Oberweis
2511212	Document Management and Groupware Systems (p. 213)	2	S	4	S. Klink
2511100	Efficient Algorithms (p. 217)	2/1	S	5	H. Schmeck
2511600	Enterprise Architecture Management (p. 239)	2/1	W	5	T. Wolf
2511402	Intelligent Systems in Finance (p. 318)	2/1	S	5	D. Seese
2511404	IT Complexity in Practice (p. 347)	2/1	W	5	D. Seese, Kreidler
2511302	Knowledge Discovery (p. 328)	2/1	W	5	R. Studer
2511214	Management of IT-Projects (p. 346)	2/1	S	5	R. Schätzle
2511210	Business Process Modelling (p. 364)	2/1	W	5	A. Oberweis
2511106	Nature-inspired Optimisation Methods (p. 373)	2/1	W	5	S. Mostaghim, P. Shukla
2511104	Organic Computing (p. 388)	2/1	S	5	H. Schmeck, S. Mostaghim
2590458	Computational Economics (p. 200)	2/1	W	4,5	P. Shukla, S. Caton
2511216	Capability maturity models for software and systems engineering (p. 436)	2	S	4	R. Kneuper
2511304	Semantic Web Technologies I (p. 448)	2/1	W	5	R. Studer, S. Rudolph, E. Simperl
2511306	Semantic Web Technologies II (p. 449)	2/1	S	5	E. Simperl, A. Harth, S. Rudolph, Daniel Oberle
2511308	Service Oriented Computing 2 (p. 496)	2/1	S	5	R. Studer, S. Agarwal, B. Norton
2511208	Software Technology: Quality Management (p. 508)	2/1	S	5	A. Oberweis
SBI	Special Topics of Enterprise Information Systems (p. 513)	2/1	W/S	5	A. Oberweis
25700sp	Special Topics of Efficient Algorithms (p. 514)	2/1	W/S	5	H. Schmeck
KompMansp	Special Topics of Complexity Management (p. 515)	2/1	W/S	5	D. Seese
SSEsp	Special Topics of Software- and Systemsengineering (p. 516)	2/1	W/S	5	A. Oberweis, D. Seese
25860sem	Special Topics of Knowledge Management (p. 517)	2/1	W/S	5	R. Studer
2511602	Strategic Management of Information Technology (p. 534)	2/1	S	5	T. Wolf
2511502	Web Service Engineering (p. 597)	2/1	S	5	C. Zirpins
2511204	Workflow-Management (p. 608)	2/1	S	5	A. Oberweis

PraBl	Computing Lab Information Systems (p. 405)	2	W/S	4	A. Oberweis, D. Seese, R. Studer
25700p	Advanced Lab in Efficient Algorithms (p. 406)	3	W/S	4	H. Schmeck
25762p	Computing Lab in Intelligent Systems in Finance (p. 407)	3	W/S	4	D. Seese
25810	Practical Seminar Knowledge Discovery (p. 487)	2	S	4	R. Studer
25818	Computing Lab in Complexity Management (p. 408)	3	W/S	4	D. Seese
25820	Lab Class Web Services (p. 411)	2	W	4	S. Tai
25740p	Exercises in Knowledge Management (p. 412)	3	W/S	4	R. Studer
2511504	Cloud Computing (p. 195)	2/1	W	5	S. Tai, Kunze
2511218	Requirements Analysis and Requirements Management (p. 146)	2/0	W	4	R. Kneuper
2511506	Business Activity Management (p. 188)	2/1		5	C. Janiesch

### 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

The module *Informatics* [WI4INFO1] has to be completed successfully.

It is only allowed to choose one lab.

### Recommendations

Knowledge of the content of the module *Emphasis in Informatics* [WI4INFO2] is helpful.

### Learning Outcomes

The student

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

### Content

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

### Remarks

The course "Web Service Engineering" will not be offered any more from summer term 2012 on. The examination will be offered latest until summer term 2013 (repeaters only).



## 5.4 Operations Research

### Module: Operations Research in Supply Chain Management and Health Care Management [WI4OR5]

**Coordination:** S. Nickel  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Operations Research

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
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. 523)	2/1	S	4,5	S. Nickel
2550488	Tactical and Operational Supply Chain Management (p. 543)	2/1	W	4,5	S. Nickel
2550480	Operations Research in Supply Chain Management (p. 380)	2/1	W/S	4,5	S. Nickel
2550495	Operations Research in Health Care Management (p. 379)	2/1	W/S	4,5	S. Nickel
2550493	Hospital Management (p. 330)	2/0	W/S	3	S. Nickel, Hansis
2550498	Practical seminar: Health Care Management (with Case Studies) (p. 414)	2/1/2	W/S	7	S. Nickel
2550497	Software Laboratory: OR Models II (p. 507)	2/1	W	4,5	S. Nickel
n.n.	Discrete-event Simulation in Production and Logistics (p. 245)	2/1	S	4,5	S. Nickel, S. Spieckermann

#### 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 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

In agreement with the module coordinator, a course from the modules *Mathematical optimization* [WW4OR6] or *Stochastic Modelling and Optimization* [WW4OR7] or the course *Game Theory I* [2520525] can be acknowledged.

#### Recommendations

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

#### Learning Outcomes

The student

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

#### Content

Supply Chain Management is concerned with the planning and optimization of the entire, inter-company procurement, production and distribution process for several products taking place between different business partners (suppliers, logistics service



providers, dealers). The main goal is to minimize the overall costs while taking into account several constraints including the satisfaction of customer demands.

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

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

**Remarks**

Some lectures and courses are offered irregularly.

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

**Module: Mathematical Programming [WI4OR6]**

**Coordination:** O. Stein  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Operations Research

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
25138	Mixed Integer Programming I (p. 263)	2/1	S	4,5	O. Stein
25140	Mixed Integer Programming II (p. 264)	2/1	W	4,5	O. Stein
25128	Special Topics in Optimization I (p. 518)	2/1	W/S	4,5	O. Stein
25126	Special Topics in Optimization II (p. 519)	2/1	W/S	4,5	O. Stein
2550484	Graph Theory and Advanced Location Models (p. 276)	2/1	W/S	4,5	S. Nickel
2550497	Software Laboratory: OR Models II (p. 507)	2/1	W	4,5	S. Nickel
2550111	Nonlinear Optimization I (p. 376)	2/1	S	4,5	O. Stein
2550113	Nonlinear Optimization II (p. 377)	2/1	S	4,5	O. Stein
2550134	Global Optimization I (p. 272)	2/1	W	4,5	O. Stein
2550136	Global Optimization II (p. 273)	2/1	W	4,5	O. Stein

**Learning Control / Examinations**

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

Upon consultation with the module coordinator, alternatively one lecture from the modules *Operations Research in Supply Chain Management and Health Care Management* [WW4OR5] and *Stochastic Modeling and Optimization* [WW4OR7] or the lecture *Game Theory I* [2520525] may be accepted.

**Learning Outcomes**

The student

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

**Content**

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

**Remarks**

The lectures are partly offered irregularly. The curriculum of the next three years is available online ([www.ior.kit.edu](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 Modelling and Optimization [WI4OR7]

**Coordination:** K. Waldmann  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Operations Research

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
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. 528)	2/1/2	W	5	K. Waldmann
2550682	Markov Decision Models II (p. 529)	2/1/2	S	4,5	K. Waldmann
2550674	Quality Control I (p. 429)	2/1/2	W	4,5	K. Waldmann
25659	Quality Control II (p. 430)	2/1/2	S	4,5	K. Waldmann
25687	Optimization in a Random Environment (p. 384)	2/1/2	W/S	4,5	K. Waldmann
2550662	Simulation I (p. 501)	2/1/2	W	4,5	K. Waldmann
2550665	Simulation II (p. 502)	2/1/2	S	4,5	K. Waldmann
25688	OR-oriented modeling and analysis of real problems (project) (p. 387)	1/0/3	W/S	4,5	K. Waldmann

### Learning Control / Examinations

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

### Learning Outcomes

The student knows and understands stochastic relationships and has a competent knowledge in modelling, analyzing and optimizing stochastic systems in economics and engineering.

### Content

see courses

## 5.5 Statistics

### Module: Mathematical and Empirical Finance [WI4STAT1]

**Coordination:** Y. Kim  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Statistics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

#### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520381	Advanced Econometrics of Financial Markets (p. 140)	2/1	S	5	Y. Kim
2520357	Portfolio and Asset Liability Management (p. 403)	2/1	S	5	Y. Kim

#### 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 the credits and truncated after the first decimal.

#### Conditions

The lecture *Stochastic Calculus and Finance* [2521331] is mandatory.

#### Learning Outcomes

##### Content

##### Remarks

The course Advanced Econometrics of Financial Markets [2520381] will not be offered any more from summer term 2013 on. The examination will be offered latest until summer term 2012.

The course Portfolio and Asset Liability Management [2520357] will not be offered any more from summer term 2013 on. The examination will be offered latest until summer term 2012.

**Module: Statistical Methods in Risk Management [WI4STAT2]**

**Coordination:** W. Heller  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Statistics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520337	Stochastic and Econometric Models in Credit Risk Management (p. 527)	2/2	S	5	Y. Kim
2520357	Portfolio and Asset Liability Management (p. 403)	2/1	S	5	Y. Kim
2520375	Data Mining (p. 205)	2	W	5	G. Nakhaeizadeh
2520317	Multivariate Methods (p. 369)	2/2	S	5	W. Heller

**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 the credits and truncated after the first decimal.

**Conditions**

None.

**Learning Outcomes****Content****Remarks**

The course Portfolio and Asset Liability Management [2520357] will not be offered any more from summer term 2013 on. The examination will be offered latest until summer term 2012.

The course Stochastic and Econometric Models in Credit Risk Management [2520337] will not be offered any more from summer term 2013 on. The examination will be offered latest until summer term 2012.

**Module: Risk Management and Econometrics in Finance [WI4STAT3]**

**Coordination:** Y. Kim  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Statistics

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520381	Advanced Econometrics of Financial Markets (p. 140)	2/1	S	5	Y. Kim

**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 the credits and truncated after the first decimal.

**Conditions**

None.

**Recommendations**

Profound knowledge in the area of probability theory, estimation theory and test theory is recommended.

**Learning Outcomes****Content****Remarks**

The course Advanced Econometrics of Financial Markets [2520381] will not be offered any more from summer term 2013 on. The examination will be offered latest until summer term 2012.

## 5.6 Engineering Sciences

### Module: Manufacturing Engineering [WI4INGMB23]

**Coordination:** V. Schulze  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
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 Engineering (p. 258)	4/1	W	9	V. Schulze

#### Learning Control / Examinations

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

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

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 the wbk. The term paper may not be convalidated in the seminar module.

#### Conditions

None.

#### Learning Outcomes

#### Content

## Module: Specialization in Production Engineering [WI4INGMB22]

**Coordination:** V. Schulze  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b> 9	<b>Cycle</b> Every term	<b>Duration</b>
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### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2149667	Quality Management (p. 428)	2	W	4	Lanza, Gisela
2149669	Materials and Processes in Automotive Lightweight Construction (p. 354)	2	W	4	Haepf
2150681	Metal Forming (p. 552)	2	S	4	Herlan
2150683	Instrumentation and Control Technolo- gies for Production Systems (p. 526)	2	S	4	Gönzheimer
2149655	Gear Cutting Technology (p. 581)	2	W	4	Felten

### Learning Control / Examinations

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

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

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

It is only possible to choose this module in combination with the module *Manufacturing Engineering* [WI4INGMB23] **or** *Integrated Production Planning* [WI4INGMB24] **or** *Werkzeugmaschinen und Handhabungstechnik* [WI4INGMB32]. The module is passed only after the final partial exam of one of the above modules is additionally passed.

### Learning Outcomes

#### Content



**Module: Integrated Production Planning [WI4INGMB24]**

**Coordination:** V. Schulze, Gisela Lanza  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
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. 317)	4/2	S	9	Lanza, Gisela

**Learning Control / Examinations**

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

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

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.

**Learning Outcomes****Content**

## Module: Global Production and Logistics [WI4INGMB31]

**Coordination:** V. Schulze, Gisela Lanza  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2149610	Global Production and Logistics - part 1: Global Production (p. 274)	2	W	4	Lanza
2149600	Global Production and Logistics - part 2: Global Logistics (p. 275)	2	S	4	K. Furmans
2118085	Automotive Logistics (p. 340)	2	S	4	K. Furmans
2118094	Information Systems and Supply Chain Management (p. 308)	2	S	4	C. Kilger
2149667	Quality Management (p. 428)	2	W	4	Lanza, Gisela
2150690	Production Systems and Production Technology in Major Assembly Production (p. 422)	2	S	4	Stauch
2149666	Electronic Business for Industrial Companies (p. 222)	2	S	4	Weisbecker

### Learning Control / Examinations

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

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

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 or the wbk. The term paper may not be convalidated in the seminar module.

### Conditions

It is only possible to choose this module in combination with the module *Manufacturing Engineering* [WI4INGMB23] **or/and** *Integrated Production Planning* [WI4INGMB24] **or/and** *Logistics in Value Chain Networks* [WI4INGMB28] **or/and** *Werkzeugmaschinen und Handhabungstechnik* [WI4INGMB32]. The module is passed only after the final partial exam of one of the above modules is additionally passed.

It is obligatory to choose the lectures *Global Production and Logistics – part 1: Global Production* [2149610] and *part 2: Global Logistics* [2149600].

### Recommendations

The module should be combined with the module: *Logistic in Value Chain Networks* [WI4INGMB28] (in this case the course *Material flow in Logistic Systems* is not obligatory).

### Learning Outcomes

The student

- acquires basic knowledge on the main topics of global production and logistics,
- will achieve a sound knowledge about planning and operations of global supply chains and will be able to use simple models for planning,
- will achieve a sound knowledge about planning global production networks

### Content

The module Global Production and Logistics provides comprehensive and well-founded basics for the main topics of global production and logistics. The lectures aim to show opportunities and market conditions for global enterprises. Part 1 focuses on foreign trade theory, legal and economic backgrounds, opportunities and risks of international production. Part 2 focuses on the structure of international logistics, their modeling, design and analysis. The threats in international logistics are discussed in case studies.

**Module: Automated Manufacturing Systems [WI4INGMBWBK1]**

**Coordination:** J. Fleischer  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every 2nd term, Summer Term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2149904	Automated Manufacturing Systems (p. 168)	4/1	S	9	J. Fleischer

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

**Content**

**Module: Machine Tools an Industrial Handling [WI4INGMB32]**

**Coordination:** J. Fleischer  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
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 an Industrial Handling (p. 600)	4/2	W	9	J. Fleischer

**Learning Control / Examinations**

The assessment is carried out as written exam of 120 min (according to Section 4(2),1 of the examination regulation) of the course of this module. The assessment procedures are described for each course of the module separately. The overall grade of the module is the grade for the written exam. 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.

**Learning Outcomes**

The student

- has knowledge about the application of machine tools.
- comprehends the assembly and the operation purpose of the major components of a machine tool.
- is able to apply methods of selection and assessment of production machines to new tasks.
- is able to assess the dimensioning of a machine tool.

**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.

## Module: Automotive Engineering [WI4INGMB5]

**Coordination:** F. Gauterin  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2113805	Basics of Automotive Engineering I (p. 278)	4	W	6	F. Gauterin, Unrau
2114835	Basics of Automotive Engineering II (p. 279)	2	S	3	F. Gauterin, Unrau
2115817	Project Workshop-Automotive Engineering (p. 424)	3	W/S	4,5	F. Gauterin
2113814	Fundamentals for Design of Motor-Vehicle Bodies I (p. 294)	1	W	1,5	Bardehle
2114840	Fundamentals for Design of Motor-Vehicle Bodies II (p. 295)	1	S	1,5	Bardehle
2114093	Fluid Power Systems (p. 261)	2	W	3	M. Geimer
2114092	CAN-Bus Release Control (p. 187)	2	S	3	M. Geimer

### 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 the credits and truncated after the first decimal.

### Conditions

None.

### Recommendations

Knowledge of the content of the courses *Engineering Mechanics I* [2161208], *Engineering Mechanics II* [8001092] and *Basics of Automotive Engineering I* [2113805], *Basics of Automotive Engineering II* [2114835] is helpful.

### Learning Outcomes

The student

- knows the most important components of a vehicle,
- knows and understands the functioning and the interaction of the individual components,
- knows the basics of dimensioning the components.

### Content

## Module: Handling Characteristics of Motor Vehicles [WI4INGMB6]

**Coordination:** F. Gauterin  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2113806	Vehicle Comfort and Acoustics I (p. 254)	2	W	3	F. Gauterin
2114825	Vehicle Comfort and Acoustics II (p. 255)	2	S	3	F. Gauterin
2113807	Handling Characteristics of Motor Vehicles I (p. 251)	2	W	3	H. Unrau
2114838	Handling Characteristics of Motor Vehicles II (p. 252)	2	S	3	H. Unrau
2115817	Project Workshop-Automotive Engineering (p. 424)	3	W/S	4,5	F. Gauterin
2113816	Vehicle Mechatronics I (p. 253)	2	W	3	Ammon
2114850	Driving Dynamics Evaluation within the Global Vehicle Simulation (p. 266)	2	S	3	B. Schick

### Learning Control / Examinations

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

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

### Conditions

None.

### Recommendations

Knowledge of the content of the courses *Engineering Mechanics I* [2161208], *Engineering Mechanics II* [2162226] and *Basics of Automotive Engineering I* [2113805], *Basics of Automotive Engineering II* [2114835] is helpful.

### Learning Outcomes

The student

- knows and understands the characteristics of vehicles, owing to the construction and design tokens,
- knows and understands especially the factors being relevant for comfort and acoustics
- is capable of fundamentally evaluating and rating handling characteristics.

### Content

**Module: Vehicle Development [WI4INGMB14]**

**Coordination:** F. Gauterin  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2115817	Project Workshop-Automotive Engineering (p. 424)	3	W/S	4,5	F. Gauterin
2113816	Vehicle Mechatronics I (p. 253)	2	W	3	Ammon
2113812	Fundamentals in the Development of Commercial Vehicles I (p. 296)	1	W	1,5	Zürn
2114844	Fundamentals in the Development of Commercial Vehicles II (p. 297)	1	S	1,5	J. Zürn
2113810	Fundamentals in the Development of Passenger Vehicles I (p. 298)	1	W	1,5	Frech
2114842	Fundamentals in the Development of Passenger Vehicles II (p. 299)	1	S	1,5	Frech
2114843	Basics and Methods for Integration of Tires and Vehicles (p. 293)	2	S	3	Leister
2114095	Simulation of coupled systems (p. 500)	2	S	3	M. Geimer

**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 the credits and truncated after the first decimal.

**Conditions**

None.

**Recommendations**

Knowledge of the content of the courses *Engineering Mechanics I* [2161208], *Engineering Mechanics II* [2162226] and *Basics of Automotive Engineering I* [2113805], *Basics of Automotive Engineering II* [2114835] is helpful.

**Learning Outcomes**

The student

- knows and understands the procedures in automobile development,
- knows and understands the technical specifications at the development procedures,
- is aware of notable boundaries like legislation.

**Content**

**Module: Mobile Machines [WI4INGMB15]**

**Coordination:** M. Geimer  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2114093	Fluid Power Systems (p. 261)	2	W	3	M. Geimer
2114095	Simulation of coupled systems (p. 500)	2	S	3	M. Geimer
2114092	CAN-Bus Release Control (p. 187)	2	S	3	M. Geimer
2113073	Mobile Machines (p. 362)	4	S	6	M. Geimer
2113812	Fundamentals in the Development of Commercial Vehicles I (p. 296)	1	W	1,5	Zürn
2114844	Fundamentals in the Development of Commercial Vehicles II (p. 297)	1	S	1,5	J. Zürn

**Learning Control / Examinations**

The assessment is carried out as a general oral exam (according to Section 4(2), 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 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 oral examination.

The assessment may be carried out as partial oral exams (according to Section 4(2), 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. In this case 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.

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

**Conditions**

None.

**Recommendations**

Knowledge of Fluid Power Systems are helpful, otherwise it is recommended to take the course *Fluid Power Systems* [2114093].

**Learning Outcomes**

The student

- knows and understands the basic structure of the machines
- masters the basic skills to develop the selected machines

**Content**

In the module of *Mobile Machines* [WI4INGMB15] the students will learn the structure of the machines and deepen the knowledge of the subject for developing the machines. After conclusion the module the student will know the latest developments in mobile machines and is able to evaluate the concepts and the trends of developments. The module is practically orientated and supported by industry partners.



**Module: Combustion Engines I [WI4INGMB18]**

**Coordination:** H. Kubach  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every 2nd term, Winter Term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2133101	Combustion Engines A (p. <a href="#">564</a> )	4/2	W	9	Spicher

**Learning Control / Examinations**

The assessment of the module is carried out by a written examination about the lecture *Combustion Engines A* [2133101] (according to Section 4(2), 1 of the examination regulation). The grade of the module corresponds to the grade of this examination.

**Conditions**

None.

**Learning Outcomes****Content**

## Module: Combustion Engines II [WI4INGMB19]

**Coordination:** H. Kubach  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2134135	Combustion Engines B (p. 565)	2/1	S	5	Spicher
21112	Supercharging of Internal Combustion Engines (p. 161)	2	S	4	Golloch
2133109	Motor Fuels for Combustion Engines and their Verifications (p. 178)	2	W	4	Volz
2134138	Internal Combustion Engines and Exhaust Gas Aftertreatment Technology (p. 283)	2	S	4	Lox
21134	Methods in Analyzing Internal Combustion (p. 358)	2	S	4	Wagner
2134137	Engine Measurement Technologies (p. 367)	2	S	4	Bernhardt
21114	Simulation of Spray and Mixture Formation in Internal Combustion Engines (p. 503)	2	W	4	Baumgarten

### 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 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* [WI4INGMB18]. The module is passed only after the final partial exam of *Combustion Engines I* is additionally passed.

The course *Combustion Engines B* [2134135] has to be attended.

### Recommendations

Basic skills in the subject of Thermodynamics are recommended.

### Learning Outcomes

#### Content

**Module: Introduction to Logistics [WI4INGMB20]**

**Coordination:** K. Furmans  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
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. 353)	3/1	W	6	K. Furmans
2118090	Quantitative Methods for Supply Chain Risk Management (p. 432)	3/1	W	6	A. Cardeneo
2118083	IT for Facility Logistics (p. 326)	3/1	S	6	F. Thomas
2118097	Warehouse and Distribution Systems (p. 333)	2	S	4	M. Schwab, J. Weiblen
2117056	Airport Logistics (p. 341)	2	W	4	A. Richter
2117061	Safety Engineering (p. 498)	2	W	4	H.-P. Kany
2117064	Industrial Application of Technological Logistics instancing Crane Systems (p. 151)	2	W	4	M. Golder
2118089	Industrial Application of Material Handling Systems in Sorting and Distribution Systems (p. 152)	2	S	4	J. Föller
2118085	Automotive Logistics (p. 340)	2	S	4	K. Furmans
2118094	Information Systems and Supply Chain Management (p. 308)	2	S	4	C. Kilger
2117500	Energy efficient intralogistic systems (p. 234)	2	W	4	F. Schönung
2117095	Basics of Technical Logistics (p. 289)	3/1	W	6	M. Mittwollen, V. Madzharov
2117096	Elements and Systems of Technical Logistics (p. 226)	3/1	W	6	M. Mittwollen, V. Madzharov

**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**

It is obligatory to choose one of the following courses:

- *Material Flow in Logistic Systems*
- *Basics of technical logistics*
- *Elements and Systems of Technical Logistics*
- *Quantitative Risk Management of Logistic Systems*

*Elements and systems of Technical Logistics* is only allowed to be examined if *Basics of Technical Logistics* is passed successfully in this or an other module. For simultaneous attending of both courses, examination dates are sequenced accordingly.

**Learning Outcomes**

The student

- acquires an overview of different logistic questions in practice,
- is able to model logistic systems with adequate accuracy by using simple models,

- is able to handle analytical methods for a performance evaluation of logistic systems,
- is able to identify cause and effects within logistic systems.

**Content**

The module *Introduction to Logistics* provides well-founded knowledge in main questions of logistics. In this module, focuses on the acquisition of theoretical basics linked with exemplary practice questions are laid. To gain a deeper understanding, the course is accompanied by exercises and further improved by case studies.

## Module: Technical Logistics [WI4INGMB27]

**Coordination:** K. Furmans  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every 2nd term, Winter Term	2

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2117095	Basics of Technical Logistics (p. 289)	3/1	W	6	M. Mittwollen, V. Madzharov
2117096	Elements and Systems of Technical Logistics (p. 226)	3/1	W	6	M. Mittwollen, V. Madzharov
2118087	selected applications of technical logistics (p. 163)	2/1	S	4	M. Mittwollen, V. Madzharov
2118088	selected applications of technical logistics and project (p. 165)	3/1	S	6	M. Mittwollen, V. Madzharov
2118083	IT for Facility Logistics (p. 326)	3/1	S	6	F. Thomas
2118097	Warehouse and Distribution Systems (p. 333)	2	S	4	M. Schwab, J. Weiblen
2117061	Safety Engineering (p. 498)	2	W	4	H.-P. Kany
2117064	Industrial Application of Technological Logistics instancing Crane Systems (p. 151)	2	W	4	M. Golder
2118089	Industrial Application of Material Handling Systems in Sorting and Distribution Systems (p. 152)	2	S	4	J. Föllner
2117500	Energy efficient intralogistic systems (p. 234)	2	W	4	F. Schönung

### 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

The lecture *basics of technical logistics* has to be chosen. If the lecture *Basics of technical logistics* has been successfully examined in another module, the lecture *elements and systems of technical logistics* can be chosen instead. If both lectures are examined successfully, one can choose selected applications of technical logistics or selected applications of technical logistics and project instead.

### Learning Outcomes

The student

- acquires well-founded knowledge on the main topics of technical logistics
- gets an overview of different applications of technical logistics in practice,
- acquires expertise and understanding about functionality of material handling systems.

### Content

The module *Technical Logistics* provides in-depth basics on the main topics of technical logistics. The module focuses on technical characteristics of material handling technology. To gain a deeper understanding, the course is accompanied by exercises.

## Module: Material Flow in Logistic Systems [WI4INGMB25]

**Coordination:** K. Furmans  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every 2nd term, Winter 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. 353)	3/1	W	6	K. Furmans
2118097	Warehouse and Distribution Systems (p. 333)	2	S	4	M. Schwab, J. Weiblen
2117056	Airport Logistics (p. 341)	2	W	4	A. Richter
2118085	Automotive Logistics (p. 340)	2	S	4	K. Furmans

### Learning Control / Examinations

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

The course *Material Flow in Logistic Systems* [2117051] is compulsory and must be examined.

### Learning Outcomes

The student

- acquires comprehensive and well-founded knowledge on the main topics of logistics, an overview of different logistic questions in practice and knows the functionality of material handling systems,
- is able to illustrate logistic systems with adequate accuracy by using simple models,
- is able to realize coherences within logistic systems,
- is able to evaluate logistic systems by using the learnt methods.

### Content

The module *Material Flow in Logistic Systems* provides comprehensive and well-founded basics for the main topics of logistics. Within the lectures, the interaction between several components of logistic systems will be shown. The module focuses on technical characteristics of material handling systems as well as on methods for illustrating and evaluating logistics systems. To gain a deeper understanding, the course is accompanied by exercises and case studies.

### Remarks

If the course 2117051 „Materialfluss in Logistiksystemen“ had been taken already, one of the modules [WI4INGMB26], [WI4INGMB27] and [WI4INGMB28] can be chosen.

**Module: Logistics in Value Chain Networks [WI4INGMB28]**

**Coordination:** K. Furmans  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2118078	Logistics - Organisation, Design, and Control of Logistic Systems (p. 338)	3/1	S	6	K. Furmans
2117062	Supply Chain Management (p. 537)	3/1	W	6	K. Alicke
2118090	Quantitative Methods for Supply Chain Risk Management (p. 432)	3/1	W	6	A. Cardeneo
2118097	Warehouse and Distribution Systems (p. 333)	2	S	4	M. Schwab, J. Weiblen
2117056	Airport Logistics (p. 341)	2	W	4	A. Richter
2118085	Automotive Logistics (p. 340)	2	S	4	K. Furmans
2118094	Information Systems and Supply Chain Management (p. 308)	2	S	4	C. Kilger

**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 lectures

- *Logistics – Organization, Design and Control of Logistic Systems* [2118078]
- *Supply Chain Management* [2117062]
- *Quantitative Methods for Supply Chain Risk Management* [2118090]

is compulsory and must be examined.

**Learning Outcomes**

The student

- is able to plan logistic systems and evaluate their performance,
- can use approaches of Supply Chain Management within the operational practice,
- identifies, analyses and evaluates risks within logistic systems.

**Content**

The module *Logistics in value chain networks* provides basics for the main topics of logistics. Within the lecture basic methods for planning and running logistic systems are introduced. Furthermore special issues like supply chain management and risks in logistic systems are focused. To gain a deeper understanding, the course is accompanied by exercises.

## Module: Material Flow in networked Logistics Systems [WI4INGMB26]

**Coordination:** K. Furmans  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every 2nd term, Winter Term	1

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2117060	Analytical Models for Material Flow (p. 145)	3/1	W	6	J. Stoll, E. Özden
2118097	Warehouse and Distribution Systems (p. 333)	2	S	4	M. Schwab, J. Weiblen
2117056	Airport Logistics (p. 341)	2	W	4	A. Richter
2118085	Automotive Logistics (p. 340)	2	S	4	K. Furmans

### 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

The course *Analytical Models for Material Flow* [2117060] is compulsory and must be examined.

### Learning Outcomes

The student

- acquires in-depth knowledge on the main topics of logistics, gets an overview of different logistic questions in practice,
- is able to evaluate logistic systems by using the learnt methods,
- is able to analyze and explain the phenomena of industrial material and value streams.

### Content

The module *Material Flow in networked Logistic Systems* provides in-depth basics for the main topics of logistics and industrial material and value streams. The obligatory lecture focuses on queuing methods to model production systems. To gain a deeper understanding, the course is accompanied by exercises.



**Module: Virtual Engineering A [WW4INGMB29]**

**Coordination:** J. Ovtcharova  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2121352	Virtual Engineering I (p. 583)	2/3	W	6	J. Ovtcharova
2121370	Virtual Engineering for Mechatronic Products (p. 582)	3/0	W	4	J. Ovtcharova, S. Rude
2123364	Product, Process and Ressource Integration in the Automotive Development (p. 420)	2/1	S	4	S. Mbang
2122387	Computer Integrated Planning of New Products (p. 433)	2/0	S	4	R. Kläger
2122371	Efficient Creativity - Processes and Methods within the Automotive Industry (p. 218)	2	S	4	Lamberti
2123375	Virtual Reality Practical Course (p. 585)	3	S	4	J. Ovtcharova

**Learning Control / Examinations**

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

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

**Conditions**

The course *Virtual Engineering I* [2121352] is compulsory modules and must be examined.

**Learning Outcomes**

The students should:

- have basic knowledge about the industrial application of Information Technology in product development,
- have understanding about current and future application of information systems in product development processes in the context of Product Lifecycle Management and Virtual Engineering,
- be able to operate current CAx- and PLM-systems in the product development process
- understands demands and relevance of interconnected IT-systems and respective methods for product development

**Content**

The Module Virtual Engineering A gives an overview about product development processes, beginning with requirement engineering, verification of manufacturing feasibility and virtual operation in the scope of Digital Factory. The guest-lectures contained in this module complete the content of the lecture with introducing current product development processes focusing on automotive industry.

**Module: Virtual Engineering B [WW4INGMB30]**

**Coordination:** J. Ovtcharova  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2122378	Virtual Engineering II (p. 584)	2/1	S	4	
2121370	Virtual Engineering for Mechatronic Products (p. 582)	3/0	W	4	J. Ovtcharova, S. Rude
2123364	Product, Process and Ressource Integration in the Automotive Development (p. 420)	2/1	S	4	S. Mbang
2122387	Computer Integrated Planning of New Products (p. 433)	2/0	S	4	R. Kläger
2122371	Efficient Creativity - Processes and Methods within the Automotive Industry (p. 218)	2	S	4	Lamberti
2123375	Virtual Reality Practical Course (p. 585)	3	S	4	J. Ovtcharova
2123356	CATIA V5 CAD training course (p. 191)		W/S	2	J. Ovtcharova
2123355	CAD-NX5 training course (p. 192)	3	W/S	2	J. Ovtcharova

**Learning Control / Examinations**

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

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

**Conditions**

The course *Virtual Engineering II* [2122378] is compulsory module and must be examined.

**Recommendations**

We recommend to attend/visit the courses *Engineering I* [2121352] before *Virtual Engineering II* [2122378]

**Learning Outcomes**

The students should:

- have basic knowledge about industrial practice of Information Technology in the field of product development,
- have basic knowledge about innovative visualization techniques like Virtual Reality and feasible application of Virtual Mock-Ups (VMU) for validating product properties.
- Is able to estimate potentials and risks of current Virtual Reality Systems in product development.
- understands demands and relevance of interconnected IT-systems and respective methods for product development

**Content**

The module *Virtual Engineering B* communicates basics of Virtual Reality applications and their fields of application for validating product properties and for supporting product development processes.

Optional courses of this module complete the content with practical application of VR techniques in product development (*Virtual Reality Exercise*), respectively current product development processes focusing on automotive industries are introduced.

### Module: Specific Topics in Material Science [WI4INGMB33]

**Coordination:** M. Hoffmann  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

#### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2178643	Constitution and Properties of Wear Resistant Materials (p. 158)	2	S	4	Ulrich
2177601	Constitution and Properties of Protective Coatings (p. 159)	2	W	4	Ulrich
2125755	Introduction in Ceramics (p. 220)	2	W	4	M. Hoffmann
2173560	Experimental Lab Class in Welding Technology, in Groups (p. 249)	3	W	1	V. Schulze
21575	Foundry Technology (p. 271)	2	S	4	Wilhelm
21754	Principles of Ceramic and Powder Metallurgy Processing (p. 281)	2	W	4	Oberacker
21642	Laser Application in Automotive Engineering (p. 335)	2	S	4	Schneider
21640	Laser Materials Processing (p. 336)	3	W/S	1	Schneider
2181612	Physical Basics of Laser Technology (p. 399)	2/1	W	5	Schneider
2174596	Polymerengineering II (p. 402)	2	S	4	P. Elsner
2173590	Polymerengineering I (p. 401)	2	W	4	P. Elsner
21751	Practical Course in Engineering Ceramics (p. 409)	2	W	1	Porz
21562	Failure Analysis (p. 444)	2	W	4	Poser-Keppler
21565/21570	Welding Technology I/II (p. 446)	2	W/S	4	Spies
2126775	Structural and Functional Ceramics (p. 535)	2	S	4	M. Hoffmann
2177618	Superhard Thin Film Materials (p. 536)	2	W	4	Ulrich
2174576	Systematic Selection of Materials (p. 540)	2/1	S	5	Wanner
21715	Failure of Structural Materials: Fatigue and Creep (p. 575)	2	W	4	Gruber
21711	Failure of Structural Materials: Deformation and Fracture (p. 576)	2	W	4	Weygand
2174574	Materials of Lightweight Construction (p. 598)	2	S	4	Weidenmann
2173553	Material Science and Engineering III (p. 599)	4/1	W	6	Wanner
2126749	High Performance Powder Metallurgy Materials (p. 427)	2	S	4	R. Oberacker

**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 separately.

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

**Conditions**

It is only possible to choose either the course *Physical Basics of Laser Technology* [21612] or the course *Laser Application in Automotive Engineering* [21642].

**Recommendations**

Knowledge, comparable to the content of the module *Emphasis Material Science* [WI3INGMB9], is highly recommended. Natural science basic knowledge is assumed.

**Learning Outcomes****Content**

**Module: BioMEMS [WI4INGMBIMT1]**

**Coordination:** V. Saile  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9		

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2143875	Practical training in basics of microsystem technology (p. 413)		W/S	3	A. Last
2143892	Selected Topics of Optics and Microoptics for mechanical engineers (p. 167)	2	W/S	3	T. Mappes
2141864	BioMEMS I (Microsystem Technology for Life-Sciences and Medicine; part I) (p. 182)	2	W	3	A. Guber
2142883	BioMEMS II (Microsystem Technology for Life-Sciences and Medicine; part II) (p. 183)	2	S	3	A. Guber
2142879	BioMEMS III (Microsystem Technology for Life-Sciences and Medicine; part III) (p. 184)	2	S	3	A. Guber
2142881	Microactuators (p. 359)	2	S	3	M. Kohl
2143893	Replication processes in micro system technologies (p. 437)	2	W/S	3	M. Worgull
	Bionics for Engineers and Natural Scientists (p. 185)	2	S	3	H. Hölscher, S. Walheim
2143873	Current Topics on BioMEMS (p. 142)	2	W/S	3	A. Guber

**Learning Control / Examinations**

The assessment is carried out as partial exams

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

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

**Conditions**

The course BioMEMS I [2141864] is compulsory and must be examined.

**Recommendations**

See descriptions of individual lectures

**Learning Outcomes**

The student

- Has basic as well as extensive knowledge about different fields of applications of BioMEMS
- Understands continuative aspects of the related subjects optics and microoptics, micro actuators, replications techniques and bionics

**Content**

Operations through small orifices, a pill which will take pictures on its way through your body or lab results right at the point of care - the need for easier and faster ways to help people is an important factor in research. The module BioMEMS (Bio(medical)-Micro-Electro-Mechanical-Systems) describes the application of microtechnology in the field of Life-Science, medical applications and Biotechnology and will teach you the necessary skills to understand and develop biological and medical devices.

The BioMEMS lectures will cover the fields of minimal invasive surgery, lab-on-chip systems, NOTES-Technology (Natural Orifice Transluminal Endoscopic Surgery), as well as endoscopic surgery and stent technology.

Additionally to the BioMEMS lectures you can specialize in various related fields like fabrication, actuation, optics and bionics. The course Replication processes will teach you some cost efficient and fast ways to produce parts for medical or biological devices. In the course Microactuation it is discussed how to receive movements in micrometer scale in a microsystem, this could be e.g. to drive micro pumps or micro valves. The necessary tools for optical measurement and methods of analysis to gain high resolution pictures are also part of this module. To deepen your knowledge and to get a hands-on experience this module contains a one week lab course. In the lecture bionics you can see how biological effects can be transferred into technical products.

**Remarks**

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

**Module: Microfabrication [WI4INGMBIMT2]**

**Coordination:** V. Saile  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9		

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2143875	Practical training in basics of microsystem technology (p. 413)		W/S	3	A. Last
2142890 / 2142891	Physics for Engineers (p. 398)	2/2	S	6	P. Gumbsch, A. Nesterov-Müller, D. Weygand, A. Last
2143882	Manufacturing Processes of Microsystem Technology (p. 257)	2	W/S	3	K. Bade
2143893	Replication processes in micro system technologies (p. 437)	2	W/S	3	M. Worgull
2143500	Chemical, physical and material science aspects of plastics in the micro technology (p. 194)	2	W/S	3	M. Worgull, D. Häringer, H. Moritz
2142007	Fundamentals of X-ray optics (p. 287)	2	W	3	M. Simon
2181712	Nanotribology and -mechanics (p. 372)	2	W	3	H. Hölscher, M. Dienwiebel

**Learning Control / Examinations**

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

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

**Conditions**

The course Manufacturing Processes of Microsystem Technology [2143882] is compulsory and must be examined.

**Recommendations**

Knowledge of microsystem technology, mechanics, optics and physics is recommended.

**Learning Outcomes**

The student

- gains advanced knowledge concerning fabrication techniques in micrometer scale
- acquires knowledge in up-to-date developing research
- can detect and use causal relation in microfabrication process chains.

**Content**

This engineering module allows the student to gain advanced knowledge in the area of microfabrication. Different manufacturing methods are described and analyzed in an advanced manner. Necessary interdisciplinary knowledge from physics, chemistry, materials science and also up-to-date developments (nano and x-ray optics) in micro fabrication is offered.

**Remarks**

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

**Module: Microoptics [WI4INGMBIMT3]**

**Coordination:** V. Saile  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9		

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2143875	Practical training in basics of microsystem technology (p. 413)		W/S	3	A. Last
2142884	Microoptics and Lithography (p. 610)	2	S	3	T. Mappes
2143892	Selected Topics of Optics and Microoptics for mechanical engineers (p. 167)	2	W/S	3	T. Mappes
2142881	Microactuators (p. 359)	2	S	3	M. Kohl
2142007	Fundamentals of X-ray optics (p. 287)	2	W	3	M. Simon
23840	Laser Physics (p. 334)	2/1	W	4,5	M. Eichhorn
23462/23463	Optical Sources and Detectors (p. 382)	2/1	S	4,5	C. Koos
23464/23465	Optical Waveguides and Fibers (p. 383)	2/1	W	4,5	C. Koos
n.n.	Fundamentals of X-ray optics II (p. 288)	2	S	3	M. Simon

**Learning Control / Examinations**

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

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

**Conditions**

The course Microoptics and Lithography [2142884] is compulsory and must be examined.

**Recommendations**

Basic knowledge in electro dynamics is expected.

Attending Grundlagen der Mikrosystemtechnik I [2141861] and Grundlagen der Mikrosystemtechnik II [2142874] is recommended.

**Learning Outcomes**

- basic knowledge for the applications of microoptical systems
- understanding fabrication processes of microoptical elements & systems
- analyzing strengths and weaknesses of lithography processes
- knowledge on the basics of optical sources and detectors and their use in technical systems
- fundamental knowledge on different lasers and their design
- knowledge on X-ray imaging methods

**Content**

Optical imaging, measuring and sensor systems are a base for modern natural sciences. In particular life sciences and telecommunications have an intrinsic need for the application of optical technologies. Numerous fields of physics and engineering, e.g. astronomy and material sciences, require optical techniques. Micro optical systems are introduced in medical diagnostics and biological sensing as well as in products of the daily life.

In this module, an introduction to the basics of optics is provided; optical effects are presented with respect to their technical use.

Optical elements and instruments are presented. Fabrication processes of micro optical systems and elements, in particular lithography, are discussed.

In addition X-ray optics and X-ray imaging systems are presented as well as elements of optical telecommunication. A closer look on the physics behind lasers, being one of the most important technical light sources, is provided. As high end technology



and clean room equipment is present in all the lectures of this module, the students will have a hands-on training with several experiments in micro optics.

**Remarks**

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

## Module: Microsystem Technology [WI4INGMBIMT4]

**Coordination:** V. Saile  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9		

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2141861	Basics of microsystemtechnology I (p. 285)	2	W	3	A. Last
2142874	Basics of microsystem technology II (p. 286)	2	S	3	A. Last
2143875	Practical training in basics of microsystem technology (p. 413)		W/S	3	A. Last
2142890 / 2142891	Physics for Engineers (p. 398)	2/2	S	6	P. Gumbsch, A. Nesterov-Müller, D. Weygand, A. Last
2143892	Selected Topics of Optics and Microoptics for mechanical engineers (p. 167)	2	W/S	3	T. Mappes
2142883	BioMEMS II (Microsystem Technology for Life-Sciences and Medicine; part II) (p. 183)	2	S	3	A. Guber
2142879	BioMEMS III (Microsystem Technology for Life-Sciences and Medicine; part III) (p. 184)	2	S	3	A. Guber
2142881	Microactuators (p. 359)	2	S	3	M. Kohl
2143500	Chemical, physical and material science aspects of plastics in the micro technology (p. 194)	2	W/S	3	M. Worgull, D. Häringer, H. Moritz
2141865	Novel Actuators and Sensors (p. 375)	2	W	3	M. Kohl, M. Sommer
2143876	Nanotechnology with clusters (p. 370)	2	W	3	J. Gspann
	Bionics for Engineers and Natural Scientists (p. 185)	2	S	3	H. Hölscher, S. Walheim
23486 / 23487	Optoelectronic Components (p. 386)	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

The course Basics of microsystem technology I [2141861] is compulsory and must be examined.

### Learning Outcomes

- 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.

### Remarks

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

**Module: Nanotechnology [WI4INGMBIMT5]**

**Coordination:** V. Saile  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9		

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2143875	Practical training in basics of microsystem technology (p. 413)		W/S	3	A. Last
2142860	Nanotechnologie using Scanning Probe Methods (p. 371)	2	S	3	H. Hölscher, M. Dienwiebel, S. Walheim
2141865	Novel Actuators and Sensors (p. 375)	2	W	3	M. Kohl, M. Sommer
2143876	Nanotechnology with clusters (p. 370)	2	W	3	J. Gspann
2181712	Nanotribology and -mechanics (p. 372)	2	W	3	H. Hölscher, M. Dienwiebel
	Bionics for Engineers and Natural Scientists (p. 185)	2	S	3	H. Hölscher, S. Walheim
23476	Quantum Functional Devices and Semiconductor Technology (p. 302)	2	S	3	M. Walther

**Learning Control / Examinations**

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

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

**Conditions**

The course Nanotechnology with Scanning Probe Methods [2142860] is compulsory and must be examined.

**Recommendations**

Knowledge in physics, mathematics, and chemistry is assumed.

**Learning Outcomes**

The student

- has detailed knowledge in the field of nanotechnology
- is able to evaluate the specific characteristics of nanosystems.

**Content**

The module deals with the most important principles and fundamentals of modern nanotechnology. The compulsory module "Nanotechnology with scanning probe methods" introduces the basics of nanotechnology and nanoanalytics. The specific phenomena and properties found in nanoscale systems are the main topic of the module.

**Remarks**

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

## Module: Optoelectronics and Optical Communication [WI4INGMBIMT6]

**Coordination:** V. Saile  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

**ECTS Credits**  
9

**Cycle**

**Duration**

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2143882	Manufacturing Processes of Microsystem Technology (p. 257)	2	W/S	3	K. Bade
2141865	Novel Actuators and Sensors (p. 375)	2	W	3	M. Kohl, M. Sommer
23616 / 23618	Communication Systems and Protocols (p. 196)	2/1	S	4,5	J. Leuthold, J. Becker, M. Hübner
23840	Laser Physics (p. 334)	2/1	W	4,5	M. Eichhorn
23476	Quantum Functional Devices and Semiconductor Technology (p. 302)	2	S	3	M. Walther
23462/23463	Optical Sources and Detectors (p. 382)	2/1	S	4,5	C. Koos
23464/23465	Optical Waveguides and Fibers (p. 383)	2/1	W	4,5	C. Koos
23460 / 23461	Optical Communication Systems (p. 381)	2/1	W	4,5	J. Leuthold, 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

The course Optical Communication Systems [23460 / 23461] is compulsory and must be examined.

The course Manufacturing Processes of Microsystem Technology [2143882] can only be examined if the module Microfabrication is not chosen.

### Recommendations

See descriptions of individual lectures.

### Learning Outcomes

- Student has basic knowledge of optical communication systems and related device and fabrication technologies:
- He/she can apply this knowledge to specific problems.

### Content

This module covers practical and theoretical aspects in the areas of optical communications and optoelectronics. System aspects of communication networks are complemented by fundamental principles and device technologies of optoelectronics as well as and microsystem fabrication technologies.

### Remarks

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

**Module: Energy and Process Technology I [WI4INGMBITS1]**

**Coordination:** K. Dullenkopf  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every 2nd term, Winter Term	

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2157961	Energy and Process Technology I for Business Engineers (p. 232)	4/2	W	9	K. Dullenkopf, H. Wirbser, A. Velji

**Learning Control / Examinations**

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

**Conditions**

None.

**Recommendations**

Good skills in physics and chemistry and German.

**Learning Outcomes**

In this modul students achieve a basic understanding of the technical properties of energy conversion processes and machines.

**Content**

Energy and Process Technology 1:

1. thermodynamic basics and cycle processes (ITT)
2. basics of piston engines (IFKM)
3. basics of turbomachines (FSM)
4. basics of thermal turbomachines (ITS)

**Remarks**

The module "Energy and Process technology" replaces the former module "Maschinenkunde/ Energie- und Umwelttechnik" in the diploma studies "Wirtschaftsingenieurwesen" since WS 2012/2013. The content has been slightly changed which will be explained in the first lecture unit. Examination of the lectures "Maschinenkunde I und II" of the old module is possible on request. All lectures and exams are hold in German only.

**Module: Energy and Process Technology II [WI4INGMBITS2]**

**Coordination:** K. Dullenkopf  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every 2nd term, Summer Term	

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2170832	Energy and Process Technology II for Business Engineers (p. 233)	4/2	S	9	K. Dullenkopf, M. Gabi, A. Velji, H. Wirbser

**Learning Control / Examinations**

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

**Conditions**

None.

**Recommendations**

Good skills in German and knowledge of the content of the lecture „Energy and Process Technology I“.

**Learning Outcomes**

In this modul students achieve the ability to evaluate solitary and interconnected energy systems with respect to societal and economical aspects

**Content**

Energy and Process Technology 1:

1. basics in combustion and pollutant formation (ITT)
2. technical realisation and application of piston engines (IFKM) fluid flow engines (FSM) and thermal turbomachines (ITS)
3. technical aspects of energy supply systems and networks (ITS)

**Remarks**

The module “Energy and Process technology” replaces the former module “Maschinenkunde/ Energie- und Umwelttechnik” in the diploma studies “Wirtschaftsingenieurwesen” since WS 2011/2012. The content has been slightly changed which will be explained in the first lecture unit. Examination of the lectures “Maschinenkunde I und II” of the old module is possible on request. All lectures and exams are hold in German only.

**Module: Design, Construction, Operation and Maintenance Highways [WI4INGBGU1]**

**Coordination:** R. Roos  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

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)
19026	Design Basics in Highway Engineering (p. 174)	1/1	S	3	R. Roos
19065	Design and Construction Highways (p. 243)	1/1	S	3	R. Roos
19301s	Operation and Maintenance Highways (p. 177)	2	S	3	R. Roos

**Learning Control / Examinations**

The assessment of the module consists of a written exam about the lecture *Design Basics in Highway Engineering* [19026] (according to §4(2), 1 of the examination regulation) and a conjointed oral exam about the lectures *Design and Construction Highways* [19065] and *Operation and Maintenance Highways* [19301s].

The exams are offered in each semester and may be resited to any ordinary examination date.

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**

Writing a student research paper with the topics of the course *Design Basics in Highway Engineering* [19026] is obligatory.

**Learning Outcomes****Content**

**Module: Highway Engineering [WI4INGBGU2]**

**Coordination:** R. Roos  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every 2nd term, Summer Term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
19065	Design and Construction Highways (p. 243)	1/1	S	3	R. Roos
19301s	Operation and Maintenance Highways (p. 177)	2	S	3	R. Roos
19302	Environmental Impact of Roads (p. 559)	1	S	1,5	R. Roos
19303s	Special Topics in Highway Engineering (p. 176)	1	S	1,5	R. Roos

**Learning Control / Examinations**

The assessment is a conjoint oral examination (according to §4(2), 2 SPO) on the selected courses of the module. Single parts of the oral examination is based on the contact hours of each course (1 contact hour = 15 min).

The examination will take place on appointment. Resits are offered as needed.

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

**Conditions**

None.

**Recommendations**

The successful completion of the course *Design Basics in Highway Engineering* [19026] is assumed. This course may be attended in a previous study programme.

**Learning Outcomes****Content****Remarks**

Writing a student research paper with the topics of the course *Design Basics in Highway Engineering* [19026] is obligatory.



**Module: Safety, Computing and Law in Highway Engineering [WI4INGBGU3]**

**Coordination:** R. Roos  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
19316	EDV in Highway Engineering (p. 214)	1/1	W	3	M. Zimmermann
19315	Safety Management in Highway Engineering (p. 497)	1	W	2	M. Zimmermann
19314	Seminar in Highway Engineering - Mitigation of an accident black spot (p. 458)	2	S	1,5	M. Zimmermann
VLBGU	Laws concerning Traffic and Roads (p. 568)	2	S	3	D. Hönig

**Learning Control / Examinations**

The assessment is carried out as a general oral exam (according to §4(2), 2 SPO) on the selected courses of the module and a presentation within the *Seminar in Highway Engineering - Mitigation of an accident black spot* [19314]. Single parts of the oral examination is based on the contact hours of each course (1 contact hour = 15 min). The examination will take place on appointment. Re-examinations are offered as needed.

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

**Conditions**

The successful completion of the course *Design Basics in Highway Engineering* [19026] is assumed. This course may be attended in the module *Design, Construction, Operation and Maintenance Highways* or be already completed in a previous study programme.

**Learning Outcomes****Content**

**Module: Public Transportation Operations [WI4INGBGU4]**

**Coordination:** M. Weigel  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
19321	Railway Logistics, Management and Operating - Part II (p. 221)	2	S	3	E. Hohnecker
19327s	Public Transit in Cities and Regions (p. 445)	2	S	3	E. Hohnecker
19320	Customer Orientation in Public Transport (p. 332)	1	S	1,5	E. Hohnecker
19307s	Construction and Maintenance of Railway Infrastructure (p. 171)	1	S	1,5	E. Hohnecker, H. Müller

**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.

The exams are offered each semester. The re-examinations are offered upon prior agreement with the interested participants and not later than the next regular examination date.

**Conditions**

The courses *Railway Logistics, Management and Operating - Part II* [19321] and *Operating Models in Railway Engineering* [19327] are obligatory and have to be attended.

**Recommendations**

The module *Foundations of Guided Systems* [WW3INGBGU2] or *Logistics and Management of Guided Systems* [WW4INGBGU7] is recommended.

**Learning Outcomes****Content**

## Module: Project in Public Transportation [WI4INGBGU5]

**Coordination:** M. Weigel  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
19323	Project in Public Transportation I (p. 570)	4	S	4	E. Hohnecker
19324	Project in Public Transportation II (p. 571)	2	W	2	E. Hohnecker
19313	Tendering, Planning and Financing in Public Transport (p. 602)	2	S	2	W. Weißkopf

### 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.

The exams are offered each semester. The re-examinations are offered upon prior agreement with the interested participants and not later than the next regular examination date.

### Conditions

The courses *Project in Public Transportation I* [19323] and *Project in Public Transportation II* [19324] are obligatory and have to be attended.

### Recommendations

The module *Foundations of Guided Systems* [WW3INGBGU2] or *Logistic and Management of Guided Systems* [WW4INGBGU7] is recommended.

### Learning Outcomes

#### Content

**Module: Guided Systems Engineering [WI4INGBGU6]**

**Coordination:** M. Weigel  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
23346	Electrical Rail Vehicles (p. 223)	2	S	3	G. Clos
19322	Mechanical Models in Railway Engineering (p. 357)	1	S	1,5	E. Hohnecker
19307s	Construction and Maintenance of Railway Infrastructure (p. 171)	1	S	1,5	E. Hohnecker, H. Müller
19308	Freight Transport (p. 301)	1	S	1,5	B. Chlond

**Learning Control / Examinations****Conditions**

The course *Electrical Rail Vehicles* [23346], *Mechanical Models in Railway Engineering* [19322] and *Development and Aspects of Guided Systems* [19326] are obligatory and have to be attended.

**Recommendations**

The module *Foundations of Guided Systems* [WW3INGBGU2] or *Logistic and Management of Guided Systems* [WW4INGBGU7] is recommended.

**Learning Outcomes****Content**

## Module: Transportation Systems [WI4INGBGU8]

**Coordination:** P. Vortisch  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

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)
19027	Transportation Planning and Traffic Engineering Basics (p. 574)	2/0	S	3	P. Vortisch, M. Kagerbauer, M. Kagerbauer
19035	Exercises in Transportation Planning and Traffic Engineering Basics (p. 551)	0/1	S	1,5	P. Vortisch, M. Kagerbauer, M. Kagerbauer
19062	Transport System Planning (p. 572)	2/0	S	3	P. Vortisch
19308	Freight Transport (p. 301)	1	S	1,5	B. Chlond
19335	Long-distance Traffic (p. 256)	2/0	W	3	B. Chlond, W. Manz
19337/19338	Transportation Data Analysis (p. 228)	2/0	W	3	M. Kagerbauer, T. Streit
19361	Air Cargo Networks (p. 342)	1/0	W	1	B. Chlond, externe Vortragende
19313	Tendering, Planning and Financing in Public Transport (p. 602)	2	S	2	W. Weißkopf

### Learning Control / Examinations

The assessment is carried out as a general oral exam (40 min, according to Section 4(2), 2 of the examination regulation) of the courses of this module; or by an assessment by different oral examinations (one about the core courses according to section §4(2), 1-3 SPO) and others for the additional chosen courses of this module. The overall grade of the module is the average of the grades for each course weighted by the credits. The examination is by offered at individually appointed dates.

### Conditions

None.

### Recommendations

Students who also assign modules from „Logistics“, are recommended to integrate *Freight Transport* [19308] into the module.

### Learning Outcomes

The students

- will have basic knowledge about the transportation sector from the perspective of the practitioners (planners and engineers),
- will know the relevant aspects from the transportation sector in order to work in the management of transport authorities or the consulting sector.
- will be able, to analyse and to assess planning concepts from both perspectives.

### Content

The transportation discipline deals with issues in the transport sector which range from planning concepts judged by overall societal criteria to technical problems of the organisation of flows of traffic. Alongside engineering and scientific methods, understanding from the social sciences (economics, ecology, empirical social research) needs to be integrated into the development of approaches to solutions for these problems. Therefore the courses are interdisciplinary.

Within the module relevant fundamentals (transport planning methodology, knowledge about potential measures for influencing behaviour, the fundamentals of traffic engineering) will be dealt with.

The module is recommended for those students who like to get first insights into the transportation sector. This basic knowledge can be enhanced by additionally choosing the module Transportation Planning and Engineering [WI4INGBGU12].

Interest in the transportation sector will be required.

### Remarks

For strengthening knowledge in the transportation field the module *Transportation Planning and Engineering* [WI4INGBGU12] is recommended.

## Module: Transportation Planning and Engineering [WI4INGBGU12]

**Coordination:** P. Vortisch  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every 2nd term, Winter Term	2

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
19301w	Transport Planning Methods (p. 569)	1/1	W	3	P. Vortisch, M. Kagerbauer
19303w	Traffic Engineering and Traffic Telematics (p. 573)	1/1	W	3	P. Vortisch, B. Chlond
19305	Simulation Methods for Transport Modelling (p. 504)	1	W	1,5	P. Vortisch
19309	Application of Simulation Tools (p. 505)	0/1	S	1,5	P. Vortisch, M. Kagerbauer, N. Mallig

### Learning Control / Examinations

The assessment of the module is a oral examination (ca. 40 minutes) according to §4(2), 1 of the examination regulation. The assessment takes place at the date fixed.

The overall grade ist the grade of the oral exam.

### Conditions

All courses of the module have to be assessed successfully.

### Learning Outcomes

The students

- will have basic knowledge about the methodologies of transportation planning and traffic engineering,
- will be able to apply relevant tools in transporation planning and traffic engineering.
- will be able, to develop planning concepts from both perspectives

### Content

This module goes beyond the range of the module *Transportation Systems* [WI4INGBGU8] . In the module *Transportation Planning and Engineering* the students will specialise in the methods and models of transportation planning and traffic engineering. The module aims at students who like to specialize in the transport sector (enrollment in two modules). This module has therefore to be understood as an enhancement of the module *Transportation Systems* [WI4INGBGU8].

**Module: Environmental Management [WI4INGBGU12]**

**Coordination:** E. Hoffmann  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
19245	Material Flux Analyses - River Basin Management (p. 530)	2	W	3	S. Fuchs
19058	Principles of Bioengineering (p. 282)	1/1	S	3	J. Winter
19260	Legislation of Water, Soil and Waste (p. 594)	2	S	3	E. Wolf
19057/58	Seminar in Freshwater Ecology (p. 270)	2	S	3	S. Fuchs
19243	Field Course in Freshwater Ecology (p. 269)	2	S	3	S. Fuchs
19241	(p. 327)	2	W	3	J. Winter

**Learning Control / Examinations**

Depending on the choice of courses, the assessment of this module is a conjoint oral exam (according to §4(2), 2 of the examination regulation) or written examinations for each course separately (according to §4(2), 1 and 2 of the examination regulation).

- *Analysing and Managing Material Currents in Water Resources Management* [19245]: written exam (40 min)
- rest: general oral exam about the chosen courses (60 min.)

A certificate of performance in the *Field Course in Freshwater Ecology* [19243] is required for admission to examination. The final mark for the module is the average of the marks for each course weighted by the credits of the course.

**Conditions**

The course *Urban Water Resources Management* [0170603] is a prerequisite for the *Seminar in Freshwater Ecology* [19057/19058].

The *Seminar in Freshwater Ecology* [19057/19058] is a prerequisite for the *Field Course in Freshwater Ecology* [19243].

The course *Foundations of Bioengineering* [19058] is a prerequisite for the course *Reaction Mechanism in Different Ecosystems* [19241].

**Recommendations**

Basic knowledge of biology, physics and chemistry, taught at the upper secondary level, is helpful.

**Learning Outcomes**

The students develop system thinking and gain applicable knowledge and tools in regard to engineering methods.

**Content**

**Module: Water Supply and Sanitation [WI4INGBGU13]**

**Coordination:** E. Hoffmann  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
19054	Process Engineering in Water Quality Management (p. 566)	2	S	3	E. Hoffmann
19243/44	Design of Wastewater Treatment Plants and Biosolids Reclaiming Systems (Design of Urban Water and Wastewater Management Systems) (p. 172)	1/1	W	3	E. Hoffmann
19248	Design and Planning of Urban Drainage Systems (p. 173)	1	S	1,5	S. Fuchs
19249	Semi- and Decentral Systems (p. 211)	1	S	1,5	E. Hoffmann, S. Fuchs
19054p	Laboratory - Process Engineering in Water Quality Management (p. 410)	2	S	3	E. Hoffmann
0170603	(p. 139)	1/1	S	3	S. Fuchs
0170110	Environmental Chemistry (p. 554)	1/1	W	3	J. Winter
0170605	(p. 558)	2	S	3	J. Winter

**Learning Control / Examinations**

Depending on the choice of courses, the assessment of this module is a conjoint oral exam (according to §4(2), 2 of the examination regulation) or written examinations for each course separately (according to §4(2), 1 and 2 of the examination regulation).

- *Urban Water Resources Management* [0170603]: written exam (30 min)
- *Environmental Chemistry* [0170110]: written exam (60 min)
- rest: conjoint oral exam about the chosen courses (60 min.)

A certificate of performance in the *Laboratory - Process Engineering in Water Quality Management* [19054] is required for admission to examination.

The final mark for the module is the average of the marks for each course weighted by the credits of the course.

**Conditions**

None.

**Recommendations**

Basic knowledge of biology, physics and chemistry, taught at the upper secondary level, is helpful.

**Learning Outcomes****Content**

- Operation in the field of urban waste management
- Particular emphasis in regard to the Millenium Development



## Module: Control Engineering I [WI4INGETIT1]

**Coordination:** M. Kluwe  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
23155	System Dynamics and Control Engineering (p. 541)	2/1	S	4,5	M. Kluwe
23180	Optimization of Dynamic Systems (p. 385)	2/1	W	4,5	S. Hohmann

### 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 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

Knowledge about integral transformations is assumed. This knowledge can be acquired in the course *Complex Analysis and Integral Transformations* or via private study (see references of the course *System Dynamics and Control Engineering* [23155]). A proof of performance about this is not necessary.

### Learning Outcomes

The students

- get familiar with the basic concepts of control theory,
- learn and understand the elements, the structure and the behavior of dynamic systems,
- have insight in the problems of control and intuition about methods available to solve those problems as well in frequency domain as in time domain,
- get familiar with the basic principles and methods for the design of optimal controllers for systems.

### Content

This module familiarizes students with the basic elements, structures and the behavior of dynamic systems. Both time continuous and time discrete models are regarded. The students gain insight into the problems of control design and methods available to solve such problems in frequency and time domain. In the second lecture methods for the static and dynamic optimization of technical processes are conveyed to the students.

**Module: Control Engineering II [WI4INGETIT2]**

**Coordination:** M. Kluwe  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
23177	Control of Linear Multivariable Systems (p. 434)	3/1	W	6	M. Kluwe
23160	Automation of Discrete Event and Hybrid Systems (p. 169)	2/0	S	3	M. Kluwe

**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 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**

For this module a basic knowledge in system theory and control engineering is assumed. These subjects can be found in the course *System Dynamics and Control Engineering* [23155] (within the Bachelor module *Control Engineering* [WW3INGETIT2]).

**Learning Outcomes**

The students

- have deeper knowledge in the field of control theory and system dynamics,
- are able to analyze multivariable systems in state space and frequency domain and are familiar with adequate methods for the control design,
- know the basics of modelling, simulation, analyses and control of discrete-event and hybrid systems.

**Content**

This module broadens the basic knowledge of system dynamics of the students to the multivariable case. Both I/O-models in frequency domain and mainly state space models are regarded, for which several methods for the analysis and the control design with different goals (decoupling, robustness) and constraints (disturbances, sensor failures) are presented. Above that, the basics of modelling, simulation, analysis and control of discrete-event and hybrid systems are discussed.

## Module: Sensor Technology I [WI4INGETIT3]

**Coordination:** W. Menesklou  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
23231	Sensors (p. 489)	2	W	3	W. Menesklou
23232	Experimental Laboratories in Sensors and Actuators (p. 404)	4	S	6	W. Menesklou
23209	Systematic Product Development in Sensor Technology (p. 539)	1/1	W	3	Ivers-Tiffée, Riegel
23240	Sensor Systems (Integrated Sensor Actuator Systems) (p. 490)	2	S	3	Wersing
23233/23234	Seminar: Sensorik (p. 484)	2	W/S	3	W. Menesklou
21881	Microactuators (p. 360)	2	S	3	Kohl

### Learning Control / Examinations

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

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

### Conditions

The course *Sensor Technology* [23231] is obligatory and has to be attended. The elected courses must not be credited in the module *Sensorik II* [WI4INGETIT5] or other modules.

Before *Experimental Laboratories in Sensors and Actuators* [23232] the course *Sensor Technology* [23231] has to be completed successfully.

### Recommendations

Knowledge of electrical engineering is assumed. Therefore it is recommended to attend the courses *Electrical Engineering II* [23224] beforehand.

### Learning Outcomes

The student

- acquires fundamental principles in materials science and device technology of sensors.
- applies materials and sensors from the viewpoint of an application or development engineer.

### Content

The operating principles of the most important sensors are taught. The student will learn to use the acquired knowledge for key issues relating to select and use sensors. Module *Sensor Technology I* gives an overview of the basic sensor principles. Module *Sensor Technology II* goes into specific topics of sensors and actuators further.

**Module: Sensor Technology II [WI4INGETIT5]**

**Coordination:** W. Menesklou  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
23232	Experimental Laboratories in Sensors and Actuators (p. 404)	4	S	6	W. Menesklou
23209	Systematic Product Development in Sensor Technology (p. 539)	1/1	W	3	Ivers-Tiffée, Riegel
23240	Sensor Systems (Integrated Sensor Actuator Systems) (p. 490)	2	S	3	Wersing
23233/23234	Seminar: Sensorik (p. 484)	2	W/S	3	W. Menesklou
21881	Microactuators (p. 360)	2	S	3	Kohl

**Learning Control / Examinations**

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

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

**Conditions**

It is only possible to choose this module in combination with the module *Sensor Technology I* [WI4INGETIT3]. The module is passed only after the final partial exam of *Sensor Technology I* is additionally passed.

**Recommendations**

Knowledge of electrical engineering is assumed. Therefore it is recommended to attend the courses *Electrical Engineering II* [23224] beforehand.

**Learning Outcomes**

The student

- acquires fundamental principles in materials science and device technology of sensors.
- applies materials and sensors from the viewpoint of an application or development engineer.

**Content**

The operating principles of the most important sensors are taught. The student will learn to use the acquired knowledge for key issues relating to select and use sensors. Sensor module I gives an overview of the basic sensor principles. Sensor module II goes into specific topics of sensors and actuators further.

**Module: High-Voltage Technology [WI4INGETIT6]**

**Coordination:** T. Leibfried, B. Hoferer  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
23360/23362	High-Voltage Technology I (p. 305)	2/1	W	4,5	Badent
23361/23363	High-Voltage Technology II (p. 306)	2/1	S	4,5	Badent

**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.

**Learning Outcomes**

The student

- has wide knowledge of electrical power engineering,
- is capable to analyse and develop electrical power engineering systems.

**Content**

The module deals with wide knowledge about the electrical power engineering. This ranges from the electric power equipment networks in terms of function, structure and interpretation on the calculation of electrical power networks to special areas such as the FACTS elements or power transformers.

**Module: Generation and transmission of renewable power [WI4INGETIT7]**

**Coordination:** T. Leibfried, B. Hoferer  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
23372/23374	Power Transmission and Power Network Control (p. 238)	2/1	S	4,5	T. Leibfried
23371/23373	Power Network Analysis (p. 175)	2/2	W	6	T. Leibfried
23381	Windpower (p. 603)	2/0	W	3	Lewald
23380	Photovoltaic Systems Technology (p. 397)	2/0	S	3	Schmidt
23392/23394	High-Voltage Test Technique (p. 304)	2/1	W	4,5	Badent

**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 *High-Voltage Technology* [WI4INGETIT6]. The module is passed only after the final partial exam of *High-Voltage Technology* is additionally passed.

The course Power Transmission and Power Network Control [23372/23374] or *Power Network Analysis* [23371/23373] is obligatory. *Power Network Analysis* can also be taken within the Bachelor's programme.

**Learning Outcomes**

The student

- has wide knowledge of electrical power engineering,
- is capable to analyse and develop electrical power engineering systems.

**Content**

The module deals with wide knowledge about the electrical power engineering. This ranges from the electric power equipment networks in terms of function, structure and interpretation on the calculation of electrical power networks to special areas such as the FACTS elements or power transformers.

**Module: Principles of Food Process Engineering [WI4INGCV3]**

**Coordination:** V. Gaukel  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
22213	Principles of Process Engineering referring to Food I (p. 290)	2/0	W	4	V. Gaukel
22214	Principles of Process Engineering referring to Food II (p. 291)	2/0	S	4	V. Gaukel
22205/6	Quality Management of Food Processing (p. 431)	1/1	S	3	Schuchmann
22207	Food Science and Functionality (p. 337)	2	W	4	Watzl

**Learning Control / Examinations**

The assessment is carried out by a general oral exam of the selected courses of this module, whose sum of credits must meet the minimum requirement of credits of this module (according to §4(2), 2 of the examination regulation).

The exam is offered upon agreement with the office of the section Food Process Engineering. Re-examination takes place at least 4 weeks after the last examination date.

The overall grade of the module is the grade of the general oral exam.

**Conditions**

The courses *Principles of Process Engineering referring to Food I* [22213] and *Principles of Process Engineering referring to Food II* [22214] are obligatory and have to be attended.

**Learning Outcomes****Content**

## Module: Specialization in Food Process Engineering [WI4INGCV4]

**Coordination:** V. Gaukel  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
22205/6	Quality Management of Food Processing (p. 431)	1/1	S	3	Schuchmann
22207	Food Science and Functionality (p. 337)	2	W	4	Watzl
22209	Microbiology of Food (p. 361)	2	W	4	Franz
22215	Product Design (p. 439)	2	S	4	Schuchmann
22218	Modern Measurement Techniques for Process Optimization (p. 365)	2	S	4	Regier
22417	Scale up in Biology and Engineering (p. 443)	2	W	4	Hausmann
6602	Fundamentals of Food Chemistry (p. 284)	2	W/S	4	Loske
22229	The Making of Emulsions and Dispersions (p. 229)	2		3	Köhler

### Learning Control / Examinations

The assessment is carried out by a general oral exam of the selected courses of this module, whose sum of credits must meet the minimum requirement of credits of this module (according to §4(2), 2 of the examination regulation).

The exam is offered upon agreement with the office of the section Food Process Engineering. Re-examination takes place at least 4 weeks after the last examination date.

The overall grade of the module is the grade of the general oral exam.

### Conditions

It is only possible to choose this module in combination with the module *Principles of Food Process Engineering* [WI4INGCV3].

The module is passed only after the final partial exam of *Principles of Food Process Engineering* is additionally passed.

The course *Quality Management of Food Processing* [22205] is obligatory and has to be attended. Has it already been attended in the Bachelor programme, an other course has to be chosen instead.

### Learning Outcomes

#### Content



**Module: Water Chemistry I [WI4INGCV6]**

**Coordination:** H. Horn  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every 2nd term, Winter Term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
22601	Chemical Technology of Water (p. 193)	2	W	4	H. Horn, M. Delay
22602	Excercises in Chemical Technology of Water (p. 550)	1	W	2	H. Horn
22664	Laboratory Work "Water" (p. 596)	2	W	4	H. Horn, G. Abbt-Braun

**Learning Control / Examinations**

The assessment is a general oral examination according to §4(2), 2 of the examination regulation about the chosen courses of this module, whose sum of credits must meet the minimum requirement of credits of this module.

The examination is offered on appointment, but at least 4 times per year in the first and last week of the summer and winter term.

The overall grade of the module is taken as the average from the individual grades of the oral examination and the grade of the Excercises weighted by credit points.

**Conditions**

None.

**Learning Outcomes**

The student

- has knowledge of types and sum of the water constituents and their interaction with each other and with the water molecules,
- knows and understands the basics of water chemistry and the most important methods for the treatment of different types of raw water.

**Content**

This module gives the basis to understand the most important methods of raw water treatment.

Therefore types and sum of water constituents and their interaction with each other and with water molecules are introduced.

The effects of the different treatment and purification methods are shown

**Module: Water Chemistry II [WI4INGCV7]**

**Coordination:** H. Horn  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
22603	Scientific Bases for Examination and Assessment of Water Quality (p. 374)	2	W	4	H. Horn, G. Abbt-Braun
22618	Fundamentals of Waste Water Treatment (p. 277)	2	S	4	S. Lackner, n.N.
22612	Oxidation Processes in Drinking Water Technology (p. 392)	2	S	4	H. Horn
22605	Membrane Separation in Water Treatment (p. 160)	2	W	4	H. Horn, F. Saravia

**Learning Control / Examinations****Conditions**

It is only possible to choose this module in combination with the module *Water Chemistry I* [WI4INGCV6]. The module is passed only after the final partial exam of *Water Chemistry I* is additionally passed.

**Learning Outcomes**

The student

- has knowledge of types and sum of the water constituents and their interaction with each other and with the water molecules,
- knows and understands the basics of water chemistry and the most important methods for the treatment of different types of raw water.
- knows about the different types of water treatment and water purification methods to convert, reduce or concentrate water constituents,

**Content**

The effects of the different treatment and purification methods are shown and it is explained how they can convert, reduce or concentrate water constituents.

**Module: Understanding and Prediction of Disasters I [WI4INGINTER1]**

**Coordination:** U. Werner  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2600101	Geological Hazards and Risks (p. 265)	2/1	W	4	Wenzel, Gottschämmer
04055	Engineering Seismology (p. 310)	3/1	S	5	Wenzel/Sokolov
19207	(p. 595)	2/0	S	4.5	B. Lehmann
19207	River Engineering and Ecology I (p. 280)	2	W	3	E. Dister
19213	River Engineering and Ecology II (p. 262)	1/1	S	3	Dister
19203	Morphodynamics of Rivers and Streams (p. 366)	1/1	W	3	F. Nestmann, B. Lehmann
19201	Foundations of Hydrological Planning (p. 307)	3/1	W	6	Ihringer
19212	Environment Communication (p. 555)	2/1	S	3	Kämpf

**Learning Control / Examinations**

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

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

**Conditions**

None.

**Learning Outcomes**

See German version.

**Content**

See German version.

**Remarks**

The course Morphodynamik von Fließgewässern [19203] will not be offered anymore in the near future, starting with SS 2012. In agreement with the coordinator of the module other suitable courses than the ones displayed can be taken.

**Module: Understanding and Prediction of Disasters II [WI4INGINTER2]**

**Coordination:** U. Werner  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
04055	Engineering Seismology (p. 310)	3/1	S	5	Wenzel/Sokolov
19207	(p. 595)	2/0	S	4.5	B. Lehmann
19207	River Engineering and Ecology I (p. 280)	2	W	3	E. Dister
19213	River Engineering and Ecology II (p. 262)	1/1	S	3	Dister
19203	Morphodynamics of Rivers and Streams (p. 366)	1/1	W	3	F. Nestmann, B. Lehmann
19201	Foundations of Hydrological Planning (p. 307)	3/1	W	6	Ihringer
19212	Environment Communication (p. 555)	2/1	S	3	Kämpf

**Learning Control / Examinations**

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

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

**Conditions**

It is only possible to choose this module in combination with the module *Understanding and Prediction of Disasters I*. The module is passed only after the final partial exam of *Understanding and Prediction of Disasters I* has been passed.

**Learning Outcomes**

See German version.

**Content**

See German version.

**Remarks**

The course Morphodynamik von Fließgewässern [19203] will not be offered anymore in the near future, starting with SS 2012. In agreement with the coordinator of the module other suitable courses than the ones displayed can be taken.

## Module: Understanding and Prediction of Disasters III [WI4INGINTER3]

**Coordination:** U. Werner  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
04055	Engineering Seismology (p. 310)	3/1	S	5	Wenzel/Sokolov
19207	(p. 595)	2/0	S	4.5	B. Lehmann
19207	River Engineering and Ecology I (p. 280)	2	W	3	E. Dister
19213	River Engineering and Ecology II (p. 262)	1/1	S	3	Dister
19203	Morphodynamics of Rivers and Streams (p. 366)	1/1	W	3	F. Nestmann, B. Lehmann
19201	Foundations of Hydrological Planning (p. 307)	3/1	W	6	Ihringer
19212	Environment Communication (p. 555)	2/1	S	3	Kämpf

### Learning Control / Examinations

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

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

### Conditions

It is only possible to choose this module in combination with the module *Understanding and Prediction of Disasters II*. The module is passed only after the final partial exam of *Understanding and Prediction of Disasters II* has been passed.

### Recommendations

In Remote Sensing, *Remote Sensing Systems* [20241] and *Remote Sensing Methods* [20243] can be chosen as a minimal combination, but it is strongly recommended to choose the comprehensive combination *Remote Sensing* [GEOD-BFB-1], which includes *Remote Sensing Systems* [20241], *Remote Sensing Methods* [20243] and *Hauptvermessungsübung III* [20245].

### Learning Outcomes

See German version.

### Content

See German version.

### Remarks

In agreement with the coordinator of the module other suitable courses than the ones displayed can be taken.

**Module: Safety Science I [WI4INGINTER4]**

**Coordination:** U. Werner  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2581962	Emissions into the Environment (p. 227)	2/0	W	3,5	U. Karl
19523	Contaminated Land Investigation, Evaluation and Remediation (p. 144)	2	W	4	Bieberstein et al.
09031	Design and Construction of Landfills for Municipal and Special Waste (p. 209)	2	W	4	Egloffstein
19621	Assessment of Development Planning (p. 156)	1/1	S	3	Kämpf
19404	Safety in Construction (p. 499)	1	S	1,5	Hirschberger, Sittinger
21562	Failure Analysis (p. 444)	2	W	4	Poser-Keppler
22308	Introduction to Process Safety in the Chemical Industry (p. 149)	2	S	4	Schmidt
2118090	Quantitative Methods for Supply Chain Risk Management (p. 432)	3/1	W	6	A. Cardeneo

**Learning Control / Examinations**

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

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

**Conditions**

None.

**Learning Outcomes**

See German version.

**Content**

See German version.

**Remarks**

In agreement with the coordinator of the module other suitable courses than the ones displayed can be taken.

**Module: Safety Science II [WI4INGINTER5]**

**Coordination:** U. Werner  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2581962	Emissions into the Environment (p. 227)	2/0	W	3,5	U. Karl
19523	Contaminated Land Investigation, Evaluation and Remediation (p. 144)	2	W	4	Bieberstein et al.
09031	Design and Construction of Landfills for Municipal and Special Waste (p. 209)	2	W	4	Egloffstein
19621	Assessment of Development Planning (p. 156)	1/1	S	3	Kämpf
19404	Safety in Construction (p. 499)	1	S	1,5	Hirschberger, Sittinger
21562	Failure Analysis (p. 444)	2	W	4	Poser-Keppler
22308	Introduction to Process Safety in the Chemical Industry (p. 149)	2	S	4	Schmidt
2118090	Quantitative Methods for Supply Chain Risk Management (p. 432)	3/1	W	6	A. Cardeneo

**Learning Control / Examinations**

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

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

**Conditions**

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

**Learning Outcomes**

See German version.

**Content**

See German version.

**Remarks**

The module is offered as an extension module to *Safety Science I* from winter term 2010/11 on.

**Module: Safety Science III [WI4INGINTER6]**

**Coordination:** U. Werner  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	2

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2581962	Emissions into the Environment (p. 227)	2/0	W	3,5	U. Karl
19523	Contaminated Land Investigation, Evaluation and Remediation (p. 144)	2	W	4	Bieberstein et al.
09031	Design and Construction of Landfills for Municipal and Special Waste (p. 209)	2	W	4	Egloffstein
19621	Assessment of Development Planning (p. 156)	1/1	S	3	Kämpf
19404	Safety in Construction (p. 499)	1	S	1,5	Hirschberger, Sittinger
21562	Failure Analysis (p. 444)	2	W	4	Poser-Keppler
22308	Introduction to Process Safety in the Chemical Industry (p. 149)	2	S	4	Schmidt
2118090	Quantitative Methods for Supply Chain Risk Management (p. 432)	3/1	W	6	A. Cardeneo

**Learning Control / Examinations**

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

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

**Conditions**

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

**Learning Outcomes**

See German version.

**Content**

See German version.

**Remarks**

In agreement with the coordinator of the module other suitable courses than the ones displayed can be taken.



**Module: Extracurricular Module in Engineering [WI4INGAPL]**

**Coordination:** Prüfer einer Ingenieurwissenschaftlichen Fakultät  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Engineering Science

ECTS Credits	Cycle	Duration
9		

**Learning Control / Examinations**

The assessment of the module is determined by the respective module coordinator. It can either be in the form of a general exam or partial exams, and must 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**

None.

**Learning Outcomes****Content**

## 5.7 Law

### Module: Commercial Law [WI4JURA2]

**Coordination:** P. Sester  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Law

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
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. 181)	2/0	S	3	T. Dreier, P. Sester
24011	Commercial and Corporate Law (p. 303)	2/0	W	3	P. Sester
24017	Exercises in Civil Law (p. 418)	2/0	W/S	3	P. Sester, T. Dreier

#### 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 for the written examination.

#### Conditions

None.

#### Learning Outcomes

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.

**Module: Intellectual Property Law [WI4JURA4]**

**Coordination:** T. Dreier  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Law

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24821	Internet Law (p. 325)	2/0	S	3	T. Dreier
24121	Copyright (p. 562)	2/0	W	3	T. Dreier
24656	Patent Law (p. 393)	2/0	S	3	P. Bittner
24609	Trademark and Unfair Competition Law (p. 348)	2/0	W/S	3	Y. Matz, P. Sester
VGE	Computer Contract Law (p. 579)	2/0	W	3	M. Bartsch
GPR	Basic Principles of Patent Law (p. 292)	2/0	W/S	3	K. Melullis
24186	(p. 394)	2/0	W	3	K. Melullis, Markus Dammler

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes****Content**

## Module: Private Business Law [WI4JURA5]

**Coordination:** P. Sester  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Law

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
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. 577)	2/0	S	3	P. Sester
24671	Law of Contracts (p. 578)	2/0	S	3	P. Sester
24167	Employment Law I (p. 153)	2	W	3	A. Hoff
24668	Employment Law II (p. 154)	2	S	3	A. Hoff
24168	Tax Law I (p. 524)	2/0	W	3	D. Dietrich
24646	Tax Law II (p. 525)	2/0	S	3	D. Dietrich

### Learning Control / Examinations

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

### Conditions

None.

### Recommendations

For the courses

- *Civil Law for Advanced* [24650]
- *Law of Contracts* [24671],

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

### Learning Outcomes

The student

- has gained in-depth knowledge of German company law, commercial law and civil law;
- is able to analyze, evaluate and solve complex legal and economic relations and problems;
- is well grounded in individual labour law, collective labour law and commercial constitutional law, evaluates and critically assesses clauses in labour contracts;
- recognizes the significance of the parties to collective labour agreements within the economic system and has differentiated knowledge of labour disputes law and the law governing the supply of temporary workers and of social law;
- possesses detailed knowledge of national earnings and corporate tax law and is able to deal with provisions of tax law in a scientific manner and assesses the effect of these provisions on corporate decision-making.

### Content

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

**Module: Public Business Law [WI4JURA6]**

**Coordination:** I. Spiecker genannt Döhmann  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Law

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

**Courses in module**

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24632	Telecommunications Law (p. 546)	2/0	S	3	I. Spiecker genannt Döhmann
24082	Public Media Law (p. 378)	2	W	3	C. Kirchberg
24666	European and International Law (p. 247)	2/0	S	3	I. Spiecker genannt Döhmann
24140	Environmental Law (p. 557)	2	W	3	I. Spiecker genannt Döhmann
24018	Data Protection Law (p. 208)	2/0	W	3	I. Spiecker genannt Döhmann

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes****Content**

## 5.8 Sociology

### Module: Sociology [WI4SOZ1]

**Coordination:** G. Nollmann  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:** Sociology

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	Every term	1

#### Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
thSoz	Theoretical Sociology (p. 547)	2	W/S	2	G. Nollmann, Pfadenhauer, Pfaff, Haupt, Grenz, Eisewicht
spezSoz	Special Sociology (p. 521)	2	W/S	4	G. Nollmann, Pfadenhauer, Pfaff, Haupt, Grenz, Eisewicht, Kunz
SozSem	Projectseminar (p. 425)	2	W/S	4	Bernart, Kunz, Pfaff, Haupt, Grenz, Eisewicht

#### 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 separately.

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

#### Conditions

*Keine.*

#### Recommendations

Knowledge of Statistics 1 and Statistics 2 is required.

#### Learning Outcomes

The student

- Gains theoretical and methodical knowledge of social processes and structures.
- Is able to apply his/her gained knowledge practically.
- Is able to present his/her work results in a precise and clear way.

#### Content

The module sociology offers students the possibility to get to know problems touching social phenomena 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 the module contains courses on sociological methods that are essential to answer the above questions scientifically.

## 5.9 General Modules

**Module: Seminar Module [WW4SEM]**

**Coordination:** Studiendekan (Fak. f. Wirtschaftswissenschaften)  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:**

<b>ECTS Credits</b>	<b>Cycle</b>	<b>Duration</b>
9	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. 450)	2	W/S	3	R. Studer, A. Oberweis, T. Wolf, R. Kneuper
SemAIFB2	Seminar Efficient Algorithms (p. 452)	2	W/S	3	H. Schmeck
SemAIFB3	Seminar Complexity Management (p. 464)	2	W/S	3	D. Seese
SemAIFB4	Seminar Knowledge Management (p. 469)	2	W	3	R. Studer
SemAIFB5	Seminar eOrganization (p. 454)	2	S	3	S. Tai
2590470	Seminar Service Science, Management & Engineering (p. 466)	2	W/S	3	C. Weinhardt, R. Studer, S. Nickel, H. Fromm
2530293	Seminar in Finance (p. 459)	2	W/S	3	M. Uhrig-Homburg, M. Ruckes
SemFBV1	Seminar in Insurance Management (p. 470)	2	W/S	3	U. Werner
SemFBV2	Seminar in Operational Risk Management (p. 471)	2	W/S	3	U. Werner
2577915	Seminar: Management and Organization (p. 485)	2	W/S	3	H. Lindstädt
SemIIP3	Seminar Business Ethics (p. 468)	2	W/S	3	A. Wollert
SemTuE1	(p. 457)				
2577916	Seminar Management accounting for industrial engineers (p. 451)	2	W/S	3	M. Wouters
2577919	„Good Governance“ at German Corporations (p. 609)	4	W/S	6	T. Reitmeyer
2572197	Seminar in strategic and behavioral marketing (p. 472)	2	W	3	B. Neibecker
SemIIP2	Seminar in Industrial Production (p. 462)	2	W/S	3	F. Schultmann, M. Fröhling, T. Comes
SemEW	Seminar Energy Economics (p. 453)	2	W/S	3	W. Fichtner, P. Jochem, A. Eßer-Frey, M. Genoese
2540510	Master Seminar in Information Engineering and Management (p. 352)	2	W	3	A. Geyer-Schulz
SemIW	Seminar Information Engineering and Management (p. 463)	2	W/S	3	C. Weinhardt
2585420/2586420	Topics of Sustainable Management of Housing and Real Estate (p. 155)	2	W/S	3	T. Lützkendorf
SemWIOR3	Seminar in Experimental Economics (p. 474)	2	W/S	3	C. Puppe
SemWIOR2	Seminar Economic Theory (p. 605)	2	W/S	3	C. Puppe
SemIWW2	Seminar in International Economy (p. 460)	2/0	W/S	3	J. Kowalski
SemIWW3	(p. 461)	2	W/S	3	I. Ott
SemETS3	Seminar on Macroeconomic Theory (p. 476)	2		3	M. Hillebrand
2560130	Seminar Public Finance (p. 455)	2	W/S	3	B. Wigger, Assistenten
2560263	Seminar on Network Economics (p. 477)	2	W/S	3	K. Mitusch
2561209	(p. 478)		W/S	3	

2550491	Seminar in Discrete Optimization (p. 473)	2	W/S	3	S. Nickel
2550131	Seminar in Continuous Optimization (p. 475)	2	W/S	3	O. Stein
2595477	Practical Seminar Service Innovation (p. 488)	3		5	G. Satzger, A. Neus, M. Kohler, H. Fromm
SemWIOR1	Seminar Stochastic Models (p. 467)	2	W/S	3	K. Waldmann
SemING	Seminar in Engineering Science (p. 311)	2	W/S	3	Fachvertreter ingenieurwissenschaftlicher Fakultäten
SemIFL	Seminar Conveying Technology and Logistics (p. 456)	2	W/S	3	K. Furmans
21690sem	Seminar paper "Production Engineering" (p. 486)	2	W/S	3	V. Schulze, Lanza, Fleischer
SemMath	Seminar in Mathematics (p. 356)	2	W/S	3	Fachvertreter der Fakultät für Mathematik
RECHT	Seminar: Legal Studies (p. 483)	2	W/S	3	Inst. ZAR
SQ HoC1	Elective "Culture - Policy - Science - Technology" (p. 591)	meist 2	W/S	3	House of Competence
SQ HoC2	Elective "Workshops for Competence and Creativity" (p. 590)	meist 2	W/S	3	House of Competence
SQ HoC3	Elective Foreign Languages (p. 589)	2-4	W/S	2-4	House of Competence
SQ HoC5	Elective "Tutor Programmes" (p. 593)	k.A.	W/S	2 / 3	House of Competence
SQ HoC4	Elective "Personal Fitness & Emotional Competence" (p. 592)	k.A.	W/S	2-3	House of Competence

### Learning Control / Examinations

The modul examination consists of two seminars and of at least one key qualification (KQ) course (according to §4 (3), 3 of the examintaion regulation). A detailed description of every singled assessment is given in the specific course characerization.

The final mark for the module is the average of the marks for each of the two seminars weighted by the credits and truncated after the first decimal. Grades of the KQ courses are not included.

### Conditions

The course specific preconditions must be observed.

- *Seminars*: Two seminars out of the course list, that have at least 3 CP each and are offered by a representative of the Faculty of Economics and Business Engineering or of the Center for applied legal studies (Department of Informatics), have to be chosen.
- Alternatively one of the two seminars can be absolved at a engineering department or at the Department of Mathematics. The seminar has to be offered by a representative of the respective department as well. The assessment has to meet the demands of the School of Economics and Business Engineering (active participation, term paper with a workload of at least 80 h, presentation). This alternative seminar **requires an official approval** and can be applied at the examination office of the School of Economics and Business Engineering. Seminars at the institutes wbk and IFL do not require these approval.
- *Key Qualification (KQ)-course(s)*: One or more courses with at least 3 CP in total of additional key qualifications have to be chosen among the courses [HoC1-5]. More detailed information can be found at the course descriptions and on <http://www.hoc.kit.edu/sq-wahlbereiche>.

### Learning Outcomes

The student

- investigates with a selected topic in a special subject,
- analyses and discusses topically issues in the course and within the final term paper,
- discusses, presents und defends subject-specific arguments within the given topic,
- plans and realizes the final term paper mostly autonomously.

### 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.



**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: <http://www.wiwi.kit.edu/2361.php>.

## Module: Master Thesis [WI4THESIS]

**Coordination:** Der Vorsitzende des Prüfungsausschusses  
**Degree programme:** Wirtschaftsingenieurwesen (M.Sc.)  
**Subject:**

ECTS Credits	Cycle	Duration
30		

### Learning Control / Examinations

The Master Thesis is a written exam which shows that the student can autonomously investigate a scientific problem in Business Engineering. The Master Thesis is described in detail in § 11 of the examination regulation.

The review is carried out by at least one examiner of the School of Economics and Business Engineering, 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 six months. On a reasoned request of the student, the examination board can extend the processing time of a maximum of three month. If the Master Thesis is not completed in time, this exam is "failed", unless the student is not being responsible (eg maternity leave).

With consent of the examiner 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 Master 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 module grade is the grade for the Master Thesis.

### Conditions

Prerequisite for admission to the Master thesis is that 50 percent of the credit points has to be completed.

A written confirmation of the examiner about supervising the Master Thesis is required.

Please pay regard to the institute specific rules for supervising a Master Thesis.

The Master 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 Master Thesis will not be accepted.

### Learning Outcomes

#### Content

The Master Thesis is a major scientific work. The topic of the Master Thesis will be chosen by the student themselves and adjusted with the examiner. The topic has to be related to Business and Engineering and has to refer to subject-specific or interdisciplinary problems.

## 6 Courses

### 6.1 All Courses

**Course:** [0170603]

**Coordinators:** S. Fuchs  
**Part of the modules:** Water Supply and Sanitation (p. 112)[WI4INGBGU13]

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

#### Learning Control / Examinations

**Conditions**  
None.

#### Learning Outcomes

**Content**

**Course: Advanced Econometrics of Financial Markets [2520381]****Coordinators:** Y. Kim**Part of the modules:** Risk Management and Econometrics in Finance (p. 70)[WI4STAT3], Mathematical and Empirical Finance (p. 68)[WI4STAT1]

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

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes**

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

**Content**

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

**Media**

transparencies, exercises.

**Literature**

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

**Remarks**

The course Advanced Econometrics of Financial Markets [2520381] will not be offered any more from summer term 2013 on. The examination will be offered latest until summer term 2012.

## Course: Advanced Topics in Economic Theory [2520527]

**Coordinators:** C. Puppe, M. Hillebrand, K. Mitusch

**Part of the modules:** Allocation and Equilibrium (p. 47)[WI4VWL7], Network Economics (p. 52)[WI4VWL4]

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

### Learning Control / Examinations

#### Conditions

None.

### Learning Outcomes

#### Content

The focus of the course is the modern economic theory of (general) equilibrium. The course is divided into three parts. The first part introduces the microeconomic foundations of general equilibrium à la Debreu ("The Theory of Value", 1959) and Hildenbrand/Kirman ("Equilibrium Analysis", 1988). The second part considers dynamic (stochastic) equilibrium models with a particular focus on the overlapping generations model which lie at the heart of modern macroeconomics. The third part deals with asymmetric information and introduces the basic models based on Akerlof's "Market for Lemons." The course is largely based on the textbook "Microeconomic Theory" (Chapters 1-5, 10, 13-20) by A.Mas-Colell, M.D.Whinston, and J.R.Green

#### Literature

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

**Course: Current Topics on BioMEMS [2143873]**

**Coordinators:** A. Guber  
**Part of the modules:** BioMEMS (p. 93)[WI4INGMBIMT1]

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

**Learning Control / Examinations****Conditions**

None.

**Recommendations**

It is recommended to attend the courses BioMEMS I [2141864], BioMEMS II [2142883] BioMEMS and III [2142879] beforehand.

**Learning Outcomes**

The student

- has extensive knowledge about one special field of application of BioMEMS
- understands the methodology of academic writing
- has fundamental knowledge of presentation methods

**Content**

Current Topics of BioMEMS.

**Literature**

- "Fundamentals of Microfabrication" by M. J. Madou
- "Medizintechnik: Life Science Engineering. Interdisziplinarität, Biokompatibilität, Technologien, Implantate, Diagnostik, Werkstoffe, Zertifizierung, Business" by Erich Wintermantel

## Course: Algorithms for Internet Applications [2511102]

**Coordinators:** H. Schmeck

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

The assessment consists of a written exam (60 min) (according to Section 4(2), 1 of the examination regulation) and an additional written examination (called "bonus exam", 45 min) (according Section 4(2), 3 of the examination regulation).

The grade of this course is the achieved grade in the written examination. If this grade is at least 4.0 and at most 1.3, a passed bonus exam will improve it by one grade level (i.e. by 0.3 or 0.4).

### Conditions

None.

### Learning Outcomes

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

In particular, the student will

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

### 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 - if time permits - security architectures.

### 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.

**Course: Contaminated Land Investigation, Evaluation and Remediation [19523]****Coordinators:** Bieberstein et al.**Part of the modules:** Safety Science I (p. 126)[WI4INGINTER4], Safety Science II (p. 127)[WI4INGINTER5], Safety Science III (p. 128)[WI4INGINTER6]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Remarks**For further information, see [http://www.ibf.uni-karlsruhe.de/vorlesungen/v\\_alllasten.html](http://www.ibf.uni-karlsruhe.de/vorlesungen/v_alllasten.html)



## Course: Analytical Models for Material Flow [2117060]

**Coordinators:** J. Stoll, E. Özden

**Part of the modules:** Material Flow in networked Logistics Systems (p. 88)[WI4INGMB26]

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

### Learning Control / Examinations

The assessment consists of an oral exam according to §4 (2), 2 of the examination regulation.

### Conditions

None.

### Recommendations

The content of a course about “stochastics” is recommended.

### Learning Outcomes

This course provides methods and models focused on the quantitative analysis of material handling systems with stochastic and queueing models. Many phenomena of industrial material handling and value streams can be explained with the models that the students use in this course.

### Content

- Operational analysis
- Queueing systems
- Open queueing system networks
- Closed queueing system networks
- Modeling of production systems
- Discrete time queueing systems

### Literature

#### Elective literature:

Furmans, Kai: Bedientheoretische Methoden als Hilfsmittel der Materialflussplanung; Wissenschaftliche Berichte des Instituts für Fördertechnik und Logistiksysteme der Universität Karlsruhe (TH); Bd. 52, Karlsruhe, 2000

## Course: Requirements Analysis and Requirements Management [2511218]

**Coordinators:** R. Kneuper

**Part of the modules:** Electives in Informatic (p. 62)[WI4INFO3], Emphasis in Informatics (p. 60)[WI4INFO2], Informatics (p. 58)[WI4INFO1]

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

### Learning Control / Examinations

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

### Conditions

None.

### Learning Outcomes

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

### Content

The analysis and management of requirements is a central task in the development of software and systems, addressing the border between the application discipline and computer science. The adequate performance of this task has a decisive influence on the whether or not a development project will be successful. The lecture provides an introduction to this topic, using the syllabus for the "Certified Professional for Requirements Engineering" (CPRE) as a guideline.

Lecture structure:

1. Introduction and overview, motivation
2. Identifying requirements
3. Documenting requirements (in natural language or using a modelling language such as UML)
4. Verification and validation of requirements
5. Management of requirements
6. Tool support

### Literature

Literature will be given in the lecture.

## Course: Applied Informatics I - Modelling [2511030]

**Coordinators:** A. Oberweis, R. Studer, S. Agarwal

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

Basic knowledge about the strengths and weaknesses of various modeling approaches including their application areas.

### 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 aspects, 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 event driven process chains together with their respective analysis techniques will be introduced.

### Media

Slides.

### Literature

- Bernhard Rumpe. Modellierung mit UML, Springer-Verlag, 2004.
- R. Elmasri, S. B. Navathe. Fundamentals of Database Systems. Pearson Education, 4. Aufl., 2004, ISBN 0321204484.
- W. Reisig. Petri-Netze, Springer-Verlag, 1986.

### 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:** S. Tai

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

Knowledge of content of the module [WI1INFO].

### Learning Outcomes

The student learns about IT methods and systems in support of modern electronic commerce. The student should be able to select, assess, design, and apply these methods and systems in a context-sensitive manner.

### Content

The course introduces methods and systems in support of electronic commerce, including the topics:

- application architectures (incl. client server architectures)
- document description and exchange (incl. XML)
- enterprise middleware (incl. CORBA, Messaging Middleware, Java Enterprise Edition)
- Web services and SOA

### Media

Slides, internet resources.

### Literature

Tba in the lecture.

**Course: Introduction to Process Safety in the Chemical Industry [22308]****Coordinators:** Schmidt**Part of the modules:** Safety Science I (p. 126)[WI4INGINTER4], Safety Science II (p. 127)[WI4INGINTER5], Safety Science III (p. 128)[WI4INGINTER6]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Remarks**

The course is usually held in June.

For further information, see <http://www.ebig.uni-karlsruhe.de/289.php>

## Course: Planning and Management of Industrial Plants [2581952]

**Coordinators:** F. Schultmann  
**Part of the modules:** Industrial Production II (p. 38)[WI4BWLIIIP2]

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

### Learning Control / Examinations

The examination will be in form of a written exam acc. to §4(2), 1 ER. Exams are offered in every semester and can be re-examined at every ordinary examination date.

### Conditions

This course is compulsory in module "Industrial Production II" [WI4BWLIIIP2].

### Learning Outcomes

- Students shall be able to describe the tasks of plant management.
- Students shall be proficient in using selected methods of investment and cost estimates.
- Students shall be able to consider necessary processing and logistical requirements of designing industrial plants.
- Students shall be able to discuss interdependencies between capacity planning, process design and plant optimization.
- Students shall be proficient in discussing and applying selected methods of quality management, plant maintenance and plant dismantling.

### Content

Industrial plant management incorporates a complex set of tasks along the entire life cycle of an industrial plant, starting with the initiation and erection up to operating and dismantling.

During this course students will get to know special characteristics of industrial plant management. Students will learn important methods to plan, realize and supervise the supply, start-up, maintenance, optimisation and shut-down of industrial plants. Alongside, students will have to handle the inherent question of choosing between technologies and evaluating each of them. This course pays special attention to the specific characteristics of plant engineering, commissioning and investment.

### Media

Media will be provided on the e-learning platform.

### Literature

will be announced in the course

## Course: Industrial Application of Technological Logistics instancing Crane Systems [2117064]

**Coordinators:** M. Golder

**Part of the modules:** Introduction to Logistics (p. 83)[WI4INGMB20], Technical Logistics (p. 85)[WI4INGMB27]

ECTS Credits	Hours per week	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

technical interest;

Beneficial: Knowledge of the lecture 'Basics of Technical Logistics'

### Learning Outcomes

The student:

- knows the proceeding during the dimensioning of a modern crane installation,
- is able to transfer the approche for the dimensioning of other material handling systems.

### Content

- Basics of modern crane construction
- Characteristics of application, classification
- Configuration, dimensioning, consideration of costs
- Relevant rules and standards
- Modern concepts of crane control and drives

### Media

presentations, black board

## Course: Industrial Application of Material Handling Systems in Sorting and Distribution Systems [2118089]

**Coordinators:** J. Föller

**Part of the modules:** Introduction to Logistics (p. 83)[WI4INGMB20], Technical Logistics (p. 85)[WI4INGMB27]

ECTS Credits	Hours per week	Term	Instruction language
4	2	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.

### Learning Outcomes

The course provides basics of sorting techniques.

### Content

- Operation characteristics, classification, configuration, dimensioning, cost consideration, sorting systems
- Relevant regulations, modern control and drive concepts



**Course: Employment Law I [24167]****Coordinators:** A. Hoff**Part of the modules:** Private Business Law (p. 132)[WI4JURA5]

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

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes**

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

**Content**

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

**Literature**

tba at the beginning of the course.

**Course: Employment Law II [24668]**

**Coordinators:** A. Hoff  
**Part of the modules:** Private Business Law (p. 132)[WI4JURA5]

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

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes**

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

**Content**

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

**Literature**

Tba at the beginning of the course.

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

**Coordinators:** T. Lützkendorf

**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

### Learning Control / Examinations

The assessment of this course is (according to §4(2), 3 SPO) in form of an examination of the written seminar thesis and a presentation.

### 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.

### Media

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

**Course: Assessment of Development Planning [19621]****Coordinators:** Kämpf**Part of the modules:** Safety Science I (p. 126)[WI4INGINTER4], Safety Science II (p. 127)[WI4INGINTER5], Safety Science III (p. 128)[WI4INGINTER6]

ECTS Credits	Hours per week	Term	Instruction language
3	1/1	Summer term	en

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: Asset Pricing [2530555]****Coordinators:** M. Uhrig-Homburg, M. Ruckes**Part of the modules:** Finance 2 (p. 22)[WI4BWLFBV2], Finance 3 (p. 23)[WI4BWLFBV11], Finance 1 (p. 21)[WI4BWLFBV1]

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

**Learning Control / Examinations****Conditions**

None.

**Recommendations**

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

**Learning Outcomes**

The objective of this course is to become familiar with advanced concepts in asset pricing (in particular the stochastic discount factor model). The second half of the course will put a focus on empirical questions related to the previous part. We strongly recommend knowledge of the basic topics in investments (bachelor course), which will be necessary to be able to follow the course.

**Content**

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

**Literature****Basic literature**

- Asset pricing / Cochrane, J.H. - Rev. ed., Princeton Univ. Press, 2005.
- The econometrics of financial markets / Campbell, J.Y., Lo, A.W., MacKinlay, A.C. - 2. printing, with corrections, Princeton Univ. Press, 1997.

**Elective literature**

- Investments / Bodie, Z., Kane, A., Marcus, A.J. - 8. ed., McGraw-Hill, 2009.

## Course: Constitution and Properties of Wear Resistant Materials [2178643]

**Coordinators:** Ulrich  
**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an oral exam (30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

### Conditions

The course *Material Science I* [21760] has to be completed beforehand.

### Recommendations

Basic knowledge of natural science and knowledge of the content *Material Science II* [21782] is recommended.

### Learning Outcomes

Students shall become familiar with the constitution, properties and changing properties of the most important groups of materials. With this basic knowledge they shall be able to decide about the technical and economical application of materials.

### Content

After presentation of a general overview, concepts of surface modification (optimisation of microstructure and surface reactions) will be shown as well as innovative coating concepts (dispersion-, composite material-, gradient-, multilayer, super lattice-, solid solution strengthening, metastable- and nano-crystalline coatings).

During realisation of these coating concepts different coating materials will be used:

Metallic alloy and metal-based materials, hard alloy and composite materials, metallic, covalent and heteropolar hard materials as well as ceramic and novel, metastable materials.

This will be followed by lectures on the methods of surface modification

1. mechanical: milling, blasting
2. thermal: melting, heat treatment, quench hardening
3. thermochemical: diffusion, heat treatment
4. ion implantation

and of coating: (mechanical, thermal, mechanochemical, electrochemical, CVD, PVD)

Afterwards, methods of characterisation of surfaces, thin films and bulk materials will be presented, based on the constitution (element-, phase and structure analyses), structure (macro-, micro- and nano structure, texture), properties (hardness, adhesion, toughness) and tribological behaviour of the material.

At the end of the lecture, the status quo of industrial coatings for tools and components as well as the latest developments of coating technology will be discussed.

### Literature

#### Elective literature:

- F.-W. Bach: Moderns Surface Technology, Wiley-VCH, Weinheim, 2006

## Course: Constitution and Properties of Protective Coatings [2177601]

**Coordinators:** Ulrich

**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an oral exam (30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

### Conditions

None.

### Recommendations

The module *Emphasis Material Science* [WI3INGMB9] should be completed successfully beforehand. Basic knowledge of physics, chemistry and material science is assumed.

### Learning Outcomes

The student

- has a specific knowledge of different parts of Material Science
- is able to apply this knowledge in practice

### Content

After a presentation of a general overview, concepts of surface modification (optimization of constitution and surface reactions) as well as innovative coating concepts (dispersion, composite and gradient coatings, multilayers, solid solution strengthened, metastable and nanocrystalline coatings) will be handled. Realizing this coating concepts different coating materials will be employed: metallic alloys, hard alloys, metallic, covalent and ionic hard materials, as well as ceramic and new metastable materials.

In the second part of the lecture, different methods to modify the surface will be presented: (i) mechanical: rolling, milling, blasting (ii) thermal: fusion, thermal treatment, quenching, (iii) thermo-chemical: diffusion, quenching, and (iv) ion implantation. Also deposition methods will be considered: (mechanical, thermal-mechanical, electro-chemical, CVD,PVD).

Thereafter different methods to characterize composites and thin films with respect to their constitution and micro structure (elemental composition, phases, crystal structure), properties (hardness, adhesion, toughness) and tribological behavior will be presented.

At the end of the lecture, the status quo of industrial protective coatings for tool and components as well as the latest developments in the field of protective coatings will be discussed.

### Literature

#### Elective literature:

F.-W. Bach: Modern Surface Technology, Wiley-VCH, Weinheim, 2006

## Course: Membrane Separation in Water Treatment [22605]

**Coordinators:** H. Horn, F. Saravia

**Part of the modules:** Water Chemistry II (p. 122)[WI4INGCV7]

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

### Learning Control / Examinations

See module description.

### Conditions

None.

### Learning Outcomes

Starting with the physical and chemical basics of membrane separation, this lecture gives a detailed overview on operation and function of the membrane plants used in water treatment.

### Content

1. Principles of membrane separation
2. Membrane manufacturing and membrane characteristics
3. Membrane configuration and membrane modules
4. Membrane plants in practice
5. Latest developments and trends

### Literature

#### Elective literature:

- Baker, R. W.: Membrane Technology and Applications. 2nd ed. Wiley & Sons, 2004.
- Crittenden, J. [Ed.]: Water Treatment. Principles and Design. 2nd ed. Wiley & Sons, 2005.
- Melin, T., Rautenbach, R.: Membranverfahren. Grundlagen der Modul- und Anlagenauslegung. 3., aktualis. u. erw. Aufl. Springer, 2007.
- Ohlrogge, K., Ebert, K. [Hrsg.]: Membranen. Grundlagen, Verfahren und industrielle Anwendungen. Wiley-VCH, 2006.



**Course: Supercharging of Internal Combustion Engines [21112]****Coordinators:** Golloch**Part of the modules:** Combustion Engines II (p. 82)[WI4INGMB19]

ECTS Credits	Hours per week	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. 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* [21101] has to be completed beforehand.

**Learning Outcomes****Content**

**Course: Auction Theory [2590408]****Coordinators:** K. Ehrhart**Part of the modules:** Applied Strategic Decisions (p. 46)[WI4VWL2], Market Engineering (p. 33)[WI4BWLISM3], Communications & Markets (p. 35)[WI4BWLISM5]

ECTS Credits	Hours per week	Term	Instruction language
4.5	2/1	Winter term	de

**Learning Control / Examinations**

The assessment of this course is a written examination (following §4(2), 1 SPO) of 60 mins.  
The exam is offered each semester.

**Conditions**

None.

**Recommendations**

We suggest to attend either Game Theory I or Decision Theory beforehand.

**Learning Outcomes**

The student

- learns the game-theoretic modeling and analysis of auctions,
- learns about various auction formats and their specific characteristics,
- understands the challenge for participating in auctions as bidder,
- understands the challenge of designing auctions as auctioneer,
- gains insight into practice by case studies,
- participates in and analyzes demonstration experiments.

**Content**

This course deals with the analysis and modeling of auction which are based on game theory. This also includes aspects of applying and designing auctions as well as experiences with auctions. Main topics are:

- Single- and multi-unit auctions
- Selling and procurement auctions
- Electronic auctions (e.g. eBay, C2C, B2B)
- Multi-attributive auctions.

**Media**

Script, overhead slides, additional printed material.

**Literature**

- Ehrhart, K.-M. und S. Seifert: Auktionstheorie, Skript zur Vorlesung, KIT, 2011
- Krishna, V.: Auction Theory, Academic Press, Second Edition, 2010
- Milgrom, P.: Putting Auction Theory to Work, Cambridge University Press, 2004
- Ausubel, L.M. und P. Cramton: Demand Reduction and Inefficiency in Multi-Unit Auctions, University of Maryland, 1999

**Course: selected applications of technical logistics [2118087]**

**Coordinators:** M. Mittwollen, V. Madzharov  
**Part of the modules:** Technical Logistics (p. 85)[WI4INGMB27]

ECTS Credits	Hours per week	Term	Instruction language
4	2/1	Summer 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**

As *selected applications of technical logistics* is based on the knowledge from *basics of technical logistics* and partly *elements and systems of technical logistics* it is strongly recommended to have heard at least *basics of technical logistics* in advance.

**Learning Outcomes**

After successfully finishing this course, the student is able to design crucial machines of conveyor technology. He can deal with effects of dynamics caused by operation. He can consider fundamental safety requirements.

**Content**

Introduction

- Repetition

Lifting of loads by the example of a bridge crane

- Design and function
- Model: one mass oscillator
- Rope stress, lifting power coefficient

Elevator

- Design, function
- Friction drive, traction capability
- Safety gear

Ground conveyor (example: s&r machine)

- Design, function
- Modeling
- Horizontal dynamics, reduction of oscillation

Tilting, Turning, Slewing of ground conveyors

- Stability against overturning
- Tilting torque, tilting axes
- Force limiting devices

Fork lift truck

- Design, function
- Modeling
- Horizontal dynamics, reducing of oscillation

**Media**

Blackboard, LCD projector, work sheets

**Literature****Elective literature:**

- M. Scheffler: Grundlagen der Fördertechnik – Elemente und Triebwerke (und ähnliche)
- Dubbel: Taschenbuch für den Maschinenbau, Kapitel: Fördertechnik
- R. Fischer: Elektrische Maschinen

- H. Martin: Transport- und Lagerlogistik
- R. Koether: Technische Logistik
- Arnold, Furmans: Materialfluss in Logistiksystemen (from 6<sup>th</sup> edition)

**Remarks**

This lecture is the direct follower to TL-II selected applications

**Course: selected applications of technical logistics and project [2118088]**

**Coordinators:** M. Mittwollen, V. Madzharov  
**Part of the modules:** Technical Logistics (p. 85)[WI4INGMB27]

ECTS Credits	Hours per week	Term	Instruction language
6	3/1	Summer 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**

As *selected applications of technical logistics* is based on the knowledge from *basics of technical logistics* and partly *elements and systems of technical logistics* it is strongly recommended to have heard at least *basics of technical logistics* in advance.

**Learning Outcomes**

After successfully finishing this course, the student is able to design crucial machines of conveyor technology. He can deal with effects of dynamics caused by operation. He can consider fundamental safety requirements. Project work deepens knowledge

**Content**

Introduction

- Repetition

Lifting of loads by the example of a bridge crane

- Design and function
- Model: one mass oscillator
- Rope stress, lifting power coefficient

Elevator

- Design, function
- Friction drive, traction capability
- Safety gear

Ground conveyor (example: s&r machine)

- Design, function
- Modeling
- Horizontal dynamics, reduction of oscillation

Tilting, Turning, Slewing of ground conveyors

- Stability against overturning
- Tilting torque, tilting axes
- Force limiting devices

Fork lift truck

- Design, function
- Modeling
- Horizontal dynamics, reducing of oscillation

Project work

- Working on a typical question with relation to and enlarging of the course

**Media**

Blackboard, LCD projector, work sheets

**Literature**

**Elective literature:**

- M. Scheffler: Grundlagen der Fördertechnik – Elemente und Triebwerke (und ähnliche)
- Dubbel: Taschenbuch für den Maschinenbau, Kapitel: Fördertechnik
- R. Fischer: Elektrische Maschinen
- H. Martin: Transport- und Lagerlogistik
- R. Koether: Technische Logistik
- Arnold, Furmans: Materialfluss in Logistiksystemen (from 6<sup>th</sup> edition)

**Remarks**

This lecture is the direct follower to TL-II selected applications

**Course: Selected Topics of Optics and Microoptics for mechanical engineers [2143892]****Coordinators:** T. Mappes**Part of the modules:** Microsystem Technology (p. 98)[WI4INGMBIMT4], BioMEMS (p. 93)[WI4INGMBIMT1], Microoptics (p. 96)[WI4INGMBIMT3]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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**

- knows the basics of linear optics
- understands the optical effects used for technical measurements
- judges upon the technical capabilities of selected optical instruments
- has the basic knowlegde to fabricate macroscopic and microscopic optical elements
- may select appropriate microscopic contrast techniques for technical questions

**Content**

The first part of the lecture deals with:

- laws of optics
- linear optics
- abberations of opt. systems
- wave optics & polarization

Based on the introduction to the basics in the first part, the second half of the lecture deals with the discussion of

- optical instruments
- contrast enhancement
- optical position control

Different fabrication methods for macroscopic and microscopic optical elements are discussed

**Media**

Lecture script as \*.pdf

**Literature**

Hecht Eugene: **Optik**; 4., überarb. Aufl.; Oldenbourg Verlag, München und Wien, 2005

**Course: Automated Manufacturing Systems [2149904]****Coordinators:** J. Fleischer**Part of the modules:** Automated Manufacturing Systems (p. [75](#))[WI4INGMBWBK1]

ECTS Credits	Hours per week	Term	Instruction language
9	4/1	Summer term	de

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**



## Course: Automation of Discrete Event and Hybrid Systems [23160]

**Coordinators:** M. Kluwe  
**Part of the modules:** Control Engineering II (p. 114)[WI4INGETIT2]

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

### Learning Control / Examinations

The assessment consists of a written exam (120 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

In the lecture the students get familiar with the basics of the modelling, simulation, analyses and control of discrete event and hybrid systems.

### Content

- *Introduction*  
system classification, definition, example: controlled charging process
- *Model classification and modelling formalisms*  
automata and formal languages, petri nets, net condition/event systems
- *Discrete process modelling*  
state-oriented modeling, resource-oriented modeling
- *Analysis of discrete event systems*  
characteristics of petri nets, analyzing petri nets, analyzing timed event graphs via Max-plus algebra
- *Specification and Design of discrete controllers*  
classification of control objectives and control, control specification, control design, implementation, control of a lifting table, control of a production line
- *Hybrid Systems*  
hybrid phenomena, simulation, analyzing and control of hybrid systems, example

### Media

Supplemental sheets  
 Demonstration with Matlab/Simulink

### Literature

- Cassandras, C. G., Lafortune, S.: Introduction to Discrete Event Systems, Kluwer Academic, Boston, 1999

### Elective literature:

- Abel, D.: Petri-Netze für Ingenieure, Springer Verlag Berlin, 1990

## Course: Basics of Liberalised Energy Markets [2581998]

**Coordinators:** W. Fichtner

**Part of the modules:** Energy Economics and Energy Markets (p. 40)[WI4BWLIIIP4]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/1	Winter term	en

### Learning Control / Examinations

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

### Conditions

None.

### Learning Outcomes

#### Content

1. The European liberalisation process
  - 1.1 The concept of a competitive market
  - 1.2 The regulated market
  - 1.3 Deregulation in Europe
2. Pricing and investments in a liberalised power market
  - 2.1 Merit order
  - 2.2 Prices and investments
  - 2.3 Market flaws and market failure
  - 2.4 Regulation in liberalised markets
  - 2.5 Additional regulation mechanisms
3. The power market and the corresponding submarkets
  - 3.1 List of submarkets
  - 3.2 Types of submarkets
  - 3.3 Market rules
4. Risk management
  - 4.1 Uncertainties in a liberalised market
  - 4.2 Investment decisions under uncertainty
  - 4.3 Estimating future electricity prices
  - 4.4 Portfolio management
5. Market power
  - 5.1 Defining market power
  - 5.2 Indicators of market power
  - 5.3 Reducing market power
6. Market structures in the value chain of the power sector

#### Media

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

#### Literature

##### Elective literature:

Power System Economics; Steven Stoft, IEEE Press/Wiley-Interscience Press, 0-471-15040-1

## Course: Construction and Maintenance of Railway Infrastructure [19307s]

**Coordinators:** E. Hohnecker, H. Müller

**Part of the modules:** Public Transportation Operations (p. 106)[WI4INGBGU4], Guided Systems Engineering (p. 108)[WI4INGBGU6]

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

### Learning Control / Examinations

The assessment will consist of a oral exam (20 min) according to §4 (2), 1 of the examination regulation.

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.

### Conditions

See module description.

See module description.

### Learning Outcomes

#### Content

methods of construction; strategies for maintenance; construction and operation

## Course: Design of Wastewater Treatment Plants and Biosolids Reclaiming Systems (Design of Urban Water and Wastewater Management Systems) [19243/44]

**Coordinators:** E. Hoffmann

**Part of the modules:** Water Supply and Sanitation (p. 112)[WI4INGBGU13]

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

### Learning Control / Examinations

See module description.

### Conditions

The prior attendance of the course *Urban Water Resources Management* [0170603] is assumed.

It is recommended to attend the course *Process Engineering in Water Quality Management* [19054] beforehand.

### Learning Outcomes

#### Content

Elements of a Waste Water Treatment Plant

- Primary treatment
- Biological stage
- Sewage sludge treatment

### Literature

#### Elective literature:

Lehr- und Handbuch der Abwassertechnik, Bände 1-5 (1995 und folgende)

Gujer, W.: Siedlungswasserwirtschaft, Springer, Berlin (3. Aufl., 2007)

Pöpel, F.: Lehrbuch für Abwassertechnik und Gewässerschutz, Deutscher Fachschriftenverlag, Wiesbaden (1979)

## Course: Design and Planning of Urban Drainage Systems [19248]

**Coordinators:** S. Fuchs

**Part of the modules:** Water Supply and Sanitation (p. 112)[WI4INGBGU13]

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

### Learning Control / Examinations

See module description.

### Conditions

Prior attendance of the course *Urban Water Resource Management and Ecological Engineering* [19057/19058].

### Learning Outcomes

#### Content

- Drainage systems -> principles and elements
- Stormwater treatment -> design and planning

### Literature

#### Elective literature:

DWA-Regelwerke: A118, A128, A138, M178

ATV-Handbuch: Planung der Kanalisation, Ernst, Berlin, 1995

Gujer, W.: Siedlungswasserwirtschaft, Springer, Berlin (3. Aufl., 2007)

## Course: Design Basics in Highway Engineering [19026]

**Coordinators:** R. Roos

**Part of the modules:** Design, Construction, Operation and Maintenance Highways (p. 103)[WI4INGBGU1]

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

### Learning Control / Examinations

The assessment of the module is a written examination (40 minutes) according to Section 4(2), 1 of the examination regulation. The exam takes place every semester as well as the re-examination. In case of failing or to improve the examination grade an additional oral examination (according to Section 4(2), 2 of the examination regulation) is offered in the same examination periode.

The 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

See corresponding module information.

### 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

### Media

Lecture notes are provided for download (information will be made available in the lecture)

**Course: Power Network Analysis [23371/23373]****Coordinators:** T. Leibfried**Part of the modules:** Generation and transmission of renewable power (p. 118)[WI4INGETIT7]

ECTS Credits	Hours per week	Term	Instruction language
6	2/2	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**

This course is obligatory within the module and has to be attended.

**Learning Outcomes**

The goal is to relay theoretical fundamentals in the field of electric power technology and power transmission.

In the first part the lecture deals with the basics of High-Voltage technology. Then the basics of transmission and distribution of electric energy is presented as well as the load flow calculation and the short-circuit calculation methods.

Supporting the lecture, assignments to the curriculum are distributed. Their solution is presented and discussed during lecture hall exercises.

**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.

**Media**

Online material is available on: [www.ieh.uni-karlsruhe.de](http://www.ieh.uni-karlsruhe.de) and can be downloaded using a password.

**Literature****Elective literature:**

Will be announced in the lecture notes.

**Remarks**

The credits have been changed to 6.

**Course: Special Topics in Highway Engineering [19303s]****Coordinators:** R. Roos**Part of the modules:** Highway Engineering (p. [104](#))[WI4INGBGU2]

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

**Learning Control / Examinations**

See module description.

**Conditions**

See corresponding module information.

**Learning Outcomes****Content**



**Course: Operation and Maintenance Highways [19301s]****Coordinators:** R. Roos**Part of the modules:** Design, Construction, Operation and Maintenance Highways (p. 103)[WI4INGBGU1], Highway Engineering (p. 104)[WI4INGBGU2]

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

**Learning Control / Examinations**

See module description.

**Conditions**

See corresponding module information.

**Learning Outcomes****Content**

**Course: Motor Fuels for Combustion Engines and their Verifications [2133109]****Coordinators:** Volz**Part of the modules:** Combustion Engines II (p. 82)[WI4INGMB19]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Winter 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**

Successful completion of the course *Combustion Engines A* [21101].

Basic knowledge of chemistry is recommended.

**Learning Outcomes****Content**

## Course: Assessment of Public Policies and Projects 1 [2561220]

**Coordinators:** A. Kopp

**Part of the modules:** Transport infrastructure policy and regional development (p. 55)[WI4VWL11]

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

### 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

Basic knowledge of microeconomics and skills of undergraduate studies or a bachelor's degree are required. Particularly helpful but not necessary: Industrial Economics and Competition in Networks. Participation as well as successful conclusion of the lecture "Assessment of public policies and projects I" guarantees the possibility to participate in the more practical lecture "Assessment of public policies and projects II".

### Learning Outcomes

The students experience knowledge about theoretical and practical assessment of large-scale transport projects. They get insights to the theory and practice of ex ante and ex post assessment methods to evaluate the economic effects of large-scale infrastructure investments. The theoretical concepts are thereby always accompanied by practical examples, mainly from the perspective of the World Bank.

### Content

This lecture is separated into two major parts: (1) Ex ante assessment of major projects and (2) Ex post assessment of large-scale projects:

Ex ante assessment:

- Cost-benefit analysis (primary effects e.g., willingness to pay, political restrictions or market and shadow prices)
- Simulation models (secondary effects of major projects)
- Estimations at the macro-level (production functions)

Ex post assessment of large-scale projects:

- Impact Evaluation (Natural limits of experiments)
- Political economy

### Remarks

A registration for the course might be necessary. Further information will be available in the VAB and on the website of the institute.

## Course: Assessment of Public Policies and Projects 2 [2560220]

**Coordinators:** A. Kopp

**Part of the modules:** Transport infrastructure policy and regional development (p. 55)[WI4VWL11]

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

### Learning Control / Examinations

Result of success is made by a home assignment as well as a presentation during a block seminar.

### Conditions

The attendance in the lecture *Assessment of public policies and projects I* is considered as a formal precondition. Basic knowledge of microeconomics and skills of undergraduate studies or a bachelor's degree are required.

### Learning Outcomes

Based on the theoretical concepts presented in the lecture "Assessment of public policies and projects I" students deepen their practical insights into the assessment of public policies and projects: To that aim they will be given a practical topic which they should elaborate in a seminar paper (either alone or in small groups). Finally, the students are supposed to present and discuss the results of their seminar papers during a block seminar.

### Content

Topics will be announced well in advance of the course

### Remarks

A registration for the course might be necessary. Further information will be available in the VAB and will be provided in *Assessment of public policies and projects I*.

**Course: Advanced Civil Law [24504]**

**Coordinators:** T. Dreier, P. Sester  
**Part of the modules:** Commercial Law (p. 130)[WI4JURA2]

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

**Learning Control / Examinations**

Assessment will consist of written exams within *Privatrechtliche Übung* following §4, Abs. 2, 3 of the examination regulation.

**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.

**Media**

Transparencies/Slides

**Literature**

Tba at the beginning of the course.

**Elective literature:**

tba at the beginning of the course

## Course: BioMEMS I (Microsystem Technology for Life-Sciences and Medicine; part I) [2141864]

**Coordinators:** A. Guber  
**Part of the modules:** BioMEMS (p. 93)[WI4INGMBIMT1]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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

The course is compulsory in the module BioMEMS and must be examined.

### Recommendations

None.

### Learning Outcomes

The student

- knows basic aspects and viewpoints for the application of micro system technology in the fields of medical engineering, life sciences and BioMEMS
- has the necessary knowledge of the different micro-fabrication techniques, biomaterials and of sterilization techniques
- has the required knowledge for a multitude of microfluidic applications like lab-on-chip systems, micro-pump systems, etc.
- masters selected aspects of micro sensor technology

### Content

Table of Contents:

- Introduction of the different microfabrication techniques (LIGA, Micro milling, Silicon-Technology, Laser-Micromachining,  $\mu$ EDM, etc.)
- Biomaterials, Sterilisation techniques
- Microcomponents for the modular set-up of microfluidic systems (Micro channels, Micro filter, Micro mixer, Micro pumps, Micro valves, Micro spectrometer, etc.)
- Microtiterplates, Nanotiterplates
- Micro analytical systems ( $\mu$ TAS), Lab-on-a-Chip-systems

### Media

Detailed script is provided free of charge.

### Literature

- "Microsystem Technology" by W. Menz, J. Mohr, O. Paul
- "Fundamentals of Microfabrication" by M. J. Madou

## Course: BioMEMS II (Microsystem Technology for Life-Sciences and Medicine; part II) [2142883]

**Coordinators:** A. Guber

**Part of the modules:** Microsystem Technology (p. 98)[WI4INGMBIMT4], BioMEMS (p. 93)[WI4INGMBIMT1]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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 student

- Knows typical applications of BioMEMS in the fields of medical engineering and life sciences
- Has extensive knowledge about the realisation of micro analysing systems like e.g. LabCD-systems, BioChips or microarrays, cell based systems, systems for tissue engineering, Patch-Clamping-systems and Drug-Delivery-systems
- Understands the fundamentals of micro process engineering
- Knows different monitoring systems for intensive care and the diagnostics of respiratory air
- Masters the required basic knowledge for the realisation of neuro-prosthetics and nano surgery

### Content

Table of Contents:

- Micro fluidic systems: LabCD, systems for protein crystallization
- BioChips and micro arrays
- Tissue engineering
- Biohybrid cell-chip systems
- Drug delivery systems
- Micro reaction technology
- Micro fluidic systems for FTIR measurements of biological fluids
- Micro systems for anesthesia, intensive care (monitoring) and infusion therapy
- Respiratory diagnostics
- Neural prostheses
- Nano surgery

### Media

Detailed script is provided free of charge.

### Literature

- "Fundamentals of Microfabrication" by M. J. Madou
- "Medizintechnik: Life Science Engineering. Interdisziplinarität, Biokompatibilität, Technologien, Implantate, Diagnostik, Werkstoffe, Zertifizierung, Business" by Erich Wintermantel

## Course: BioMEMS III (Microsystem Technology for Life-Sciences and Medicine; part III) [2142879]

**Coordinators:** A. Guber

**Part of the modules:** Microsystem Technology (p. 98)[WI4INGMBIMT4], BioMEMS (p. 93)[WI4INGMBIMT1]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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 student

- has fundamental as well as advanced knowledge of different BioMEMS applications, especially in the micro technical based field of medical engineering
- knows the first principles of the minimal invasive surgery (MIC), NOTES and of endoscopic neurosurgery
- understands the use and procedure of catheter based systems in the interventional vascular therapy
- has extensive knowledge in the field of stent based systems
- knows aspects of surgery robots and video pills
- has available knowledge of the Medical Devices Act

### Content

Table of Contents:

- Minimal Invasive Surgery (MIS)
- Endoscopic Neurosurgery
- Interventional Cardiology and Vascular Therapy
- NOTES (Natural Orifice Transluminal Endoscopic Surgery)
- robotic surgery and Endosystems
- Approval of medical devices (Medical Device Directive) and Quality Management

### Media

Detailed script is provided free of charge.

### Literature

- "Fundamentals of Microfabrication" by M. J. Madou
- "Medizintechnik: Life Science Engineering. Interdisziplinarität, Biokompatibilität, Technologien, Implantate, Diagnostik, Werkstoffe, Zertifizierung, Business" by Erich Wintermantel



## Course: Bionics for Engineers and Natural Scientists []

**Coordinators:** H. Hölscher, S. Walheim

**Part of the modules:** Microsystem Technology (p. 98)[WI4INGMBIMT4], Nanotechnology (p. 99)[WI4INGMBIMT5], BioMEMS (p. 93)[WI4INGMBIMT1]

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

### Learning Control / Examinations

#### Conditions

None.

#### Recommendations

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.

### 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:** Finance 2 (p. 22)[WI4BWLFBV2], Finance 3 (p. 23)[WI4BWLFBV11]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes**

Students learn about current developments regarding organisation of exchanges and securities trading.

**Content**

- Organisation of exchanges: Changing Zeitgeist - Corporates instead of cooperative structures
- Market models: order driven vs. market maker - Liquidity provision for less frequently traded securities
- Trading systems: The end of an era? - No more need for running traders?
- Clearing: Diversity instead of uniformity - Safety for all?
- Settlement: Increasing importance - Does efficient settlement assure the "value added" of exchanges in the long run?

**Literature****Elective literature:**

Educational material will be offered within the lecture.

## Course: CAN-Bus Release Control [2114092]

**Coordinators:** M. Geimer

**Part of the modules:** Automotive Engineering (p. 77)[WI4INGMB5], Mobile Machines (p. 80)[WI4INGMB15]

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

### Learning Control / Examinations

Assessment for the module *Mobile Machines*: See module description.

Assessment for the module *Automotive Engineering*: The assessment consists of an oral exam (20 min) taking place in 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

Basic knowledge of electrical engineering is recommended. Programming skills are also helpful.

### Learning Outcomes

The students will get an overview of the theoretic and practical functioning of different bus systems.

After the practical oriented lessons the students will be able to visualize the communication structure of different applications, design basic systems and evaluate the complexity of programming of the complete system.

### Content

- Knowledge of the basics of data communication in networks
- Overview of the operating mode of current field buses
- Explicit observation of the operating mode and application areas of CAN buses
- Practical programming of an example application (hardware is provided)

### Literature

#### Elective literature:

- Kiencke U. and L. Nielsen: *Automotive Control Systems*. Berlin Heidelberg: Springer 2005..
- n.n.: *Control and Diagnostics in automotive Applications: Proceedings of 3<sup>rd</sup> International Conference*; 4.-6. July 2001, Sestri Levante, Italy.

### Remarks

The course will be replenished by interesting lectures of professionals.

**Course: Business Activity Management [2511506]****Coordinators:** C. Janiesch**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

**Learning Control / Examinations**

The assessment of this course is a written examination (60min.) in the first week after lecture period (nach §4(2), 1 SPO).

**Conditions**

None.

**Recommendations**

The course might be combined with the lecture "Service Oriented Computing 1".

**Learning Outcomes****Content****Media**

Slides in PDF-format will be provided via the course webpages.

**Literature**

Compulsory literature will be announced in the course.

**Course: Business and IT Service Management [2590484]**

**Coordinators:** G. Satzger, J. Kunze von Bischhoffshausen  
**Part of the modules:** Service Management (p. 36)[WI4BWLISM6]

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

**Learning Control / Examinations**

The assessment of this course is a written examination (60 min.) (following §4(2), 1 SPO) and by submitting written papers as part of the exercise (following §4(2), 3 SPO).

**Conditions**

None.

**Learning Outcomes**

Students understand the importance of “servitization” for organizations, the challenges for the management of service-oriented enterprises and the interdependence of business and IT services.

Students learn standard concepts and methods of service-oriented management and are able to apply them in practical case studies.

Student get familiar with current research and tools and are able to critically evaluate them.

Students practice to communicate in English and to work on solutions in teams.

**Content**

The rapid development of information and communication technology transforms many enterprises towards service-oriented structures: with new digital services, new business models and process structures within larger service networks. Thus, strategic and operative management of service-oriented enterprises increasingly gains importance. In this course, we want to systematically acquire relevant know-how and apply this to real word examples. Particular focus will be on the interdependence of business, IT and legal aspects.

The course will be taught in English. It should provide ample opportunity for active participation of students. The course will integrate presentations of experts from business practice as well as a comprehensive case study (“en bloc” for 1 day) in which students will actively work on the strategic service-oriented shift of an enterprise.

**Media**

Presentation (pdf)

**Literature**

Fitzsimmons J./Fitzsimmons, M., Service Management, Operations, Strategy and Information Technology, 6. ed., 2007

Maister, David H., Managing The Professional Service Firm, 1997

Teboul, J. , Service is Front Stage: Positioning services for value advantage, 2006

Grönroos, Service Management and Marketing, 2007

**Course: Business Dynamics [2540531]****Coordinators:** A. Geyer-Schulz, P. Glenn**Part of the modules:** Advanced CRM (p. 31)[WI4BWLISM1], Electronic Markets (p. 32)[WI4BWLISM2]

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

**Learning Control / Examinations**

Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation.

The course is considered successfully taken, if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 25) from exercise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	113
1.3	106
1.7	99
2.0	92
2.3	85
2.7	78
3.0	71
3.3	64
3.7	57
4.0	50
4.7	40
5.0	0

**Conditions**

None.

**Learning Outcomes**

Students

- acquire the system thinking worldview for economics
- utilize different methods and tools to map the structure of complex economic systems
- are able to relate dynamic effects to these structures
- learn how to simulate systems within the computer for testing purposes
- use simulation results to improve models
- can independently as well as in teams model, analyze, and optimize business processes and applications
- know how to offer business dynamics as a consulting service and work together with client teams

**Content**

Corporate growth, the diffusion of new technologies, business processes, project management, product development, service quality management — all these are examples for application areas of business dynamics. They all are dynamic systems that are characterized by feedback loops between many different variables. By means of the tools of business dynamics such systems can be modelled. Simulations of complex systems allow the analysis, the goal centered design, as well as the optimization of markets, business processes, policies, and organizations.

**Media**

- Slides
- System Dynamics Software Vensim PLE: <http://www.vensim.com/venple.html>

**Literature**

John D. Sterman. Business Dynamics: Systems Thinking and Modeling for a Complex World. McGraw-Hill, 2000.

**Course: CATIA V5 CAD training course [2123356]**

**Coordinators:** J. Ovtcharova  
**Part of the modules:** Virtual Engineering B (p. 90)[WW4INGMB30]

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

**Learning Control / Examinations**

Practical examination, duration: 60 min., auxiliary means: script

**Conditions**

None.

**Recommendations**

Dealing with technical drawings is required.

**Learning Outcomes**

Students are able to create their own 3D geometric models in the CAD system, to generate drawings due to the created geometry and then carry out FE-studies and kinematic simulations using the integrated CAE tools. With advanced, knowledge-based functionalities of CATIA the participants will learn to automate the creation of geometry and thus to ensure the reusability of the models.

**Content**

The participant will learn the following knowledge:

- Basics of CATIA V5 such as user interface, handling etc.
- Production and processing of different model types
- Production of basic geometries and parts
- Generation of detailed drawings
- Integration of partial solutions in modules
- Working with constrains
- Strength analysis with FEM
- Kinematic simulation with DMU
- Dealing with CATIA Knowledgeware

**Literature**

practical course skript

**Remarks**

For the practical course attendance is compulsory.

**Course: CAD-NX5 training course [2123355]****Coordinators:** J. Ovtcharova**Part of the modules:** Virtual Engineering B (p. 90)[WW4INGMB30]

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

**Learning Control / Examinations**

Practical examination, duration: 60 min., auxiliary means: script

**Conditions**

None

**Recommendations**

Dealing with technical drawings is required.

**Learning Outcomes**

Students are able to create their own 3D geometric models in the CAD system, to generate drawings due to the created geometry and then carry out FE-studies and kinematic simulations using the integrated CAE tools. With advanced, knowledge-based functionalities of NX5 the participants will learn to automate the creation of geometry and thus to ensure the reusability of the models.

**Content**

The participant will learn the following knowledge:

- Overview of the functional range
- Introduction to the work environment of UG NX5
- Basics of 3D-CAD modelling
- Feature-based modelling
- Freeform modelling
- Generation of technical drawings
- Assembly modelling
- Finite element method (FEM) and multi-body simulation (MBS) with UG NX5

**Literature**

Practical course skript

**Remarks**

For the practical course compulsory attendance exists.



**Course: Chemical Technology of Water [22601]**

**Coordinators:** H. Horn, M. Delay  
**Part of the modules:** Water Chemistry I (p. 121)[WI4INGCV6]

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

**Learning Control / Examinations**

See module description.

**Conditions**

See corresponding module information.

**Learning Outcomes**

The student has a basic knowledge of water chemistry and knows the most important methods for the treatment of different raw waters for drinking and process water purposes.

**Content**

1. Water: hydrological cycle, physical and chemical characteristics
2. Water as solvent
3. Acid / Base systems
4. Redox reactions
5. Contents and assessment
6. Water treatment, part I (Sieving, sedimentation, flotation, filtration, membrane separation, flocculation)
7. Water treatment, part II (Adsorption, ion exchange, gas transfer, deacidification, softening, oxidation, disinfection)

**Literature****Elective literature:**

- Crittenden, J. [Ed.]: Water Treatment. Principles and Design. 2nd ed. Wiley & Sons, 2005.
- DVGW: Wasseraufbereitung - Grundlagen und Verfahren. In: Lehr- und Handbuch Wasserversorgung Bd.6. Oldenbourg Industrie-Verlag, 2004.
- Frimmel, F. H.: Wasser und Gewässer. Ein Handbuch. Spektrum Verlag, 1999.
- Grohmann, A., Hässelbarth, U., Schwerdtfeger, W.(Hrsg.): Die Trinkwasserverordnung. 4. Auflage, E. Schmid, Berlin, 2002.
- Sigg, L., Stumm, W.: Aquatische Chemie. Eine Einführung in die Chemie wässriger Lösungen und natürlicher Gewässer. Verlag der Fachvereine Zürich, 1994.
- Stumm, W., Morgan, J. J.: Aquatic Chemistry. Chemical Equilibria and Rates in Natural Waters. 3rd ed. Wiley & Sons, 1996.

## Course: Chemical, physical and material science aspects of plastics in the micro technology [2143500]

**Coordinators:** M. Worgull, D. Häringer, H. Moritz

**Part of the modules:** Microsystem Technology (p. 98)[WI4INGMBIMT4], Microfabrication (p. 95)[WI4INGMBIMT2]

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

This Lecture can be combined with "Replication processes in micro technology" [2143893]

Intermediate examination or bachelor degree of mach/wing necessary.

Basic knowledge of the micro-system technology (but not a requirement) and interdisciplinary interest are favourable.

### Learning Outcomes

#### Content

- **Introduction to the world of the plastics**
- **Chemistry of the polymers - synthesis and chemical characteristics**
- **Tailor-made composite / polymer blends**
- **Physical characteristics of plastics and their description**
  - Morphologic structure
  - Thermal behaviour
  - Time temperature - equivalence
  - Rheology of polymer melts
  - Thermo analysis
- **Plastics processing in the micro technology**
- **Application of polymers as construction material in the micro-system technology**
  - Composites / Compounds
  - MID – injection moulding of circuit carriers
  - Assembling and welding of plastics
  - Engineering with plastics
  - Environmental problems - biological degradable polymers
- **Meaning of the plastics in the micro technology explained by examples of current developments of polymer-based applications**
  - Semi conducting organic plastics
  - Nano-structured polymer surfaces
  - Polymer sensors (biologically, chemically, optically)

### Media

Printouts of the lecture presentation, if applicable further scientific articles.

## Course: Cloud Computing [2511504]

**Coordinators:** S. Tai, Kunze

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

#### Conditions

None.

#### Learning Outcomes

The course introduces concepts, methods, and techniques of Cloud Computing for providing and consuming IT resources, development- and runtime environments, and software applications of all kinds as Web services.

#### Content

Building on compute and storage virtualization, Cloud Computing provides scalable, network-centric, abstracted IT infrastructure, platforms, and software applications as on-demand services that are billed by consumption. Innovative business models, cost efficiency, and time-to-market are further promises associated with Cloud Computing. The lecture introduces Cloud Computing, covering topics such as:

- Fundamentals: Virtualization, Service-orientation
- Commercial and Open-Source Cloud offerings
- Cloud service engineering
- Web-scale Cloud service architecture
- Cloud service management
- Obstacles and opportunities

#### Literature

Cloud Computing: Web-Based Dynamic IT Services, von C. Baun, M. Kunze, J. Nimis, S. Tai. Springer-Verlag 2011.

**Course: Communication Systems and Protocols [23616 / 23618]****Coordinators:** J. Leuthold, J. Becker, M. Hübner**Part of the modules:** Optoelectronics and Optical Communication (p. 100)[WI4INGMBIMT6]

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

**Learning Control / Examinations**

The assessment consists of a written exam (120 minutes) (following §4(2), 1 of the examination regulation).

**Conditions**

None.

**Recommendations**

Mathematics of a bachelor.

**Learning Outcomes**

Students

- Will have a basic knowledge of protocols
- Will understand the purpose of layers

Knows the TCIP/IP protocol suite and can work and debug using a network analyzer program.

**Content**

- Communications Fundamentals: Analog/Digital Conversion, The Channel description in Time and Frequency, Channel Capacity, Transmission Media
- Modulation Formats(brief introduction)
- Networks and Layers: System Architecture, Network Layers, Layer Service Models, Peer-to-peer protocols, Medium Access Control Protocols, Repeater/Hub/Bridge/Switch/Router/Gateway
- Local Area Networks: Ethernet, Token-Ring, WiFi, WiMax, RPR
- Packet Switched Networks: Network Layer Categorization (Circuit-Switched Networks, Burst-Switched Networks, Packet-Switched Networks; Datagrams and Virtual Circuits; Routing
- TCP/IP: TCP/IP Architecture, the IP protocol; UDP; TCP; IP; DNS
- Bus-Systems and Protocols
- Basics of transmitters and drivers
- System busses (I2C, V24)
- Peripheral busses (RS232, USB, Firewire)

Process busses (ASI, Profibus, CAN, LIN, FlexRay)

**Media**

Viewegraph &amp; blackboard lecture.

Lecture notes will be handed out.

**Remarks**

This is a basic lecture and useful for all communications lectures.

## Course: Communications Economics [2540462]

**Coordinators:** J. Kraemer

**Part of the modules:** Telecommunications Markets (p. 54)[WI4VWL10], Information Engineering (p. 37)[WI4BWLISM7], Communications & Markets (p. 35)[WI4BWLISM5]

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

### Learning Control / Examinations

The assessment of this course is a written examination (following §4(2), 1 SPO) and by submitting written papers as part of the exercise (following §4,(2), 3 SPO).

The total grade for this lecture will consist to 80% of the grade achieved in the written examination and to 20% of the assignments during the exercises.

### Conditions

None.

### Recommendations

Formally, there are no prerequisites to visiting this class. The course is aimed at MA students with a solid background in economics, preferably, but not necessarily, in Industrial Organization. The course is complementary to the course "Telekommunikations- und Internetökonomie [2561232]" which is held in German and deals with more advanced topics in communications economics.

### Learning Outcomes

The course will provide students with an introduction to the economic, technological and legal (regulatory) foundations of telecommunications markets. Moreover, students will get acquainted with current regulatory economic challenges, such as local loop unbundling, regulation of the Internet, or assignment of spectrum licenses.

### Content

The lessons of this course include:

- The Demand of Telecommunications Services
- Technological and Economic Principles of Telecommunications Infrastructure
- Foundations of (Telecommunications) Regulation
- One-Way Access & Access Pricing
- Frequency Licenses and Spectrum Assignment
- The Economics and the Design of Telecommunications Tariffs
- The Economics of the Internet

### Term Paper:

Each student is required to submit a short term paper (4 pages) on a current topic in telecommunications regulation. The topic will be presented in the first lecture and students have time for the remainder of the course to work on the term paper. The term paper is graded and accounts for 20% of the final grade.

### Tutorials:

In addition, complementary tutorials will be held every two weeks. Exercise sheets will be submitted to the students in advance. Solutions to the exercises will be presented during the tutorials.

### Media

- Powerpoint
- eLearning Platform Ilias

### Literature

- J.-J. Laffont, J. Tirole (2000): *Competition in Telecommunications*, MIT Press.
- R. R. Braeutigam (1989): "Optimal Policies for Natural Monopolies" in: R. Schmalensee and R. Willig (eds.): *Handbook of Industrial Organization*, Vol. 2, Ch. 23, pp. 1289–1346, North-Holland
- Steger, U., Büdenbender, U., Feess, E., Nelles, D. (2008): *Die Regulierung elektrischer Netze: Offene Fragen und Lösungsansätze*, Springer
- Varian, Hal (2006): "Intermediate microeconomics: a modern approach", 7th edition (international student edition), Norton

### Remarks

The course is added to the Module Telecommunications Markets in the winter term 2011/12.

## Course: Complexity Management [2511400]

**Coordinators:** D. Seese

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

The assessment of this course consists of a written examination (60 min) (following §4(2), 1 SPO). The exam will be offered every semester and may be repeated at every ordinary exam date.

Questions are in German and English, answers are possible in German or in English.

In case that only a small number of candidates apply for the examination there will be offered an oral examination according to Section 4(2),1 of the examination regulation.

### Conditions

None.

### Recommendations

A basic knowledge in informatics is suitable.

### Learning Outcomes

Students will be enabled to acquire abilities, methods and instruments in the area of complexity management and learn to use them in an innovative way. The students should be enabled to find arguments for the solution of problems in this area. The basic goal of the lecture is to enable to understand the difficulties to manage complex systems and processes.

### Content

Complexity is one of the biggest challenges of our time. Central questions are: - Why humans often fail in complex situations? - What is complexity? -What are reasons for complexity? - Which parameters are essential to control complexity? - How systems have to be designed to reduce their complexity and to enable management of complexity?

The lecture gives a survey on fundamental results and handles the following topics: - Understanding of the difficulties produced by complex systems and complex processes - Foundations: modelling complex systems, complexity theory, descriptive, structural and parametric complexity, dynamic systems, topology, dimension, non-linearity, chaos, randomness and emerging structures, human shortcomings, simulation - Complexity of products and production - Complexity of markets - How to improve complexity management? - Decision support by intelligent use of IT

### Media

The slides of the lectures will be provided on the website of the lecture.

### Literature

- Franz Reither: Komplexitätsmanagement. Gerling Akademie Verlag, München 1997
- Dietrich Dörner: The Logic of Failure, Basic Books 1996
- G. Schuh, U. Schwenk: Produktkomplexität managen. Carl Hanser Verlag, München 2001
- Ch. Perrow: Normal Accidents. Living with High-Risk technologies, Basic Books, New York, 1984.
- J.D. Sterman: Business Dynamics, Systems Thinking and Modeling for a Complex World, McGraw-Hill Higher Education, 2000.
- R. G. Downey, M.R. Fellows: Parameterized Complexity. Springer 1999
- Heinz-Otto Peitgen, Hartmut Jürgens, Dietmar Saupe: Chaos and Fractals, Springer-Verlag New York, 1992, 2004 (second edition).
- S. Wolfram: A new kind of Science. Wolfram Media Inc. 2002

### Elective literature:

- M.R. Garey, D. S. Johnson: Computers and intractability A guide to the theory of NP-completeness, W. H. Freeman and Company, New York, 1979
- N. Immerman: Descriptive Complexity; Springer-Verlag, New York 1999
- R. Diestel: Graphentheorie, Springer 1996
- J. A. Bondy, U.S.R. Murty: Graph Theory, Springer 2008
- H.D. Ebbinghaus, J. Flum, W. Thomas: Mathematical Logic, Springer-Verlag, New York 1984
- Christos H. Papadimitriou: Computational Complexity, Addison-Wesley, Reading, Massachusetts, 1994

- R. Niedermeier: Invitation to Fixed-Parameter Algorithms, Oxford University Press 2006
- W. Metzler: Nichtlineare Dynamik und Chaos, Teubner Studienbücher Mathematik, Stuttgart 1998
- G. Frizelle, H. Richards (eds.): Tackling industrial complexity: the ideas that make a difference. University of Cambridge, Institute of Manufacturing 2002
- W. Bick, S. Drexl-Wittbecker: Komplexität reduzieren, Konzept. Methoden. Praxis, LOG\_X Verlag GmbH, Stuttgart, 2008
- U. Lindemann, M. Maurer, T. Braun: Structural Complexity Management, An Approach for the field of Product Design, Springer-Verlag, Berlin, Heidelberg, 2009
- M. J. North, Ch. M. Macal: Managing Business Complexity, Discovering Strategic Solutions with Agent-Based Modeling and Simulation, Oxford University Press 2006
- S. Bornholdt, H. G. Schuster (Eds.): Handbook of Graphs and Networks, From the Genome to the Internet, Wiley-VCH, 2003
- Further references will be given in each lecture.

**Remarks**

The content of the lecture will permanently be adapted to actual developments. This can be the cause to changes of the described content and schedule.

The course "Complexity Management" will not be offered any more from summer term 2016 on. The examination will be offered latest until summer term 2015 (repeaters only).

## Course: Computational Economics [2590458]

**Coordinators:** P. Shukla, S. Caton

**Part of the modules:** Emphasis in Informatics (p. 60)[WI4INFO2], Informatics (p. 58)[WI4INFO1], Market Engineering (p. 33)[WI4BWLISM3], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

The assessment of this course is a written examination (following §4(2), 1 SPO) and by submitting written papers as part of the exercise (following §4,(2), 3 SPO).

The total grade for this lecture will consist to 70% of the grade achieved in the written examination and to 30% of the assignments during the exercises.

### Conditions

None.

### Learning Outcomes

The student

- understands the methods of Computational Economics and applies them on practical issues
- evaluates agent models considering bounded rational behaviour and learning algorithms,
- analyses agent models based on mathematical basics,
- knows the benefits and disadvantages of the different models and how to use them,
- examines and argues the results of a simulation with adequate statistical methods,
- is able to support the chosen solutions with arguments and can explain them.

### Content

Examining complex economic problems with classic analytical methods usually requires making numerous simplifying assumptions, for example that agents behave rationally or homogeneously. Recently, widespread availability of computing power gave rise to a new field in economic research that allows the modeling of heterogeneity and forms of bounded rationality: Computational Economics. Within this new discipline, computer based simulation models are used for analyzing complex economic systems. In short, an artificial world is created which captures all relevant aspects of the problem under consideration. Given all exogenous and endogenous factors, the modelled economy evolves over time and different scenarios can be analyzed. Thus, the model can serve as a virtual testbed for hypothesis verification and falsification.

### Media

- Lecture slides and exercises as pdf-files.

### Literature

- R. Axelrod: "Advancing the art of simulation in social sciences". R. Conte u.a., Simulating Social Phenomena, Springer, S. 21-40, 1997.
- R. Axtel: "Why agents? On the varied motivations for agent computing in the social sciences". CSED Working Paper No. 17, The Brookings Institution, 2000.
- K. Judd: "Numerical Methods in Economics". MIT Press, 1998, Kapitel 6-7.
- A. M. Law and W. D. Kelton: "Simulation Modeling and Analysis", McGraw-Hill, 2000.
- R. Sargent: "Simulation model verification and validation". Winter Simulation Conference, 1991.
- L. Tesfation: "Notes on Learning", Technical Report, 2004.
- L. Tesfatsion: "Agent-based computational economics". ISU Technical Report, 2003.

### Elective literature:

- Amman, H., Kendrick, D., Rust, J.: "Handbook of Computational Economics". Volume 1, Elsevier North-Holland, 1996.
- Tesfatsion, L., Judd, K.L.: "Handbook of Computational Economics". Volume 2: Agent-Based Computational Economics, Elsevier North-Holland, 2006.
- Marimon, R., Scott, A.: "Computational Methods for the Study of Dynamic Economies". Oxford University Press, 1999.
- Gilbert, N., Troitzsch, K.: "Simulation for the Social Scientist". Open University Press, 1999.

### Remarks

This course is offered in cooperation with the Institute of Applied Informatics and Formal Description Models (AIFB).

Summer Term 2011: The course has been added to the Module [IW3NAIFB5] "*Algorithms and Applications*" and is thus also eligible for 3rd year B.Sc. students majoring in Information Engineering and Management.



## Course: Computer-based Production Planning and Control, Process Simulation and Supply Chain Management [2581975]

**Coordinators:** M. Fröhling, F. Schultmann  
**Part of the modules:** Industrial Production III (p. 39)[WI4BWLIIIP6]

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

### Learning Control / Examinations

The examination will be in form of an oral or written exam acc. to §4(2), 1 ER. Exams are offered in every semester and can be re-examined at every ordinary examination date.

### Conditions

None.

### Learning Outcomes

- Students shall be able to discuss problems arising out of IT-based PPS, process simulations and Supply Chain Management.
- Students shall be able to apply general approaches to solve the addressed problems.

### Content

Following an introduction into the structure, the history and still existing shortcomings of systems for planning and control of production, this lecture introduces different approaches for computer-assisted planning. The approaches are subdivided into methodologies for the simulation of processes on the one hand and optimising and descriptive planning models on the other hand. Finally, commercially available, industry-specific software tools are presented and discussed, which focus on production planning (PP) and materials management (MM) in the SAP ERP system.

Furthermore, process engineering software tools are presented and discussed in the light of integration into production planning as well as tools to simulate material flows and supply chains (with respect to Advanced Planning Systems).

### Media

Media will be provided on the e-learning platform.

### Literature

will be announced in the course

**Course: Corporate Financial Policy [2530214]****Coordinators:** M. Ruckes**Part of the modules:** Finance 2 (p. 22)[WI4BWLFBV2], Finance 3 (p. 23)[WI4BWLFBV11]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes**

Students are told profound knowledge about appropriate financing of firms.

**Content**

The course deals with the theory of corporate finance:

- Financing contracts
- Financing capacity
- Issuance of securities
- Capital structure
- Payout policy
- Liquidity management
- Corporate acquisitions and restructurings

**Literature****Elective literature:**

Tirole, J. (2006): The Theory of Corporate Finance. Princeton University Press.

**Course: Current Issues in the Insurance Industry [2530350]****Coordinators:** W. Heilmann**Part of the modules:** Insurance Management II (p. 25)[WI4BWLFBV7], Insurance Management I (p. 24)[WI4BWLFBV6]

ECTS Credits	Hours per week	Term	Instruction language
2,5	2/0	Summer term	de

**Learning Control / Examinations**

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

**Conditions**

None.

**Recommendations**For the understanding of this course knowledge of *Private and Social Insurance* [2530050] is required.**Learning Outcomes**

Knowledge and understanding of important current characteristics of insurance, e.g. insurance markets, lines, products, investment, company pension schemes, corporate structures and governance as well as controlling.

**Content**

Current topics in insurance markets.

**Literature****Elective literature:**

Farny, D. *Versicherungsbetriebslehre*. Verlag Versicherungswirtschaft; Auflage: 5. 2011  
 Koch, P. *Versicherungswirtschaft - Ein einführender Überblick*. Verlag Versicherungswirtschaft. 2005  
 Tonndorf, F., Horn, G., and Bohner, N. *Lebensversicherung von A-Z*. Verlag Versicherungswirtschaft. 1999  
 Fürstenwerth, J., and Weiß, A. *Versicherungsalphabet (VA)*. Verlag Versicherungswirtschaft. 2001  
 Buttler, A. *Einführung in die betriebliche Altersversorgung*. Verlag Versicherungswirtschaft. 2008  
 Liebwein, P. *Klassische und moderne Formen der Rückversicherung*. Verlag Versicherungswirtschaft. 2009  
 Gesamtverband der Deutschen Versicherungswirtschaft. *Jahrbuch 2011 Die deutsche Versicherungswirtschaft*.  
[http://www.gdv.de/wp-content/uploads/2011/11/GDV\\_Jahrbuch\\_2011.pdf](http://www.gdv.de/wp-content/uploads/2011/11/GDV_Jahrbuch_2011.pdf). 2011  
 Deutsch, E. *Das neue Versicherungsvertragsrecht*. Verlag Versicherungswirtschaft. 2008  
 Schwebler, Knauth, Simmert. *Kapitalanlagepolitik im Versicherungsbinnenmarkt*. 1994  
 Seng. *Betriebliche Altersversorgung*. 1995  
 von Treuberg, Angermayer. *Jahresabschluss von Versicherungsunternehmen*. 1995

**Remarks**

Block course. For organizational reasons, please register with the secretary of the chair: thomas.mueller3@kit.edu.

**Course: Customer Relationship Management [2540508]**

**Coordinators:** A. Geyer-Schulz  
**Part of the modules:** Advanced CRM (p. 31)[WI4BWLISM1]

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

**Learning Control / Examinations**

Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation.

The course is considered successfully taken, if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 25) from exercise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	113
1.3	106
1.7	99
2.0	92
2.3	85
2.7	78
3.0	71
3.3	64
3.7	57
4.0	50
4.7	40
5.0	0

**Conditions**

None.

**Learning Outcomes**

The students

- understand service management as an economic basis for Customer Relationship Management and learn the resulting consequences for the management, the organisation itself and their departments,
- design and develop service concepts and service systems at a conceptual level,
- work on case studies in the CRM-area in small groups with limit time,
- learn English as the technical language in the area of CRM and consult internationale literature from this field for the case studies.

**Content**

The course begins with an introduction into Service Management as the strategic concept which also covers all CRM applications. The course is divided in the basics of Service Management as well as different topics within this concept like external and internal marketing, quality management and organizational requirements.

**Media**

Slides, Audio, Reader

**Literature**

Christian Grönroos. Service Management and Marketing : A Customer Relationship Management Approach. Wiley, Chichester, 2nd edition, 2000.

**Elective literature:**

Jill Dyché. The CRM Handbook: A Business Guide to Customer Relationship Management. Addison-Wesley, Boston, 2nd edition, 2002.

Ronald S. Swift. Accelerating Customer Relationships: Using CRM and RelationshipTechnologies. Prentice Hall, Upper Saddle River, 2001.

Stanley A. Brown. Customer Relationship Management: A Strategic Imperative in theWorld of E-Business. John Wiley, Toronto, 2000.

**Course: Data Mining [2520375]**

**Coordinators:** G. Nakhaeizadeh  
**Part of the modules:** Statistical Methods in Risk Management (p. 69)[W14STAT2]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

Part one: Data Mining

Why Data Mining?

- What is Data Mining?
- History of Data Mining
- Conferences and Journals on Data Mining
- Potential Applications
- Data Mining Process:
- Business Understanding
- Data Understanding
- Data Preparation
- Modeling
- Evaluation
- Deployment
- Interdisciplinary aspects of Data Mining
- Data Mining tasks
- Data Mining Algorithms (Decision Trees, Association Rules, Regression, Clustering, Neural Networks)
- Fuzzy Mining
- OLAP and Data Warehouse
- Data Mining Tools
- Trends in Data Mining

Part two: Examples of application of Data Mining

- Success parameters of Data Mining Projects
- Application in industry
- Application in Commerce

**Literature**

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

- Jiawei Han, Micheline Kamber, *Data Mining : Concepts and Techniques*, 2nd edition, Morgan Kaufmann, ISBN 1558609016, 2006.
- David J. Hand, Heikki Mannila and Padhraic Smyth, *Principles of Data Mining*, MIT Press, Fall 2000
- Trevor Hastie, Robert Tibshirani, Jerome Friedman, *The Elements of Statistical Learning: Data Mining, Inference, and Prediction*, Springer Verlag, 2001.
- Pang-Ning Tan, Michael Steinbach, Vipin Kumar, *Introduction to Data Mining*, Pearson Addison wesley (May, 2005). Hardcover: 769 pages. ISBN: 0321321367
- Ripley, B.D. (1996) *Pattern Recognition and Neural Networks*, Cambridge: Cambridge University Press.
- Ian witten and Eibe Frank, *Data Mining: Practical Machine Learning Tools and Techniques*, 2nd Edition, Morgan Kaufmann, ISBN 0120884070, 2005.

**Course: Database Systems [2511200]****Coordinators:** A. Oberweis, Dr. D. Sommer**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

**Learning Control / Examinations**

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

**Conditions**Knowledge of course *Applied Informatics I - Modelling* [2511030] is expected.**Learning Outcomes**

Students

- are familiar with the concepts and principles of data base models, languages and systems and their applications,
- can design and model relational data bases on the basis of theoretical foundations,
- are able to ensure an error-free operation and the integrity of the data base and
- 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).

**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: Database Systems and XML [2511202]

**Coordinators:** A. Oberweis

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation in the first week after lecture period.

### Conditions

None.

### Learning Outcomes

Students know the basics of XML, as well as appropriate data models and are capable of generating XML documents. They are able to use XML database systems and to formulate queries to XML documents. Furthermore, they know to assess the use of XML in operational practice in different application contexts.

### Content

Databases are a proven technology for managing large amounts of data. The oldest database model, the hierarchical model, was replaced by different models such as the relational or the object-oriented data model. The hierarchical model became particularly important with the emergence of the Extensible Markup Language XML. XML is a data format for structured, semi-structured, and unstructured data. In order to store XML documents consistently and reliably, databases or extensions of existing data base systems are required. Among other things, this lecture covers the data model of XML, concepts of XML query languages, aspects of storage of XML documents, and XML-oriented database systems.

### Media

Slides, access to internet resources.

### Literature

- M. Klettke, H. Meyer: XML & Datenbanken: Konzepte, Sprachen und Systeme. dpunkt.verlag 2003
- H. Schöning: XML und Datenbanken: Konzepte und Systeme. Carl Hanser Verlag 2003
- W. Kazakos, A. Schmidt, P. Tomchyk: Datenbanken und XML. Springer-Verlag 2002
- R. Elmasri, S. B. Navathe: Grundlagen der Datenbanksysteme. 2002
- G. Vossen: Datenbankmodelle, Datenbanksprachen und Datenbankmanagementsysteme. Oldenbourg 2000

**Course: Data Protection Law [24018]**

**Coordinators:** I. Spiecker genannt Döhmann  
**Part of the modules:** Public Business Law (p. 133)[WI4JURA6]

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

**Learning Control / Examinations**

Assessment will consist of a written exam (following §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](http://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. Organisational regulations, particularly data security official will be approached as well. Further on, in a case study current concepts of data protection and the problem of video surveillance will be discussed. Finally, there are three units on sector-specific regulation of telecommunication and teleservice / mediaservice.

**Media**

extensive script with cases; content structure, further information in the lectures

**Literature**

Will be announced in the course.

**Elective literature:**

Will 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: Design and Construction of Landfills for Municipal and Special Waste [09031]****Coordinators:** Egloffstein**Part of the modules:** Safety Science I (p. 126)[WI4INGINTER4], Safety Science II (p. 127)[WI4INGINTER5], Safety Science III (p. 128)[WI4INGINTER6]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Remarks**For further information, see <http://www.agk.uni-karlsruhe.de/index.php> and <http://www2.agk.uni-karlsruhe.de/mitarbeiter/mitarbeiter.html#eh>

**Course: Derivatives [2530550]****Coordinators:** M. Uhrig-Homburg**Part of the modules:** Finance 1 (p. 21)[WI4BWLFBV1], Finance 3 (p. 23)[WI4BWLFBV11], Finance 2 (p. 22)[WI4BWLFBV2]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes**

The objective of the Derivatives lecture is to become familiar with financial markets, especially derivatives markets. Traded securities and frequently used trading strategies will be introduced. Furthermore the pricing of derivatives will be derived and their use in risk management will be discussed.

**Content**

The lecture deals with the application areas and valuation of financial derivatives. After an overview of the most important derivatives and their relevance, forwards and futures are analysed. Then, an introduction to the Option Pricing Theory follows. The main emphasis is on option valuation in discrete and continuous time models. Finally, construction and usage of derivatives are discussed, e.g. in the context of risk management.

**Media**

Slides, Exercises/Exercise sheets

**Literature**

- Hull (2005): Options, Futures, & Other Derivatives, Prentice Hall, 6th Edition

**Elective literature:**

Cox/Rubinstein (1985): Option Markets, Prentice Hall

## Course: Semi- and Decentral Systems [19249]

**Coordinators:** E. Hoffmann, S. Fuchs

**Part of the modules:** Water Supply and Sanitation (p. 112)[WI4INGBGU13]

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

### Learning Control / Examinations

See module description.

### Conditions

Recommended: prior attendance of *Design of Wastewater Treatment Plants and Biosolids Reclaiming Systems (Design of Urban Water and Wastewater Management Systems)* [19243/44] and *Material Flux Analyses - River Basin Management* [19245]

### Learning Outcomes

#### Content

- Ecological and economic aspects of sustainable sanitation systems
- Quantity and quality of domestic wastewater flows
- Nutrient recovery

### Literature

#### Elective literature:

Lange. J., Otterpohl, R.: „ Abwasser: Handbuch zu einer zukunftsfähigen Wasserwirtschaft, Mall-Beton-Verlag, Donaueschingen\_Pföhren (1997)

**Course: Services Marketing and B2B Marketing [2572158]**

**Coordinators:** M. Klarmann  
**Part of the modules:** Sales Management (p. 43)[WI4BWLMAR6]

ECTS Credits	Hours per week	Term	Instruction language
3		Winter term	

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

**Content**

## Course: Document Management and Groupware Systems [2511212]

**Coordinators:** S. Klink

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

The assessment consists of an 1h written exam in the first week after lecture period according to Section 4(2), 1 of the examination regulation).

### Conditions

None.

### Learning Outcomes

Students master the basics of integration and structure of document management systems (DMS) and know the complete DMS process - from document capture of the archiving until retrieval. Students know how to realize operative workflows. They know which activities are needed to carry out the conceptual design and installation of DMS and they are able to apply a DMS as an archive system, workflow system and retrieval system. Furthermore, they know groupware systems exemplarily and can use them for collaborative tasks.

### Content

The lecture gives basics of document management and groupware systems. It covers different system categories, their interaction and their use areas and illustrates this with concrete examples. These include document management in the strict sense, scanning, Document Imaging (acquisition and visualization of scanned documents), indexing, electronic archiving, retrieval of relevant documents, workflow, groupware, and office communications.

### Media

Slides, access to internet resources.

### Literature

- Klaus Götzer, Udo Schneiderath, Berthold Maier, Torsten Komke: Dokumenten-Management. Dpunkt Verlag, 2004, 358 Seiten, ISBN 3-8986425-8-5
- Jürgen Gulbins, Markus Seyfried, Hans Strack-Zimmermann: Dokumenten-Management. Springer, Berlin, 2002, 700 Seiten, ISBN 3-5404357-7-8
- Uwe M. Borghoff, Peter Rödiger, Jan Scheffczyk, Lothar Schmitz: Langzeitarchivierung – Methoden zur Erhaltung digitaler Dokumente. Dpunkt Verlag, 2003, 299 Seiten, ISBN 3-89864-258-5

### Elective literature:

Further literature is given in each lecture individually.

**Course: EDV in Highway Engineering [19316]****Coordinators:** M. Zimmermann**Part of the modules:** Safety, Computing and Law in Highway Engineering (p. 105)[WI4INGBGU3]

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

**Learning Control / Examinations**

See module description.

**Conditions**

See corresponding module information.

**Learning Outcomes****Content**

## Course: eEnergy: Markets, Services, Systems [2540464]

**Coordinators:** C. van Dinther, C. Weinhardt

**Part of the modules:** Energy Economics and Energy Markets (p. 40)[WI4BWLIP4], Information Engineering (p. 37)[WI4BWLISM7], Market Engineering (p. 33)[WI4BWLISM3]

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

### Learning Control / Examinations

The assessment of this course is a written examination (following §4(2), 1 SPO) and by submitting written papers as part of the exercise (following §4,(2), 3 SPO).

The total grade for this lecture will consist to 70% of the grade achieved in the written examination and to 30% of the assignments during the exercises.

### Conditions

None.

### Learning Outcomes

The student

- understands the tasks and basic structure of the energy economy, in particular concerning electricity markets,
- understands the change in the energy economy and the necessity for the development of a Smart Grid,
- knows the market mechanisms in the energy market and their role in coordination and allocation of electric energy,
- is able to describe the relation between OTC, spot and balancing energy markets,
- knows the regulation specifications for energy markets and can reflect them critically,
- is able to model smart grid mechanisms and to evaluate them by simulation based methods.

### Content

Scope of the lecture *eEnergy: Markets, Services, Systems* is economics and information management in energy markets. Integration of the growing number of renewable energy sources imposes new challenges on energy markets and the power system. To improve coordination between supply and demand it is necessary to interlink centralized and decentralized generators as well as consumers by means of ICT. Current electricity networks are extended by intelligent IT components thus incorporating the "Smart Grid". Existing market structures for electricity have to be adjusted for a successful implementation of demand side management and integration of an increasing number of renewable energy producers as well as electric vehicles. Apart from regulatory and economic concepts, methods for modeling and analysis of energy markets are introduced and explained during the course.

The lecture is structured as follows:

1. **Electricity Markets**  
Market Models, EEX (spot and futures market), OTC Trading, Market Coupling
2. **Regulation**  
Charges and Incentives, Network Congestion (Management)
3. **Demand Side Management**  
Smart Meters, Tariffs, Price Elasticity, Storage Systems, Electric Mobility
4. **Modeling and Analysis of Energy Markets**

### Media

- Powerpoint
- eLearning Plattform Ilias

### Literature

- Erdmann G, Zweifel P. *Energieökonomik, Theorie und Anwendungen*. Berlin Heidelberg: Springer; 2007.
- Grimm V, Ockenfels A, Zoettl G. Strommarktdesign: Zur Ausgestaltung der Auktionsregeln an der EEX \*. *Zeitschrift für Energiewirtschaft*. 2008:147-161.
- Stoft S. *Power System Economics: Designing Markets for Electricity*. IEEE; 2002.,
- Ströbele W, Pfaffenberger W, Heuterkes M. *Energiewirtschaft: Einführung in Theorie und Politik*. 2nd ed. München: Oldenbourg Verlag; 2010:349.

### Remarks

The lecture has also been added in the IIP Module "Basics of Liberalised Energy Markets".

## Course: Efficient Energy Systems and Electric Mobility [2581006]

**Coordinators:** R. McKenna, P. Jochem  
**Part of the modules:** Energy Economics and Technology (p. 41)[WI4BWLIP5]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Summer term	en

### Learning Control / Examinations

**Conditions**  
None.

### Learning Outcomes

- Understand the concept of energy efficiency as applied to specific systems
- Obtain an overview of the current trends in energy efficiency
- Be able to determine and evaluate alternative methods of energy efficiency improvement
- Overview of technical and economical stylized facts on electric mobility
- Judging economical, ecological and social impacts through electric mobility

### Content

This lecture series combines two of the most central topics in the field of energy economics at present, namely energy efficiency and electric mobility. The objective of the lecture is to provide an introduction and overview to these two subject areas, including theoretical as well as practical aspects, such as the technologies, political framework conditions and broader implications of these for national and international energy systems.

The energy efficiency part of the lecture provides an introduction to the concept of energy efficiency, the means of affecting it and the relevant framework conditions. Further insights into economy-wide measurements of energy efficiency, and associated difficulties, are given with recourse to several practical examples. The problems associated with market failures in this area are also highlighted, including the Rebound Effect. Finally and by way of an outlook, perspectives for energy efficiency in diverse economic sectors are examined.

The electric mobility part of the lecture examines all relevant issues associated with an increased penetration of electric vehicles including their technology, their impact on the electricity system (power plants and grid), their environmental impact as well as their optimal integration in the future private electricity demand (i.e. smart grids and V2G). Besides technical aspects the user acceptance and behavioral aspects are also discussed.

### Media

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

### Literature

Will be announced in the lecture.



**Course: Efficient Algorithms [2511100]****Coordinators:** H. Schmeck**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

**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: Efficient Creativity - Processes and Methods within the Automotive Industry [2122371]****Coordinators:** Lamberti**Part of the modules:** Virtual Engineering B (p. 90)[WW4INGMB30], Virtual Engineering A (p. 89)[WW4INGMB29]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

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

**Coordinators:** R. Riordan

**Part of the modules:** Finance 2 (p. 22)[WI4BWLFBV2], Finance 3 (p. 23)[WI4BWLFBV11], Market Engineering (p. 33)[WI4BWLISM3]

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

### Learning Control / Examinations

70% of the mark is based on the written examination and 30% is based on assignments during the exercises.

### Conditions

None.

### Learning Outcomes

The students

- are able to understand the theoretical and practical aspects of securities 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 platforms
- are able to analyse capital marketplaces concerning their efficiency, weaknesses and technical configuration
- are able to apply theoretical methods of econometrics
- are able to understand, criticize and present articles with a finance-scientific background
- learn to elaborate solutions in a team.

### Content

The theoretical part of the course examines the New Institutions Economics which provides a theoretically found explanation for the existence of markets and intermediaries. Building upon the foundations of the market micro structure, several key parameters and factors of electronic trading are examined. These insights gained along a structured securities trading process are complemented and verified by the analysis of prototypical trading systems developed at the institute as well as selected trading systems used by leading exchanges in the world. In the more practical-oriented second part of the lecture, speakers from practice will give talks about financial trading systems and link the theoretical findings to real-world systems and applications.

### Media

- Powerpoint presentations
- recorded lecture available on the internet

### Literature

- Picot, Arnold, Christine Bortenlänger, Heiner Röhr (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 in Ceramics [2125755]

**Coordinators:** M. Hoffmann

**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an oral exam (20-30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

### Conditions

The course *Material Science I* [21760] has to be completed beforehand.

Basic knowledge of natural science and knowledge of the content *Material Science II* [21782] is recommended.

### Learning Outcomes

The lecture gives an overview of the relationship among processing, microstructure and properties of ceramics. Important processing routes and characterization methods will be discussed on various examples.

### Content

The course is arranged in the following units:

- Atomic bonding in solids
- Crystal structures and structural imperfections
- Surfaces, interfaces and grain boundaries
- Binary and ternary phase diagrams
- Structure of glass
- Characterization and processing of ceramic powders
- Shaping methods (pressing, slip casting, injection molding)
- Densification and grain growth (sintering)
- Introduction to fracture mechanics, strength and failure probability of brittle materials
- Materials behavior at high temperatures (creep, oxidation)
- Toughening mechanisms
- Methods for microstructural characterization

### Literature

#### Elective literature:

- H. Salmang, H. Scholze, „Keramik“, Springer-Verlag
- Kingery, Bowen, Uhlmann, „Introduction To Ceramics“, Wiley-Verlag

## Course: Railway Logistics, Management and Operating - Part II [19321]

**Coordinators:** E. Hohnecker

**Part of the modules:** Public Transportation Operations (p. 106)[WI4INGBGU4]

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

### Learning Control / Examinations

The assessment will consist of a oral exam (20 min) according to §4 (2), 1 of the examination regulation.

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.

### Conditions

See module description.

### Learning Outcomes

#### Content

operation modi in europe and america; international signalling systems;

#### Literature

##### Elective literature:

Pachl: Systemtechnik des Schienenverkehrs, Teubner-Verlag, Stuttgart

**Course: Electronic Business for Industrial Companies [2149666]****Coordinators:** Weisbecker**Part of the modules:** Global Production and Logistics (p. 74)[WI4INGMB31]

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

**Learning Control / Examinations**

The assessment consists of an oral exam (20 min) taking place during the recess period (according to Section 4(2), 1 or 2) of the examination regulation).

The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

**Conditions**

None.

**Learning Outcomes****Content****Remarks**

The credits were changed to 4 CP.

**Course: Electrical Rail Vehicles [23346]****Coordinators:** G. Clos**Part of the modules:** Guided Systems Engineering (p. 108)[WI4INGBGU6]

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

**Learning Control / Examinations**

The assessment will consist of a oral exam (20 min) according to §4 (2), 2 of the examination regulation.

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.

**Conditions**

See module description.

See module description.

**Learning Outcomes****Content**

traction modi; engines; power supply; electrical elements in signalling / operation

**Literature****Elective literature:**

Steimel: Elektrische Triebfahrzeuge und ihre Energieversorgung, Oldenbourg-Verlag, München

**Course: Electronic Markets (Principles) [2540502]**

**Coordinators:** A. Geyer-Schulz  
**Part of the modules:** Electronic Markets (p. 32)[WI4BWLISM2]

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

**Learning Control / Examinations**

Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation.

The course is considered successfully taken, if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 25) from exercise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	113
1.3	106
1.7	99
2.0	92
2.3	85
2.7	78
3.0	71
3.3	64
3.7	57
4.0	50
4.7	40
5.0	0

**Conditions**

None.

**Learning Outcomes**

The student

- has an overview about the different organizational form and their efficiency,
- names coordination methods and motivation methods and evaluates them regarding their efficiency,
- knows, in the context of markets as a coordination form, the conditions under which markets are not efficient (market failure),
- knows phenomena like adverse selections and moral hazard,
- names reasons for these phenomena and develops methods to encounter them.

**Content**

What are the conditions that make electronic markets develop? The first part of the lecture treats the selection of the type of organization as an optimization of transaction costs. The second part includes the efficiency of electronic markets (price, information and allocation efficiency) as well as reasons for market failure.

Besides a centralistic approach, markets can be used for decentral coordination of plans and activities. Hereby, optimality can be guaranteed, if the coordination problem has no design or innovation characteristics. Viewed from a bottom-up perspective, given the coordination problem, it is possible to answer questions regarding the centralization or decentralization, the design of coordination mechanisms, and the coherence of business strategies. The last part of the lecture consists of motivation problems, like bounded rationality and information asymmetries (private information and moral hazard) and the development of incentive systems.

**Literature**

Kapitel "Management Control Systems, Dezentralisierung, interne Märkte und Transferpreise" (S. 745-773) in Charles T. Horngren, Srikant M. Datar, and George Foster. Cost Accounting: A Managerial Emphasis. Prentice Hall, Upper Saddle River, 11 edition, 2003.

Paul Milgrom and John Roberts. Economics, Organisation and Management. Prentice Hall, 1 edition, 1992.

**Elective literature:**

Michael Dell and Catherine Fredman. Direct from DELL: Strategies that Revollutionized an Industry. Harper Collins Publisher, London, 1999.



Andreas Geyer-Schulz, Michael Hahsler, and Maximillian Jahn. Educational and scientific recommender systems: Designing the information channels of the virtual university. *International Journal of Engineering Education*, 17(2):153 – 163, 2001.

Friedrich A. Hayek. The use of knowledge in society. *The American Economic Review*, 35(4):519 – 530, Sep 1945.

Norbert Hochheimer. *Das kleine QM-Lexikon*. Wiley-UCH, Weinheim, 2002.

Adam Smith. *An Inquiry into the Nature and Causes of the Wealth of Nations*, volume II. 1976.

## Course: Elements and Systems of Technical Logistics [2117096]

**Coordinators:** M. Mittwollen, V. Madzharov

**Part of the modules:** Introduction to Logistics (p. 83)[WI4INGMB20], Technical Logistics (p. 85)[WI4INGMB27]

ECTS Credits	Hours per week	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

LV 2117095 must be passed successfully - examination dates are sequenced accordingly

### Learning Outcomes

The student:

- knows about elements and systems of technical logistics
- knows about structures and function of special conveying machines
- knows about material flow systems
- and is able to equip material flow systems with applicable machines

### Content

material flow systems and their (conveying) technical components

mechanical behaviour of conveyors;

dedicated use of knowledge from *basics of technical logistics*

detailed 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

### Media

supplementary sheets, projector, blackboard

### Literature

recommendations during lectures

**Course: Emissions into the Environment [2581962]****Coordinators:** U. Karl**Part of the modules:** Industrial Production II (p. 38)[WI4BWLIIIP2], Safety Science I (p. 126)[WI4INGINTER4], Safety Science II (p. 127)[WI4INGINTER5], Safety Science III (p. 128)[WI4INGINTER6]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Winter term	de

**Learning Control / Examinations**

The examination will be in form of an written exam acc. to §4(2), 1 ER with a duration of 1h.

**Conditions**

None.

**Learning Outcomes**

The student should identify problems of industrial pollution control.

The student knows solutions to these problems and their ways of application.

**Content**

The course will provide an overview of sources of air pollution, waste and municipal waste; methods to monitor and to reduce/manage pollutant flows; regulatory framework on national and international level.

**A Air pollution control**

- Introduction and definitions
- Sources and pollutants
- Regulatory framework
- Emission monitoring
- Air pollution control measures

**B Waste management and Recycling**

- Introduction and regulatory framework
- Statistics and logistics
- Recycling and disposal
- Waste treatment

**C Waste water treatment**

- Municipal waste water treatment systems
- Sewage sludge disposal

**Media**

Media will be provided on learning platform.

**Literature****Elective literature:**

A compilation of documents is made available on the web.

**Course: Transportation Data Analysis [19337/19338]****Coordinators:** M. Kagerbauer, T. Streit**Part of the modules:** Transportation Systems (p. [109](#))[WI4INGBGU8]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: The Making of Emulsions and Dispersions [22229]****Coordinators:** Köhler**Part of the modules:** Specialization in Food Process Engineering (p. 120)[WI4INGCV4]

ECTS Credits	Hours per week	Term	Instruction language
3	2		de

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

## Course: Theory of endogenous growth [2561503]

**Coordinators:** I. Ott

**Part of the modules:** Innovation and growth (p. 57)[WW4VWLIWW1], Concentration, convergence, and divergence (p. 56)[WI4VWL12]

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

### Learning Control / Examinations

The assessment consists of a written exam (60 min) according to Section 4(2), 1 of the examination regulation. The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Students will be given the opportunity of writing and presenting a short paper during the lecture time to achieve a bonus on the exam grade. If the mandatory credit point exam is passed, the awarded bonus points will be added to the regular exam points. A deterioration is not possible by definition, and a grade does not necessarily improve, but is very likely to (not every additional point improves the total number of points, since a grade can not become better than 1). The voluntary elaboration of such a paper can not countervail a fail in the exam.

### Conditions

None.

### Recommendations

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

### Learning Outcomes

Students shall be given the ability to understand, analyze and evaluate selected models of endogenous growth theory.

### Content

- Basic models of endogenous growth
- Human capital and economic growth
- Modelling of technological progress
- Diversity Models
- Schumpeterian growth
- Directional technological progress
- Diffusion of technologies

### Media

- lecture slides
- exercises

### Literature

Excerpt:

- Acemoglu, D. (2008): Introduction to modern economic growth. Princeton University Press, New Jersey.
- Aghion, P., Howitt, P. (2009): Economics of growth, MIT-Press, Cambridge/MA.
- Barro, R.J., Sala-I-Martin, X. (2003): Economic Growth. MIT-Press, Cambridge/MA.
- Sydsaeter, K., Hammond, P. (2008): Essential mathematics for economic analysis. Prentice Hall International, Harlow.
- Sydsæter, K., Hammond, P., Seierstad, A., Strom, A., (2008): Further Mathematics for Economic Analysis, Second Edition, Pearson Education Limited, Essex.

**Course: Energy and Environment [2581003]****Coordinators:** U. Karl, n.n.**Part of the modules:** Environmental Economics (p. 53)[WI4VWL5], Energy Economics and Technology (p. 41)[WI4BWLIP5]

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

**Learning Control / Examinations**

The examination will be in form of a written exam acc. to §4(2), 2 ER.

**Conditions**

None.

**Learning Outcomes****Content**

**Course: Energy and Process Technology I for Business Engineers [2157961]****Coordinators:** K. Dullenkopf, H. Wirbser, A. Velji**Part of the modules:** Energy and Process Technology I (p. 101)[WI4INGMBITS1]

ECTS Credits	Hours per week	Term	Instruction language
9	4/2	Winter term	de

**Learning Control / Examinations**

The assessment consists of a written exam (120 minutes) (following §4(2), 1 of the examination regulation).

**Conditions**

None.

**Recommendations**

None.

**Learning Outcomes****Content**



**Course: Energy and Process Technology II for Business Engineers [2170832]****Coordinators:** K. Dullenkopf, M. Gabi, A. Velji, H. Wirbser**Part of the modules:** Energy and Process Technology II (p. [102](#))[WI4INGMBITS2]

ECTS Credits	Hours per week	Term	Instruction language
9	4/2	Summer term	de

**Learning Control / Examinations**

The assessment consists of a written exam (120 minutes) (following §4(2), 1 of the examination regulation).

**Conditions**

None.

**Learning Outcomes****Content**

## Course: Energy efficient intralogistic systems [2117500]

**Coordinators:** F. Schönung

**Part of the modules:** Introduction to Logistics (p. 83)[WI4INGMB20], Technical Logistics (p. 85)[WI4INGMB27]

ECTS Credits	Hours per week	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

Knowledge of Electrical Engineering and Technical Mechanics is recommended.

### Learning Outcomes

The lecture provides basics for the analysis and the design of energy and resource efficient intralogistic systems for production and distribution.

### Content

The main focuses of the course are:

- 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.

**Course: Energy Trade and Risk Management [2581020]**

**Coordinators:** K. Hufendiek  
**Part of the modules:** Energy Economics and Energy Markets (p. 40)[WI4BWLIP4]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/1	Summer term	de

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes****Content****Media**

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

**Literature****Elective literature:**

Burger, M., Graeber, B., Schindlmayr, G. (2007): *Managing energy risk: An integrated view on power and other energy markets*, Wiley&Sons, Chichester, England  
 EEX (2010): *Einführung in den Börsenhandel an der EEX auf Xetra und Eurex*, www.eex.de  
 Erdmann, G., Zweifel, P. (2008), *Energieökonomik, Theorie und Anwendungen*, Springer, ISBN: 978-3-540-71698-3  
 Hull, J.C. (2006): *Options, Futures and other Derivatives*, 6. Edition, Pearson Prentice Hall, New Jersey, USA  
 Borchert, J., Schlemm, R., Korth, S. (2006): *Stromhandel: Institutionen, Marktmodelle, Pricing und Risikomanagement (Gebundene Ausgabe)*, Schäffer-Poeschel Verlag  
 www.riskglossary.com

**Course: Energy Policy [2581959]****Coordinators:** M. Wietschel**Part of the modules:** Energy Economics and Energy Markets (p. 40)[WI4BWLIP4]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Summer term	de

**Learning Control / Examinations**

The assessment consists of a written exam 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****Content**

The course deals with material and energy policy of policy makers and includes the effects of such policies on the economy as well as the involvement of industrial and other stakeholders in the policy design. At the beginning the neoclassical environment policy is discussed. Afterwards the Sustainable Development concept is presented and strategies how to translate the concept in policy decision follows. In the next part of the course an overview about the different environmental instruments classes, evaluation criteria for these instruments and examples of environmental instruments like taxes or certificates will be discussed. The final part deals with implementation strategies of material and energy policy.

**Literature**

Will be announced in the lecture.

**Course: Energy Systems Analysis [2581002]****Coordinators:** A. Eßer-Frey**Part of the modules:** Energy Economics and Technology (p. 41)[WI4BWLIIIP5]

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

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes****Content****Media**

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

**Remarks**

Since 2011 the lecture is offered in winter term. Exams can still be taken in summer term.

## Course: Power Transmission and Power Network Control [23372/23374]

**Coordinators:** T. Leibfried

**Part of the modules:** Generation and transmission of renewable power (p. 118)[WI4INGETIT7]

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

### Learning Control / Examinations

The assessment consists of a written exam (120 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

The course *Power Network Analysis* [23371] has to be completed successfully beforehand.

### Learning Outcomes

The goal is to relay further and deeper theoretical fundamentals in the field of electric power technology and power transmission.

In the first part the lecture deals with the dynamic behaviour of synchronous generators. The second main chapter deals with HVDC, a technology for the transmission of a high amount of electric energy. Subsequently, FACTS are presented which help to increase the flexibility of power transmission systems. Finally, the dynamic behaviour of power stations and the entire power grid will be discussed.

Supporting the lecture, assignments to the curriculum are distributed. Their solution is presented and discussed during lecture hall exercises.

### Content

In its first part, this lecture introduces the dynamic behaviour of synchronous generators and the mathematical description.

In a first step, the construction of synchronous generators is described. Then, the dq0 frame and its application for the mathematical description of the dynamic behaviour of synchronous generators is presented. Subsequently, the transition from the common mathematical description of synchronous generators towards the equations describing the steady state condition is shown. Then, transients are discussed at the example of a 60 Hz synchronous generator. Finally, the short circuit nearby the generator using the dq0 frame is discussed.

The second chapter deals with the HVDC technology. First of all, the characteristics of HVDC for power transmission are discussed. Then, line commutated current converters are introduced, especially the B6 circuit and 12 pulse current converters consisting of two B6 circuits switched in series are discussed. Then, the HVDC system configuration and components like filters, thyristors, smoothing reactors and converter transformers are presented. Finally, the basic control concept for HVDC transmission systems is shown.

The third and very comprehensive chapter deals with the technology and characteristics of FACTS, which can be used to increase the flexibility and the transmission capacity of power transmission systems. First of all the fields of application of FACTS are described. Then, the individual FACTS circuits and their mathematical description are presented, which can be divided into FACTS switched in series and parallel to the grid.

The fourth chapter deals with the dynamic behaviour of power stations and power grids. In the first part of the chapter, the system control modelling of power stations and power grids is presented. Then, the causes of frequency and voltage deviations in the grid are discussed. The main part of the chapter deals with the frequency control in the power grid.

Finally, the voltage control of the power grid is presented.

To accompany the lecture, a collection of problems can be downloaded. During lecture hall exercises their solutions will be discussed.

### Media

Online material is available on: [www.ieh.uni-karlsruhe.de](http://www.ieh.uni-karlsruhe.de) and can be downloaded using a password.

### Literature

Will be announced in the lecture notes.

### Remarks

The credits have been reduced to 4,5 in summer term 2011.

## Course: Enterprise Architecture Management [2511600]

**Coordinators:** T. Wolf

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

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

### Conditions

None.

### Learning Outcomes

Students understand the connection between enterprise strategy, business processes and business objects and IT architecture; they know methods to depict these connections and how they can be developed based on each other.

### Content

The following topics will be covered: components of enterprise architecture, enterprise strategy including methods to develop strategies, business process (re)engineering, methods to implement changes within enterprises (management of change)

### Media

Slides, access to internet resources.

### Literature

- Nolan, R., Croson, D.: Creative Destruction: A Six-Stage Process for Transforming the Organization. Harvard Business School Press, Boston Mass. 1995
- Doppler, K., Lauterburg, Ch.: Change Management. Campus Verlag 1997
- Jacobson, I.: The Object Advantage, Business Process Reengineering with Object Technology. Addison-Wesley Publishing Company, Wokingham England 1994
- Keller, G., Teufel, Th.: SAP R/3 prozessorientiert anwenden. Addison Wesley 1998
- Österle, H.: Business Engineering Bd. 1 und 2. Springer Verlag, Berlin 1995

## Course: Enterprise Risk Management [2530326]

**Coordinators:** U. Werner

**Part of the modules:** Operational Risk Management II (p. 27)[WI4BWLFBV10], Operational Risk Management I (p. 26)[WI4BWLFBV9]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	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.

### Literature

- K. Hoffmann. Risk Management - Neue Wege der betrieblichen Risikopolitik. 1985.
- R. Hölscher, R. Elfgén. 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.

### Remarks

For organizational reasons, please register with the secretary of the chair: thomas.mueller3@kit.edu.



**Course: Decision Theory [2520365]**

**Coordinators:** K. Ehrhart  
**Part of the modules:** Applied Strategic Decisions (p. 46)[WI4VWL2]

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

**Learning Control / Examinations**

The assessment of this course is a written examination (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.

**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. Edition.
- Berninghaus, S.K., K.-M. Ehrhart und W. Güth (2006): Strategische Spiele. Berlin u.a.: Springer, 3., Edition

**Remarks**

Until summer term 2010 this lecture was called "Economic Theory of Uncertainty."

## Course: Decision Theory and Objectives in Applied Politics [25537]

**Coordinators:** A. Melik-Tangyan  
**Part of the modules:** Social Choice Theory (p. 49)[WI4VWL9]

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

### Learning Control / Examinations

#### Conditions

None.

### Learning Outcomes

#### Content

A decision model usually consists of a utility function which represents the decision maker's preference to be maximized, and constraints which represent financial, juridical and other restrictions. In policy making, the bottle neck is the definition of the utility function which can be viewed as an aggregated indicator for policy monitoring and evaluation. The lecture course deals with theoretical methods for (i) constructing quadratic and additive utility functions, (ii) eliciting the required data from policy makers, (iii) constructing aggregated indicators with their applications to labour market policies (flexicurity, decent work, aiding regions), and (iv) finding equilibrium prices.

**Course: Design and Construction Highways [19065]****Coordinators:** R. Roos**Part of the modules:** Design, Construction, Operation and Maintenance Highways (p. 103)[WI4INGBGU1], Highway Engineering (p. 104)[WI4INGBGU2]

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

**Learning Control / Examinations**

See module description.

**Conditions**

See corresponding module information.

**Learning Outcomes****Content**

**Course: Gas-Markets [2581022]****Coordinators:** A. Pustisek**Part of the modules:** Energy Economics and Energy Markets (p. 40)[WI4BWLIP4]

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

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes****Content****Media**

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

## Course: Discrete-event Simulation in Production and Logistics [n.n.]

**Coordinators:** S. Nickel, S. Spieckermann

**Part of the modules:** Operations Research in Supply Chain Management and Health Care Management (p. 64)[WI4OR5]

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

### Learning Control / Examinations

The assessment consists of a written paper and an oral exam (according to §4(2), 3 of the examination regulation).

### Conditions

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

### Recommendations

Besides knowledge of Operations Research students are assumed to be familiar with the following topics:

- Introduction in Statistics
- Programming basics (algorithms and data structures)
- Basic knowledge in production and logistics

### Learning Outcomes

The course covers basic concepts of discrete event simulation models and qualifies students for the computer-based usage of simulation systems. This enables students to structure simulation studies according to process models. Additionally, students deepen their knowledges for logical issues and discover the importance of statistical methods in in modeling and evaluation of simulation models. Students gain insight to coupled systems of simulation and meta-heuristics, and they are able to characterize simulation programs.

### Content

Simulation of production and logistics systems is an interdisciplinary subject connecting expert knowledge from production management and operations research with mathematics/statistics as well as computer science and software engineering. With completion of this course, students know statistical foundations of discrete simulation, are able to classify and apply related software applications, and know the relation between simulation and optimization as well as a number of application examples. Furthermore, students are enabled to structure simulation studies and are aware of specific project scheduling issues.

### Remarks

The course is planned to be held every summer term.

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

**Course: Economic integration in Europe [2561257]****Coordinators:** J. Kowalski**Part of the modules:** Economic Policy (p. 50)[WI4VWL6], Economic Policy II (p. 51)[WW4VWL3]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Literature****Elective literature:**

Baldwin, R./ Wyplosz, M.: "The economics of European Integration" McGraw-Hill 2006, 2nd Edition

**Course: European and International Law [24666]**

**Coordinators:** I. Spiecker genannt Döhmann  
**Part of the modules:** Public Business Law (p. 133)[WI4JURA6]

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

**Learning Control / Examinations**

The assessment consists of a written exam (following §4(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](http://www.kit.edu/zar))

**Learning Outcomes**

Due to the Europeanization of national law, the examination of European law is indispensable for everyone aiming to gain basic legal knowledge. Hardly any national activity can be imagined without the consideration of presetting of European Community law. By comparison, the influence of international law is of small importance. In light of this, the lecture predominantly deals with European law and imparts the knowledge of the EU law necessary for the students in order to comprehend how the national law is being covered by European Community law defaults. Afterwards, the student should be able to solve questions regarding European legislation in a problem-oriented manner. As the subject matter partly will be acquired in discourse with the students, it is necessary to acquire a corpus juris (e.g. Beck-Texte "Europarecht").

**Content**

The lecture predominantly deals with the European law: in the origin, this contains an analysis of history from the EEC to EC and EU, of participants (parliament, commission, council, European Court of Justice), of sources of law (regulations, directives, final judgements, opinions, recommendations) and legislative procedure. Further, the lecture focuses on the basic liberties of the EC, which enable a free flow of goods (for example of beer not matching the German purity law), persons (like the professional footballer Bosman), services (like entrepreneurial activities) and capital. In addition, the charter of fundamental rights of the EC and the rules of competition will be discussed, in each case in the light of a concrete legal case. Moreover, the fundamental rights of the European Convention on Human Rights (ECHR) are being introduced. Concluding, a short survey of international law, especially of the World Trade Organization (WTO), will be given.

**Media**

extensive script with cases; content structure, further information in the lectures

**Literature**

Further details will be announced in the lecture.

**Elective literature:**

Further details will be announced in the lecture.

**Course: Experimental Economics [2520373]****Coordinators:** M. Adam, Ch. Weinhardt**Part of the modules:** Applied Strategic Decisions (p. 46)[WI4VWL2], Market Engineering (p. 33)[WI4BWLISM3]

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

**Learning Control / Examinations**

The assessment of this course is a written examination (following §4(2), 1 SPO).

**Conditions**

See corresponding module information.

**Learning Outcomes**

The students should learn

- how to gain scientific experience and knowledge (philosophy of science),
- how Game Theory and Experimental Economics influenced each other in scientific research,
- about the methods as well as the strengths and weaknesses of Experimental Economics,
- some examples of experimental research, such as markets and auctions, coordination games, bargaining, decision making under risk,
- how to evaluate data.

**Content**

Experimental Economics have become a separate field in Economics. Nearly all fields of the economic discipline use economic experiments to verify theoretical results. Besides being used for empirical validation, this method is applied in political and strategic consulting. The lecture gives an introduction to experimental methods in economics and shows differences to experiments in natural sciences. Scientific studies are used to show exemplary applications.

**Media**

Classroom experiments or experiments in the computer laboratory will be conducted. To some extent, slides are made available online.

**Literature**

- Strategische Spiele; S. Berninghaus, K.-M. Ehrhart, W. Güth; Springer Verlag, 2nd ed., 2006.
- Handbook of Experimental Economics; J. Kagel, A. Roth; Princeton University Press, 1995.
- Experiments in Economics; J.D. Hey; Blackwell Publishers, 1991.
- Experimental Economics; D.D. Davis, C.A. Holt; Princeton University Press, 1993.
- Experimental Methods: A Primer for Economists; D. Friedman, S. Sunder; Cambridge University Press, 1994.

**Remarks**

- The Lecture was taken over by Marc Adam, PhD, in the winter term 2011/12.



## Course: Experimental Lab Class in Welding Technology, in Groups [2173560]

**Coordinators:** V. Schulze

**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of a written report at the end of the experimental lab (according to Section 4(2), 3 of the examination regulation).

### Conditions

The participation in the course *Welding Technology I/II* [21565/21570] is assumed.

### Learning Outcomes

During the lab class a survey of current welding processes and their suitability for joining different materials is given. An important goal of the lab class is to understand and to evaluate the advantages and disadvantages of the individual procedures.

### Content

- Gas welding of steels with different weld geometries
- Gas welding of cast iron, nonferrous metals
- Brazing of aluminum
- Electric arc welding with different weld geometries
- Gas welding according to the TIG, MIG and MAG procedures

### Media

Distributed during the lab attendance.

### Literature

#### Elective literature:

Distributed during the lab attendance.

## Course: The Management of R&D Projects with Case Studies [2581963]

**Coordinators:** H. Schmied

**Part of the modules:** Industrial Production III (p. 39)[WI4BWLIP6]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/2	Winter / Summer Term	de

### Learning Control / Examinations

The examination will be in form of a written exam acc. to §4(2), 1 ER. Exams are offered in every semester and can be re-examined at every ordinary examination date.

### Conditions

None.

### Learning Outcomes

- Students shall be able to discuss different tasks of R&D-management.
- Students shall be able to apply common approaches to solve these general problems.

### Content

- The communication between R&D, production and marketing.
- Problems concerning measuring the productivity of the R&D system.
- Methods for improving the productivity of R&D systems.
- Planning of R&D projects with the help of the Communication-Matrix-Methods for controlling R&D projects' progress.
- The marketing of scientific skills.
- The communication matrix as a tool for the implementation of simultaneous engineering.
- Case studies.

### Literature

will be announced in the course

## Course: Handling Characteristics of Motor Vehicles I [2113807]

**Coordinators:** H. Unrau

**Part of the modules:** Handling Characteristics of Motor Vehicles (p. 78)[WI4INGMB6]

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

### Learning Control / Examinations

The assessment consists of an oral exam (30-40 min) taking place in the recess period and in the lecture 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.

### Recommendations

It is recommended to attend the course *Basics of Automotive Engineering I and II* [2113805 and 2114835] beforehand.

### Learning Outcomes

The students know the basic connections between drivers, vehicles and environment. They can build up a vehicle simulation model, with which forces of inertia, aerodynamic forces and tyre forces as well as the appropriate moments are considered. They have proper knowledge in the area of tyre characteristics, since a special meaning comes to the tire behavior during driving dynamics simulation.

### Content

1. Problem definition: Control loop driver - vehicle - environment (e.g. coordinate systems, modes of motion of the car body and the wheels)
2. Simulation models: Creation from motion equations (method according to D'Alembert, method according to Lagrange, programme packages for automatically producing of simulation equations), model for handling characteristics (task, motion equations)
3. Tyre behavior: Basics, dry, wet and winter-smooth roadway

### Literature

#### Elective literature:

1. Willumeit, H.-P.: Modelle und Modellierungsverfahren in der Fahrzeugdynamik, B. G. Teubner Verlag, 1998
2. Zomotor, A.: Fahrwerktechnik: Fahrverhalten, Vogel Verlag, 1991
3. Gnadler, R.: Umdrucksammlung zur Vorlesung "Fahreigenschaften von Kraftfahrzeugen I"

## Course: Handling Characteristics of Motor Vehicles II [2114838]

**Coordinators:** H. Unrau

**Part of the modules:** Handling Characteristics of Motor Vehicles (p. 78)[WI4INGMB6]

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

### Learning Control / Examinations

The assessment will consist of an oral exam (30-40 min) taking place in the recess period and in the lecture 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.

### Recommendations

It is recommended to attend the course *Handling Characteristics of Motor Vehicles I* [2113807] and *Basics of Automotive Engineering I and II* [2113805 and 2114835] beforehand.

### Learning Outcomes

The students have an overview of common test methods, with which the handling of vehicles is gauged. They are able to interpret results of different stationary and transient testing methods. Apart from the methods, with which e.g. the driveability in curves or the transient behaviour from vehicles can be registered, also the influences from cross-wind and from uneven roadways on the handling characteristics are well known. They are familiar with the stability behavior from single vehicles and from vehicles with trailer.

### Content

1. Vehicle handling: Bases, steady state cornering, steering input step, single sine, double track switching, slalom, cross-wind behavior, uneven roadway
2. stability behavior: Basics, stability conditions for single vehicles and for vehicles with trailer

### Literature

#### Elective literature:

1. Richter, B.: Schwerpunkte der Fahrzeugdynamik, Verlag TÜV, 1990
2. Zomotor, A.: Fahrwerktechnik: Fahrverhalten, Vogel Verlag, 1991
3. Gnadler, R.: Umdrucksammlung zur Vorlesung "Fahreigenschaften von Kraftfahrzeugen II "

**Course: Vehicle Mechatronics I [2113816]**

**Coordinators:** Ammon  
**Part of the modules:** Handling Characteristics of Motor Vehicles (p. 78)[WI4INGMB6], Vehicle Development (p. 79)[WI4INGMB14]

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

**Learning Control / Examinations**

The assessment will consist of an oral exam (30-40 min) 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**

It is recommended to have knowledge of control engineering, technical mechanics and automobile technology.

**Learning Outcomes**

The students have an overview of the system science field of mechatronics and its application in the area of vehicle conception, especially in the context of vehicle system dynamics. They know the tools and methods for a systematic analysis, conception, and design of mechatronic systems, focussing on mechatronically extended suspension systems.

**Content**

1. Introduction: Mechatronics in vehicle technology
2. Vehicle Control systems  
 Brake- and traction controls (ABS, ASR, automated power train controls)  
 Active and semiactive suspension systems, active stabilizer bars  
 Vehicle dynamics controls, driver assistance systems
3. Modelling technology  
 Mechanics - multi body dynamics  
 Electrical and electronical systems, control systems  
 Hydraulics  
 Interdisciplinary coupled systems
4. Computer simulation technology  
 Numerical integration methods  
 Quality (validation, operating areas, accuracy, performance)  
 Simulator-coupling (hardware-in-the-loop, software-in-the-loop)
5. Systemdesign (example: brake control)  
 Demands, requirements (funktion, safety, robustness)  
 Problem setup (analysis - modelling - model reduction)  
 Solution approaches  
 Evaluation (quality, efficiency, validation area, concept ripeness)

**Literature****Elective literature:**

1. Ammon, D., Modellbildung und Systementwicklung in der Fahrzeugdynamik, Teubner, Stuttgart, 1997
2. Mitschke, M., Dynamik der Kraftfahrzeuge, Bände A-C, Springer, Berlin, 1984ff
3. Miu, D.K., Mechatronics - Electromechanics and Contromechanics, Springer, New York, 1992
4. Popp, K. u. Schiehlen, W., Fahrzeugdynamik - Eine Einführung in die Dynamik des Systems Fahrzeug-Fahrweg, Teubner, Stuttgart, 1993
5. Roddeck, W., Einführung in die Mechatronik, Teubner, Stuttgart, 1997
6. Zomotor, A., Fahrwerktechnik: Fahrverhalten, Vogel, Würzburg, 1987

**Course: Vehicle Comfort and Acoustics I [2113806]****Coordinators:** F. Gauterin**Part of the modules:** Handling Characteristics of Motor Vehicles (p. 78)[WI4INGMB6]

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

**Learning Control / Examinations**

The assessment consists of an oral exam (30-40 min) taking place in the recess period and in the lecture 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**

The students know what are noise and vibration, how they are generated, and how they are perceived by human beings. They have knowledge about the requirements given by users and the public. They know which components of the vehicle are participating in which way on noise and vibration phenomenon and how they could be improved.

**Content****Media**

Lecture Script

**Literature****Elective literature:**

1. Michael Möser, Technische Akustik, Springer, Berlin, 2005
2. Russel C. Hibbeler, Technische Mechanik 3, Dynamik, Pearson Studium, München, 2006
3. Manfred Mitschke, Dynamik der Krafffahrzeuge, Band B: Schwingungen, Springer, Berlin, 1997

**Remarks**

In the following summer semester this lecture is to be continued with the lecture *Vehicle Comfort and Acoustics II* [21825]. In this lecture, noise and vibration characteristics as well as optimization possibilities of other components will be discussed. Moreover, the issue of traffic handled will be brought up. This lecture may be visited independently of the first part.  
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## Course: Vehicle Comfort and Acoustics II [2114825]

**Coordinators:** F. Gauterin

**Part of the modules:** Handling Characteristics of Motor Vehicles (p. 78)[WI4INGMB6]

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

### Learning Control / Examinations

The assessment consists of an oral exam (30-40 minutes) 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 can be attended independently from the course *Vehicle Comfort and Acoustics II* [2113806].

### Learning Outcomes

The students have knowledge about the noise and vibration properties of the chassis components and the drive train. They know what kind of noise and vibration phenomena do exist, what are the generation mechanisms behind, which components of the vehicle participate in which way and how could they be improved.

They have knowledge in the subject area of noise emission of automobiles: Noise impact, legal requirements, sources and influencing parameters, component and system optimization, target conflicts and development methods.

### Content

#### Media

Lecture script.

**Course: Long-distance Traffic [19335]****Coordinators:** B. Chlond, W. Manz**Part of the modules:** Transportation Systems (p. 109)[WI4INGBGU8]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**



## Course: Manufacturing Processes of Microsystem Technology [2143882]

**Coordinators:** K. Bade

**Part of the modules:** Microfabrication (p. 95)[WI4INGMBIMT2], Optoelectronics and Optical Communication (p. 100)[WI4INGMBIMT6]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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

The course is compulsory in the module Microfabrication and must be examined.

### Recommendations

Lectures

Mikrosystemtechnik I [2141861] and/or II [2142874].

### Learning Outcomes

The student

- collects advanced knowledge
- understands process conditions and process layout
- gains interdisciplinary knowledge (chemistry, manufacturing, physics)

### Content

The lecture offers an advanced understanding of manufacturing processes in microsystem technology. Basic aspects of microtechnological processing will be introduced. With examples from semiconductor microfabrication and microsystem technology the base processing steps for conditioning and finishing, patterning, removal are imparted. Nano-patterning is covered is also included and the micro-nano interface is discussed. By the help of typical processing steps elementary mechanisms, process execution, and equipment are explained. Additionally quality control, process control and environmental topics are included.

### Media

pdf files of presentation sheets

### Literature

- M. Madou: Fundamentals of Microfabrication CRC Press, Boca Raton, 1997
- W. Menz, J. Mohr, O. Paul: Mikrosystemtechnik für Ingenieure, Dritte Auflage, Wiley-VCH, Weinheim 2005
- L.F. Thompson, C.G. Willson, A.J. Bowden: Introduction to Microlithography, 2<sup>nd</sup> Edition, ACS, Washington DC, 1994

## Course: Manufacturing Engineering [2149657]

**Coordinators:** V. Schulze  
**Part of the modules:** Manufacturing Engineering (p. 71)[WI4INGMB23]

ECTS Credits	Hours per week	Term	Instruction language
9	4/1	Winter term	de

### Learning Control / Examinations

The assessment consists of a written exam (180 min) taking place at the beginning of 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.

### Learning Outcomes

The student

- is able to **name** the different manufacturing methods and to **explain** their functions
- is able to **classify** the manufacturing methods by their general structure and functionality according to specific main groups
- is able to **perform** a process selection based on the methods he/she has **learned about** and their characteristics
- is able to **identify** the **correlation** between different methods
- is able to **evaluate** the different methods against specific applications on the basis of technical and economical aspects

### Content

The objective of the lecture is to look at manufacturing engineering within the wider context of production engineering, to provide an overview over the different manufacturing methods and to impart detailed process knowledge of the common methods. The lecture covers the basic principles of manufacturing engineering and deals with the manufacturing methods according to their classification into main groups on the basis of technical and economical aspects. The lecture is completed with topics such as process chains in manufacturing.

The following topics will be covered:

- Introduction
- Quality control
- Primary processing (casting, plastics engineering, sintering, generative methods),
- 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
- Work preparation

### Media

Slides and lecture notes for the manufacturing engineering lecture will be made available through Ilias.

## Course: Fixed Income Securities [2530260]

**Coordinators:** M. Uhrig-Homburg

**Part of the modules:** Finance 2 (p. 22)[WI4BWLFBV2], Finance 3 (p. 23)[WI4BWLFBV11]

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

### Learning Control / Examinations

The assessment consists of a written exam following §4, Abs. 2, 1.

### Conditions

None.

### Learning Outcomes

The objective of this course is to become familiar with national and international bond markets. Therefore, we first have a look at financial instruments that are of particular importance. Thereafter, specific models and methods that allow the evaluation of interest rate derivatives are introduced and applied.

### Content

The lecture deals with both German and international bond markets, which are an important source of funding for both the corporate and the public sector. After an overview of the most important bond markets, various definitions of return are discussed. Based on that, the concept of the yield curve is presented. The modelling of the dynamics of the term structure of interest rates provides the theoretical foundation for the valuation of interest rate derivatives, which is discussed in the last part of the lecture.

### Literature

- Bühler, W., Uhrig-Homburg, M., Rendite und Renditestruktur am Rentenmarkt, in Obst/Hintner, Geld-, Bank- und Börsenwesen - Handbuch des Finanzsystems, (2000), S.298-337.
- Sundaresan, S., Fixed Income Markets and Their Derivatives, South-Western College Publishing, (1997).

### Elective literature:

- Hull, J., Options, Futures, & Other Derivatives, Prentice Hall, Sixth Edition, (2005).

**Course: Financial Intermediation [2530232]****Coordinators:** M. Ruckes**Part of the modules:** Finance 2 (p. 22)[WI4BWLFBV2], Finance 3 (p. 23)[WI4BWLFBV11]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes**

Students are introduced to the theoretical fundamentals of financial intermediation.

**Content**

- Arguments for the existence of financial intermediaries
- Bank loan analysis, relationship lending
- Competition in the banking sector
- Stability of the financial system
- The macroeconomic role of financial intermediation

**Literature****Elective literature:**

- Hartmann-Wendels/Pfingsten/Weber (2006): Bankbetriebslehre, 4. Auflage, Springer Verlag.
- Freixas/Rochet (1997): Microeconomics of Banking, MIT Press.

## Course: Fluid Power Systems [2114093]

**Coordinators:** M. Geimer

**Part of the modules:** Automotive Engineering (p. 77)[WI4INGMB5], Mobile Machines (p. 80)[WI4INGMB15]

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

### Learning Control / Examinations

Assessment for the module *Mobile Machines*: See module description.

Assessment for the module *Automotive Engineering*: The assessment consists of an oral exam (20 min) 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

The students will be able to

- know and understand physical principles of fluid power systems
- know the current components and their operating mode
- know the advantages and disadvantages of different components
- dimension the components for a given purpose and to
- calculate simple systems

### Content

In the range of hydrostatics the following topics will be introduced:

- Hydraulic fluids
- Pumps and motors
- Valves
- Accessories
- Hydraulic circuits.

In the range of pneumatics the following topics will be introduced:

- Compressors
- Motors
- Valves
- Pneumatic circuits.

## Course: River Engineering and Ecology II [19213]

**Coordinators:** Dister

**Part of the modules:** Understanding and Prediction of Disasters I (p. 123)[WI4INGINTER1], Understanding and Prediction of Disasters II (p. 124)[WI4INGINTER2], Understanding and Prediction of Disasters III (p. 125)[WI4INGINTER3]

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

### Learning Control / Examinations

**Conditions**

None.

### Learning Outcomes

**Content**

**Remarks**

For further information, see [http://www.iwk.uni-karlsruhe.de/kurse\\_vertiefungsstudium.php](http://www.iwk.uni-karlsruhe.de/kurse_vertiefungsstudium.php) and <http://www.auen.uni-karlsruhe.de/489.php>

## Course: Mixed Integer Programming I [25138]

**Coordinators:** O. Stein  
**Part of the modules:** Mathematical Programming (p. 66)[WI4OR6]

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

### Learning Control / Examinations

The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation. The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

The examination can also be combined with the examination of *Mixed Integer Programming II* [25140]. In this case, the duration of the written examination takes 120 minutes.

In a combined examination of *Mixed Integer Programming I* [25138] and *Mixed Integer Programming II* [25140], upon attaining more than 60% of the exercise points, the grade of the passed examination is improved by a third of a grading step.

In a combined examination of *Mixed Integer Programming I* [25138] and *Mixed Integer Programming II* [25140], upon attaining more than 60% of the computer exercise points, the grade of the passed examination is improved by a third of a grading step.

### Conditions

None.

### Learning Outcomes

The student

- knows and understands the fundamentals of linear mixed integer programming,
- is able to choose, design and apply modern techniques of linear mixed integer programming in practice.

### Content

Many optimization problems from economics, engineering and natural sciences are modeled with continuous as well as discrete variables. Examples are the energy minimal design of a chemical process in which several reactors may be switched on or off, or the time minimal covering of a distance with a vehicle equipped with a gear shift. While optimal points can be defined straightforwardly, for their numerical identification an interplay of ideas from discrete and continuous optimization is necessary. The lecture treats methods for the numerical solution of optimization problems which depend linearly on continuous as well as discrete variables. It is structured as follows:

- Existence results
- Concepts of linear optimization
- Mixed-integer linear programming (Gomory cuts, Benders decomposition)

Part II of the lecture treats nonlinear mixed integer programs.

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

### Literature

#### Elective literature:

- C.A. Floudas, *Nonlinear and Mixed-Integer Optimization: Fundamentals and Applications*, Oxford University Press, 1995
- J. Kallrath: *Gemischt-ganzzahlige Optimierung*, Vieweg, 2002
- D. Li, X. Sun: *Nonlinear Integer Programming*, Springer, 2006
- G.L. Nemhauser, L.A. Wolsey, *Integer and Combinatorial Optimization*, Wiley, 1988
- M. Tawarmalani, N.V. Sahinidis, *Convexification and Global Optimization in Continuous and Mixed-Integer Nonlinear Programming*, Kluwer, 2002.

### Remarks

The lecture is offered irregularly. The curriculum of the next three years is available online ([kop.ior.kit.edu](http://kop.ior.kit.edu)).

## Course: Mixed Integer Programming II [25140]

**Coordinators:** O. Stein  
**Part of the modules:** Mathematical Programming (p. 66)[WI4OR6]

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

### Learning Control / Examinations

The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation.

The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

The examination can also be combined with the examination of *Mixed Integer Programming I* [25138]. In this case, the duration of the written examination takes 120 minutes.

In a combined examination of *Mixed Integer Programming I* [25138] and *Mixed Integer Programming II* [25140], upon attaining more than 60% of the exercise points, the grade of the passed examination is improved by a third of a grading step.

In a combined examination of *Mixed Integer Programming I* [25138] and *Mixed Integer Programming II* [25140], upon attaining more than 60% of the computer exercise points, the grade of the passed examination is improved by a third of a grading step.

### Conditions

None.

### Learning Outcomes

The student

- knows and understands the fundamentals of convex and of nonconvex mixed integer programming,
- is able to choose, design and apply modern techniques of nonlinear mixed integer programming in practice.

### Content

Many optimization problems from economics, engineering and natural sciences are modeled with continuous as well as discrete variables. Examples are the energy minimal design of a chemical process in which several reactors may be switched on or off, or the time minimal covering of a distance with a vehicle equipped with a gear shift. While optimal points can be defined straightforwardly, for their numerical identification an interplay of ideas from discrete and continuous optimization is necessary. Part I of the lecture deals with linear mixed integer programs.

Part II treats methods for the numerical solution of optimization problems which depend nonlinearly on continuous as well as discrete variables. It is structured as follows:

- Concepts of convex optimization
- Mixed integer convex programming (branch and bound methods)
- Mixed integer nonconvex programming
- Generalized Benders decomposition
- Outer approximation methods
- Heuristics

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

### Literature

#### Elective literature:

- C.A. Floudas, *Nonlinear and Mixed-Integer Optimization: Fundamentals and Applications*, Oxford University Press, 1995
- J. Kallrath: *Gemischt-ganzzahlige Optimierung*, Vieweg, 2002
- D. Li, X. Sun: *Nonlinear Integer Programming*, Springer, 2006
- G.L. Nemhauser, L.A. Wolsey, *Integer and Combinatorial Optimization*, Wiley, 1988
- M. Tawarmalani, N.V. Sahinidis, *Convexification and Global Optimization in Continuous and Mixed-Integer Nonlinear Programming*, Kluwer, 2002.

### Remarks

The lecture is offered irregularly. The curriculum of the next three years is available online ([kop.ior.kit.edu](http://kop.ior.kit.edu)).



**Course: Geological Hazards and Risks [2600101]****Coordinators:** Wenzel, Gottschämmer**Part of the modules:** Understanding and Prediction of Disasters I (p. [123](#))[WI4INGINTER1]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

## Course: Driving Dynamics Evaluation within the Global Vehicle Simulation [2114850]

**Coordinators:** B. Schick

**Part of the modules:** Handling Characteristics of Motor Vehicles (p. 78)[WI4INGMB6]

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

### Learning Control / Examinations

The assessment will consist of an oral exam (30-40 min) 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

### Recommendations

Previous visit of *Handling Characteristics of Motor Vehicles I* [21807] is recommended.

### Learning Outcomes

The students have an overview of the vehicle dynamics simulation, the model parametrization and the related data sources. They have good knowledge about vehicle dynamics test methods and related execution of virtual test driving (open loop, closed loop). They are able to evaluate driving behavior based on self-created results. They have achieved knowledge about influences and interactions of components such as tires, suspension, kinematics and compliance, roll bars, steering, brakes, mass distribution and powertrain and they have the qualification to design components with regard to global vehicle behavior.

### Content

1. Testing and evaluation methods
2. Fundamentals of vehicle dynamics simulation
3. Execution of virtual test driving and evaluation of the results
4. Influence of several components and optimization of global driving behavior

### Literature

#### Elective literature:

1. Reimpell, J.: Fahrwerktechnik: Grundlagen, Vogel Verlag, 1995
2. Unrau, H.-J.: Skriptum zur Vorlesung "Fahreigenschaften I"
3. Unrau, H.-J.: Skriptum zur Vorlesung "Fahreigenschaften II"
4. IPG: Benutzerhandbuch CarMaker

## Course: Business Models in the Internet: Planning and Implementation [2540456]

**Coordinators:** C. Weinhardt

**Part of the modules:** Business & Service Engineering (p. 34)[WI4BWLISM4]

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

### Learning Control / Examinations

50% of the mark is based on the written mid term examination, 10% is based on assignments during the exercises, and 40% of the mark is based on a project work, which includes a term paper and a presentation.

### Conditions

None.

### Learning Outcomes

The student

- is able to list the most important features of web application lifecycles
- analyses, designs and implements web applications
- evaluates and argues internet business models with special requirements and features
- is able to estimate the practicability of business models

### Content

The emergence of internet economy has resulted in an accelerated evolution of commerce models in eBusiness. Early adopters have experimented with a variety of new business models, technologies and application designs. At the same time, there has been a growing demand for new standards to facilitate the exchange of information, catalogue content and transactions between buyers and sellers. But the true understanding of how to bring buyers and sellers together is still widely missing, leading to multiple cases of costly missed investments. This course focuses on the design and implementation of successful business models for eBusiness applications for the World Wide Web (WWW), imparting the basic knowledge for building successful eBusiness applications. We consider not only technical foundations of eBusiness applications but also economical aspects. In small groups, students develop and implement an eBusiness model that is eventually discussed with a representative from the venture capitalist industry.

### Media

- Powerpoint presentations
- recorded lecture available on the internet
- videoconferencing, if circumstances allow

### Literature

Will be announced within the course.

**Course: Business Strategies of Banks [2530299]****Coordinators:** W. Müller**Part of the modules:** Finance 2 (p. 22)[WI4BWLFBV2], Finance 3 (p. 23)[WI4BWLFBV11]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes**

Students are told the basics of commercial banking.

**Content**

The management of a bank is in charge of the determination and implementation of business policy - taking into account all relevant endogenous and exogenous factors - that assures the bank's success in the long run. In this context, there exists a large body of banking models and theories which are helpful in describing the success and risk of a bank. This course is meant to be the bridging of banking theory and practical implementation. In the course of the lectures students will learn to take on the bank management's perspective.

The first chapter deals with the development of the banking sector. Making use of appropriate assumptions, a banking policy is developed in the second chapter. The design of bank services (ch. 3) and the adequate marketing plan (ch. 4) are then built on this framework. The operational business of banks must be guided by appropriate risk and earnings management (ch. 5 and 6), which are part of the overall (global) bank management (ch. 7). Chapter eight, at last, deals with the requirements and demands of bank supervision as they have significant impact on a bank's corporate policy.

**Literature****Elective literature:**

- A script is disseminated chapterwise within the lecture.
- Hartmann-Wendels, Thomas; Pfingsten, Andreas; Weber, Martin; 2000, Bankbetriebslehre, 2. Auflage, Springer

## Course: Field Course in Freshwater Ecology [19243]

**Coordinators:** S. Fuchs

**Part of the modules:** Environmental Management (p. 111)[WI4INGBGU12]

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

### Learning Control / Examinations

See module description.

### Conditions

It is recommended to attend the course *Principles of Bioengineering* [19058] beforehand.

Basic knowledge of microbiology is assumed.

It is recommended to attend the *Seminar in Freshwater Ecology* [19057/19058].

Prior attendance of the course *Urban Water Resource Management and Ecological Engineering* [19057/19058].

### Learning Outcomes

- Training during three days
- Environmental site assessment of several river systems
- Limnological investigations (Odenwald and Neckar rivers)
- Water pollution
- Anthropogenic disturbances
- General characterization: Water and its environment -> water structure survey

### Content

- physical and chemical parameters
- oxygen balance
- particle size distribution
- water quality studies

### Literature

#### Elective literature:

Schwörbel, J.: Einführung in die Limnologie, 7. Aufl., UTB-Verlag Gustav Fischer (1993)

Lampert, W., Sommer, U.: Limnoökologie, Thieme Verlag (1993)

Schwörbel, J.: Methoden der Hydrobiologie, Süßwasserbiologie, 3. Aufl., UTB-Verlag Gustav Fischer (1986)

## Course: Seminar in Freshwater Ecology [19057/58]

**Coordinators:** S. Fuchs

**Part of the modules:** Environmental Management (p. 111)[WI4INGBGU12]

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

### Learning Control / Examinations

See module description.

### Conditions

Prior attendance of the course *Urban Water Resource Management and Ecological Engineering* [19057/19058].

Combination with *Field Course in Freshwater Ecology* [19243] is recommended.

### Learning Outcomes

#### Content

- Characterization and zonation of rivers and streams
- Nutrients (carbon, nitrogen, phosphorus, oxygen)
- Interaction between sediments and open water
- Water framework direction
- Characterization of Neckar
- Municipal wastewater
- hygienic load
- thermal load

#### Literature

##### Elective literature:

Schwörbel, J.: Einführung in die Limnologie, 7. Aufl., UTB-Verlag Gustav Fischer (1993)

Lampert, W., Sommer, U.: Limnoökologie, Thieme Verlag (1993)

## Course: Foundry Technology [21575]

**Coordinators:** Wilhelm  
**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an oral exam (20-30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

### Conditions

None.

### Learning Outcomes

Basic knowledge from the field of casting technology for mechanical engineers; the focus is placed on moulding materials, moulding processes, casting materials and metallurgy. Special notes of virtual casting development.

### Content

- Moulding and casting processes
- Solidifying of melts
- Castability
- Fe-Alloys
- Non-Fe-Alloys
- Moulding and additive materials
- Core production
- Sand reclamation
- Feeding technology
- Design in casting technology
- Casting simulation
- Foundry Processes

### Literature

#### Elective literature:

Will be announced in the lecture.

**Course: Global Optimization I [2550134]**

**Coordinators:** O. Stein  
**Part of the modules:** Mathematical Programming (p. 66)[WI4OR6]

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

**Learning Control / Examinations**

The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation.

The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

The examination can also be combined with the examination of *Global Optimization II* [2550136]. In this case, the duration of the written examination takes 120 minutes.

In a combined examination of *Global Optimization I* [2550134] and *Global Optimization II* [2550136], upon attaining more than 60% of the exercise points, the grade of the passed examination is improved by a third of a grading step.

In a combined examination of *Global Optimization I* [2550134] and *Global Optimization II* [2550136], upon attaining more than 60% of the computer exercise points, the grade of the passed examination is improved by a third of a grading step.

**Conditions**

None.

**Learning Outcomes**

The student

- knows and understands the fundamentals of deterministic global optimization,
- is able to choose, design and apply modern techniques of deterministic global optimization 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.

**Literature****Elective literature:**

- W. Alt *Numerische Verfahren der konvexen, nichtglatten Optimierung* Teubner 2004
- C.A. Floudas *Deterministic Global Optimization* Kluwer 2000
- R. Horst, H. Tuy *Global Optimization* Springer 1996
- A. Neumaier *Interval Methods for Systems of Equations* Cambridge University Press 1990

**Remarks**

Part I and II of the lecture are held consecutively in the *same* semester.



**Course: Global Optimization II [2550136]**

**Coordinators:** O. Stein  
**Part of the modules:** Mathematical Programming (p. 66)[WI4OR6]

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

**Learning Control / Examinations**

The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation.

The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration to the written examination 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.

In a combined examination of *Global Optimization I* [2550134] and *Global Optimization II* [2550136], upon attaining more than 60% of the exercise points, the grade of the passed examination is improved by a third of a grading step.

In a combined examination of *Global Optimization I* [2550134] and *Global Optimization II* [2550136], upon attaining more than 60% of the computer exercise points, the grade of the passed examination is improved by a third of a grading step.

**Conditions**

None.

**Learning Outcomes**

The student

- knows and understands the fundamentals of deterministic global optimization,
- is able to choose, design and apply modern techniques of deterministic global optimization 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  $\alpha$ BB method
- Branch and bound methods
- Lipschitz optimization

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

**Literature****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 Production and Logistics - part 1: Global Production [2149610]****Coordinators:** Lanza**Part of the modules:** Global Production and Logistics (p. 74)[WI4INGMB31]

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

**Learning Control / Examinations**

The assessment consists of a written exam (60 min) taking place during the recess period (according to Section 4(2), 1 or 2) of the examination regulation).

The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

**Conditions**

None.

**Learning Outcomes****Content****Remarks**

The course is the replacement for *International Production and Logistics* [21692] and was changed to 4 CP.

## Course: Global Production and Logistics - part 2: Global Logistics [2149600]

**Coordinators:** K. Furmans

**Part of the modules:** Global Production and Logistics (p. 74)[WI4INGMB31]

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

### Learning Control / Examinations

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

### Conditions

None.

### Recommendations

Prerequisites: *Logistics – Organisation, Design and Control of Logistics Systems* [2118078].

### Learning Outcomes

After successfully finishing this course, the student will have sound knowledge about planning and operations of global supply chains and will be able to use simple models for planning. The student will be familiar with the requirements and characteristics of global trade and transport.

### Content

Characteristics of global trade

- Incoterms
- Customs clearance, documents and export control

Global transport and shipping

- Maritime transport, esp. container handling
- Air transport

Modeling of supply chains

- SCOR model
- Value stream analysis

Location planning in cross-border-networks

- Application of the Warehouse Location Problem
- Transport Planning

Inventory Management in global supply chains

- Stock keeping policies
- Inventory management considering lead time and shipping costs

### Media

Blackboard, data projector.

### Literature

#### Elective literature:

- Arnold/Isermann/Kuhn/Tempelmeier. *HandbuchLogistik*, Springer Verlag, 2002 (Neuaufgabe in Arbeit)
- Domschke. *Logistik, Rundreisen und Touren*, Oldenbourg Verlag, 1982
- Domschke/Drexl. *Logistik, Standorte*, OldenbourgVerlag, 1996
- Gudehus. *Logistik*, Springer Verlag, 2007
- Neumann-Morlock. *Operations-Research*, Hanser-Verlag, 1993
- Tempelmeier. *Bestandsmanagement in SupplyChains*, Books on Demand 2006
- Schönsleben. *IntegralesLogistikmanagement*, Springer, 1998

### Remarks

The course is the replacement for *International Production and Logistics* [21692] and was changed to 4 CP.

## Course: Graph Theory and Advanced Location Models [2550484]

**Coordinators:** S. Nickel

**Part of the modules:** Mathematical Programming (p. 66)[WI4OR6]

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

### Learning Control / Examinations

The assessment is a 120 minutes written examination (according to §4(2), 1 of the examination regulation). The examination is held in the term of the lecture and the following lecture.

### Conditions

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

### Learning Outcomes

The lecture is divided into two parts: In the first part “Graph Theory“, basic concepts and algorithms of Graph Theory are presented, which are used in engineering, economic and socio-scientific problems. The students become acquainted with models and methods in order to optimize on graphs and networks. The second part “Advanced Location Models” addresses some selected advanced topics of location theory. The students become familiar with praxis-relevant and current research topics and learn about solution concepts of different location problems.

### Content

Graph Theory is an important part of Discrete Mathematics. A special attraction is in its clearness and variety of proof techniques. Object of the first part “Graph Theory” is the mediation of basic graph theoretical concepts and algorithms, which are deployed in many areas. In focus is the modeling of different problems with graph theoretical methods und their solutions with efficient algorithms. Significant focal points are Shortest Paths, Flows, Matchings, Colorings and Matroids.

A variety of application areas of location theory has attracted increasing research interest within the last decades, because location decisions are a critical factor in strategic planning. In the second part “Advanced Location Models”, some current research questions of modern industrial location theory are discussed after a short introduction. Thereby, practical models and suitable solution methods for location problems in general networks are presented. The lecture goes into details about Pareto Solutions in Networks, Ordered Median Problems, Covering Problems and Allocation Problems.

### Literature

- Jungnickel: Graphs, Networks and Algorithms, 2<sup>nd</sup> edition, Springer, 2005
- Diestel: Graph Theory, 3<sup>rd</sup> edition, Springer, 2006
- Bondy, Murt: Graph Theory, Springer, 2008
- Nickel, Puerto: Location Theory, Springer, 2005
- Drezner: Facility Location – Applications and Theory, 2<sup>nd</sup> edition, Springer, 2005

### Remarks

The lecture is planned to be held in the summer term 2013.

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

**Course: Fundamentals of Waste Water Treatment [22618]**

**Coordinators:** S. Lackner, n.N.  
**Part of the modules:** Water Chemistry II (p. 122)[WI4INGCV7]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes****Content****Literature****Elective literature:**

- Bever, J., Stein, A., Teichmann, H. [Hrsg.]: Weitergehende Abwasserreinigung. 4. Aufl. Oldenbourg Industrieverlag, 2002.
- Frimmel, F. H.: Wasser und Gewässer. Ein Handbuch. Spektrum Verlag, 1999.

## Course: Basics of Automotive Engineering I [2113805]

**Coordinators:** F. Gauterin, Unrau

**Part of the modules:** Automotive Engineering (p. 77)[WI4INGMB5]

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

### Learning Control / Examinations

The assessment consists of a written exam (120 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

The students know the movements and the forces at the vehicle and are familiar with active and passive security. They have proper knowledge about operation of engines, the necessary transmission between engine and drive wheels and the power distribution. They have an overview of the components necessary for the drive and the calculation methods for sizing. They are able to lay out the appropriate modules of a vehicle.

### Content

1. Driving mechanics: Driving resistances and driving performances, mechanics of the longitudinal and transverse forces, collision mechanics
2. Engine: Classification, comparison processes, real processes, waste gas emission, alternative drives
3. Transmission: Clutches (e.g. friction clutch, visco clutch), transmission (e.g. mechanical transmission, hydraulic fluid transmission)
4. Power transmission and distribution: drive shafts, cardon joints, differentials

### Literature

#### Elective literature:

1. Reimpell, J.: Fahrwerktechnik: Fahrzeugmechanik, Vogel Verlag, 1992
2. Braes, H.H.; Seiffert, U.: Handbuch Kraftfahrzeugtechnik, Vieweg & Sohn-Verlag, 2005
3. Gnadler, R.: Umdrucksammlung zur Vorlesung "Grundlagen der Fahrzeugtechnik I"

## Course: Basics of Automotive Engineering II [2114835]

**Coordinators:** F. Gauterin, Unrau  
**Part of the modules:** Automotive Engineering (p. 77)[WI4INGMB5]

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

### Learning Control / Examinations

The assessment consists of a written exam (90 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

It is recommended to attend the course *Basics of Automotive Engineering I* [2113805].

### Learning Outcomes

The students have an overview of the modules, which are necessary for the road holding of a motor vehicle and the power transmission between vehicle bodywork and roadway. They have knowledge of different wheel suspensions, the tyres, the steering elements and the brakes. They know different execution forms, the function and the influence on the driving or brake behavior. They are able to construct the appropriate components correctly.

### Content

1. Chassis: Wheel suspensions (rear axles, front axles, kinematics of axles), tyres, springs, damping devices
2. Steering elements: Steering elements of single vehicles and of trailers
3. Brakes: Disc brake, drum brake, retarder, comparison of the designs

### Literature

#### Elective literature:

1. Reimpell, J.: Fahrwerktechnik: Grundlagen, Vogel Verlag, 1995
2. Burckhardt, M.: Bremsdynamik und Pkw-Bremsanlagen, Vogel Verlag, 1991
3. Gnadler, R.: Umdrucksammlung zur Vorlesung "Grundlagen der Fahrzeugtechnik II"

**Course: River Engineering and Ecology I [19207]****Coordinators:** E. Dister**Part of the modules:** Understanding and Prediction of Disasters I (p. 123)[WI4INGINTER1], Understanding and Prediction of Disasters II (p. 124)[WI4INGINTER2], Understanding and Prediction of Disasters III (p. 125)[WI4INGINTER3]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Remarks**For further information, see [http://www.iwk.uni-karlsruhe.de/kurse\\_vertiefungsstudium.php](http://www.iwk.uni-karlsruhe.de/kurse_vertiefungsstudium.php) and <http://www.ifgg.kit.edu/1828.php>



## Course: Principles of Ceramic and Powder Metallurgy Processing [21754]

**Coordinators:** Oberacker

**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an oral exam (20-30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

### Conditions

The module *Emphasis Material Science* [WI3INGMB9] has to be completed successfully beforehand.

Basic knowledge of experimental physics and chemistry is recommended.

### Learning Outcomes

The lecture is focused on basic aspects of powder technology used in ceramic and powder metallurgy (PM) processing. Learning target: Detailed skills of system- and process parameters which control shaping of dry powders, pasts, suspensions

### Content

- Overview on the ceramic/PM fabrication process
- Materials produced by powder based technologies
- Powder characteristics and powder characterization
- Shaping by dry pressing
- Control and shaping of powder suspensions and pasts

### Literature

#### Elective literature:

R.J.Brook: Processing of Ceramics I+II, VCH Weinheim, 1996

M.N. Rahaman: Ceramic Processing and Sintering, 2nd Ed., Marcel Dekker, 2003

F.Thümmeler, R. Oberacker: Introduction to Powder Metallurgy, Inst. of Materials, London, 1993

## Course: Principles of Bioengineering [19058]

**Coordinators:** J. Winter

**Part of the modules:** Environmental Management (p. 111)[WI4INGBGU12]

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

### Learning Control / Examinations

See module description.

### Conditions

Good biological knowledge (secondary school level)

Regular attendance

### Learning Outcomes

Combination of biological and process engineering parameters

### Content

- Bacteria (e.g. biofilm)
- Microbiological conversions
- Process steps in procedure for municipal wastewater treatment
- Nitrification
- Denitrification
- Biological phosphorus removal

### Literature

#### Elective literature:

e.g. Hartmann, Biologische Abwasserreinigung, Springer-Verlag.

Mudrack/Kunst, Biologie der Abwasserreinigung, Gustav-Fischer-Verlag.

Fuchs/Schlegel, Allgemeine Mikrobiologie, Thieme-Verlag. Goebel, Brock-Mikrobiologie, Spektrum Akademischer Verlag G. Fischer.

Einsele/Finn/Samhaber, Mikrobiologische und biochemische Verfahrenstechnik, VCH-Verlag.

Stanbury/Whitaker, Principles of Fermentation Technology, Pergamon Press

Further literature will be announced every semester.

**Course: Internal Combustion Engines and Exhaust Gas Aftertreatment Technology [2134138]****Coordinators:** Lox**Part of the modules:** Combustion Engines II (p. 82)[WI4INGMB19]

ECTS Credits	Hours per week	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* [21101] has to be completed beforehand.

**Learning Outcomes****Content****Literature**

Will be announced in the lecture.

**Course: Fundamentals of Food Chemistry [6602]****Coordinators:** Loske**Part of the modules:** Specialization in Food Process Engineering (p. 120)[WI4INGCV4]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes****Content**

## Course: Basics of microsystemtechnology I [2141861]

**Coordinators:** A. Last

**Part of the modules:** Microsystem Technology (p. 98)[WI4INGMBIMT4]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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.

### Recommendations

The course Microsystem technology II [2142874] and the practical exercise [2143875] are recommended.

### Learning Outcomes

Learning the basics of structuring silicon, crystallographic background and the processes required.

### Content

- Silicon and microelectronics techniques
- Physical basics and materials for the micro structure technology
- Basic technologies
- Silicon micro mechanics

### Media

Lecture notes at the institutes website

### Literature

- Microsystemtechnology for engineers, W. Menz und J. Mohr, VCH Verlagsgesellschaft, Weinheim 2005.
- Fundamentals of Microfabrication, M. Madou, CRC Press, Boca Raton 1997

### Remarks

There are two fixed examination dates per year, both Thursdays, in the second complete week in September and the second week after Ash Wednesday in March or April.

**Course: Basics of microsystem technology II [2142874]**

**Coordinators:** A. Last  
**Part of the modules:** Microsystem Technology (p. 98)[WI4INGMBIMT4]

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

**Learning Control / Examinations**

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

**Conditions**

None.

**Recommendations**

The course Microsystem technology I [2141861] and the practical exercise [2143875] are recommended.

**Learning Outcomes**

Learning the basics of UV-lithography, deep X-ray lithography, LIGA-process and divers other processes used for micro structuring.

**Content**

- lithography
- LIGA-process
- mechanical micro structuring
- structuring with lasers
- joining techniques
- micro systems

**Media**

Lecture notes at the institutes website

**Literature**

- Micro system technology for engineers, W. Menz und J. Mohr, VCH Verlagsgesellschaft, Weinheim 2005.
- Fundamentals of Microfabrication, M. Madou, CRC Press, Boca Raton 1997.

**Remarks**

There are two fixed examination dates per year, both Thursdays, in the second complete week in September and the second week after Ash Wednesday in March or April.

**Course: Fundamentals of X-ray optics [2142007]****Coordinators:** M. Simon**Part of the modules:** Microfabrication (p. 95)[WI4INGMBIMT2], Microoptics (p. 96)[WI4INGMBIMT3]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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**

Attending the following Lectures is recommended:

LAS:

Beschleunigerphysik I: Teilchenbeschleuniger

Beschleunigerphysik II: Synchrotronstrahlungsquellen

IMT:

Grundlagen der Mikrosystemtechnik I [2141861] and II [2142874]

**Learning Outcomes**

Attending this lecture enables the intrigued student to identify applications for X-ray optical methods of analysis and to choose the most suitable method.

The student

- knows the basics of optics and X-ray optics which are essential to understand the principles of image formation with technical systems
- knows technically relevant methods for generating X-rays
- is aware of contrast mechanisms for image formation with X-rays
- understands the functional principles and knows the characteristics of X-ray optical components.

**Content**

During the lecture the basic principles of optics are repeated as necessary for the understanding of X-ray optics. The student will learn about fabrication and mode of operation of reflective, refractive and diffractive X-ray optical elements and systems. A choice of methods in X-ray imaging methods of analysis in respect to X-ray optical systems is introduced, including their possibilities and limits.

**Media**

lecture slides, to be downloaded from the institute's homepage

**Literature**

- M. Born und E. Wolf: Principles of Optics, 7th (expanded) edition, Cambridge University Press, 2010
- A. Erko, M. Idir, T. Krist und A. G. Michette: Modern Developments in X-Ray and Neutron Optics Springer Series in Optical Sciences, Vol. 137, Springer-Verlag Berlin Heidelberg, 2008
- D. Attwood: Soft X-Rays and Extreme Ultraviolet Radiation: Principles and Applications, Cambridge University Press, 1999

## Course: Fundamentals of X-ray optics II [n.n.]

**Coordinators:** M. Simon  
**Part of the modules:** Microoptics (p. 96)[WI4INGMBIMT3]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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

Fundamentals of X-ray optics I [2142007] must be examined beforehand.

### Recommendations

Attending the following Lectures is recommended:

LAS:

Beschleunigerphysik I: Teilchenbeschleuniger

Beschleunigerphysik II: Synchrotronstrahlungsquellen

IMT:

Grundlagen der Mikrosystemtechnik I [2141861] und II [2142874]

### Learning Outcomes

Attending this lecture enables the intrigued student to identify applications for X-ray optical methods of analysis and to choose the most suitable method.

The student

- knows various X-ray imaging systems and their setups, purposes and functional limits
- Understands the basic functionality of X-ray imaging detectors
- knows methods of processing and analysis of data accruing from X-ray imaging systems
- has the knowledge to decide which X-ray imaging system matches a given analysis problem and how to use the chosen system

### Content

During the lecture properties of X-ray optical elements and systems are discussed. X-ray imaging methods of analysis are derived and preconditions to employ such methods are elaborated in dependence of the expected results and with respect to boundary conditions given by the same system.

### Media

Slides of the lecture

### Literature

- M. Born und E. Wolf: Principles of Optics, 7th (expanded) edition, Cambridge University Press, 2010
- A. Erko, M. Idir, T. Krist und A. G. Michette: Modern Developments in X-Ray and Neutron Optics, Springer Series in Optical Sciences, Vol. 137, Springer-Verlag Berlin Heidelberg, 2008
- D. Attwood: Soft X-Rays and Extreme Ultraviolet Radiation: Principles and Applications, Cambridge University Press, 1999



## Course: Basics of Technical Logistics [2117095]

**Coordinators:** M. Mittwollen, V. Madzharov

**Part of the modules:** Introduction to Logistics (p. 83)[WI4INGMB20], Technical Logistics (p. 85)[WI4INGMB27]

ECTS Credits	Hours per week	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

The student:

- knows about processes and machines of technical logistics
- is able to handle fundamental structures and the impacts
- is able to refer to industrially used machines and
- practices the calculation on applying knowledge from lessons.

### 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; basic examples for elements of intralogistics (belt conveyor, racks, automatic guided vehicles, fan-in, bifurcation)  
sample applications and calculations in addition to the lectures inside practical lectures

### Media

supplementary sheets, projector, blackboard

### Literature

Recommendations during lessons

**Course: Principles of Process Engineering referring to Food I [22213]****Coordinators:** V. Gaukel**Part of the modules:** Principles of Food Process Engineering (p. 119)[WI4INGCV3]

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

**Learning Control / Examinations**

See module description.

**Conditions**

The course is an obligatory course within the module and has to be attended.

**Learning Outcomes****Content**

**Course: Principles of Process Engineering referring to Food II [22214]****Coordinators:** V. Gaukel**Part of the modules:** Principles of Food Process Engineering (p. 119)[WI4INGCV3]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes****Content**

## Course: Basic Principles of Patent Law [GPR]

**Coordinators:** K. Melullis  
**Part of the modules:** Intellectual Property Law (p. 131)[WI4JURA4]

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

### Learning Control / Examinations

The assessment consists of a written seminar thesis and the presentation thereof as a graded assessment according to sec. 4 subsec. 2 no. 3 study and examination regulations.

### Conditions

None.

### Learning Outcomes

#### Content

#### Media

slides

#### Literature

Nirk/Ullmann, Patent- Gebrauchsmuster- und Sortenschutzrecht, C.F. Müller, 3. Aufl. 2007, ISBN: 3811433687

#### Elective literature:

Schulte, Rainer, Patentgesetz, Carl Heymanns Verlag, 8. Aufl. 2008, ISBN:3406555055

Kraßer, Rudolf, Patentrecht, Verlag C.H. Beck, 6. Aufl. 2009, ISBN: 3-406-384552

Jestaedt, Bernhard, Patentrecht - Ein fallbezogenes Lehrbuch, Heymanns, 2. Aufl. 2008, ISBN: 3452261832

Bekard, Patent- und Gebrauchsmustergesetz, Verlag C.H. Beck, 10. Aufl. 2006, ISBN: 3406539548

#### Remarks

*This course was previously announced as Aktuelle Fragen des Patentrechts.*

**Course: Basics and Methods for Integration of Tires and Vehicles [2114843]****Coordinators:** Leister**Part of the modules:** Vehicle Development (p. 79)[WI4INGMB14]

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

**Learning Control / Examinations**

The assessment will consist of an oral exam (30 min) 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**

Knowledge of automobile technology is recommended.

**Learning Outcomes****Content**

## Course: Fundamentals for Design of Motor-Vehicle Bodies I [2113814]

**Coordinators:** Bardehle  
**Part of the modules:** Automotive Engineering (p. 77)[WI4INGMB5]

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

### Learning Control / Examinations

The assessment consists of an oral exam (30 min) 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

The students have an overview of the fundamental possibilities for design and manufacture of motor-vehicle bodies. They know the complete process, from the first idea, through the concept to the dimensioned drawings (e.g. with FE-methods). They have knowledge about the fundamentals and their correlations, so that the design of relevant assemblies can be performed to the required demands.

### Content

#### Literature

##### Elective literature:

1. Automobiltechnische Zeitschrift ATZ, Friedr. Vieweg & Sohn Verlagsges. mbH, Wiesbaden
2. Automobil Revue, Bern (Schweiz)
3. Automobil Produktion, Verlag Moderne Industrie, Landsberg

## Course: Fundamentals for Design of Motor-Vehicle Bodies II [2114840]

**Coordinators:** Bardehle  
**Part of the modules:** Automotive Engineering (p. 77)[WI4INGMB5]

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

### Learning Control / Examinations

The assessment consists of an oral exam (30 min) 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

It is recommended to attend the course *Fundamentals for Design of Motor-Vehicle Bodies I* [21814] beforehand.

### Learning Outcomes

The students know that, often the design of seemingly simple detail components can result in the solution of complex problems. They have knowledge in testing procedures of body properties. They have an overview of body parts such as bumpers, window lift mechanism and seats. They understand, as well as, parallel to the normal electrical system, about the electronic side of a motor vehicle. They have knowledge of the inert safety of a motor vehicle.

### Content

#### Literature

#### Elective literature:

1. Automobiltechnische Zeitschrift ATZ, Friedr. Vieweg & Sohn Verlagsges. mbH, Wiesbaden
2. Automobil Revue, Bern (Schweiz)
3. Automobil Produktion, Verlag Moderne Industrie, Landsberg

## Course: Fundamentals in the Development of Commercial Vehicles I [2113812]

**Coordinators:** Zürn

**Part of the modules:** Vehicle Development (p. 79)[WI4INGMB14], Mobile Machines (p. 80)[WI4INGMB15]

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

### Learning Control / Examinations

Assessment for the module *Mobile Machines*: See module description.

Assessment for the module *Automotive Engineering*: The assessment consists of an oral exam (20 min) taking place in 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

The students have proper knowledge about the process of commercial vehicle development starting from the concept and the underlying original idea to the real design. They know that the customer requirements, the technical realisability, the functionality and the economy are important drivers. The students are able to develop parts and components. Furthermore they have knowledge about different cap concepts, the interior and the interior design process.

### Content

1. Definitions in the area of commercial vehicles
2. Driver of the commercial vehicle development process
3. Development process
4. Development tools
5. Specification criteria
6. Component and parts development
7. Cab

### Literature

#### Elective literature:

1. Marwitz, H., Zittel, S.: ACTROS - die neue schwere Lastwagenbaureihe von Mercedes-Benz, ATZ 98, 1996, Nr. 9
2. Alber, P., McKellip, S.: ACTROS - Optimierte passive Sicherheit, ATZ 98, 1996
3. Morschheuser, K.: Airbag im Rahmenfahrzeug, ATZ 97, 1995, S. 450 ff.



## Course: Fundamentals in the Development of Commercial Vehicles II [2114844]

**Coordinators:** J. Zürn

**Part of the modules:** Vehicle Development (p. 79)[WI4INGMB14], Mobile Machines (p. 80)[WI4INGMB15]

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

### Learning Control / Examinations

Assessment for the module *Mobile Machines*: See module description.

Assessment for the module *Automotive Engineering*: The assessment will consist of an oral exam (20 min) 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.

### Recommendations

It is recommended to attend the course *Fundamentals in the Development of Passenger Vehicles I* [21810] beforehand.

### Learning Outcomes

The students are able to create general vehicle concepts tailored for different areas of application. They know the advantages and disadvantages of different drives. Furthermore they are familiar with components, such as transfer box, propeller shaft, powered and non-powered frontaxle etc. Beside other mechanical components, such as chassis, axle suspension and braking system, also electric and electronic systems, such as lighting, control, bus and diagnostic systems, are known.

### Content

1. Drive and Drive train of Commercial Vehicles
2. Chassis
3. Axle suspension
4. Braking System
5. Elektrics
6. Elektronic Systems

### Literature

#### Elective literature:

1. Schittler, M., Heinrich, R., Kerschbaum, W.: Mercedes-Benz Baureihe 500 - neue V-Motorengeneration für schwere Nutzfahrzeuge, MTZ 57 Nr. 9, S. 460 ff., 1996
2. Robert Bosch GmbH (Hrsg.): Bremsanlagen für Kraftfahrzeuge, VDI-Verlag, Düsseldorf, 1. Auflage, 1994
3. Rubi, V., Striffler, P. (Hrsg. Institut für Kraftfahrwesen RWTH Aachen): Industrielle Nutzfahrzeugentwicklung, Schriftenreihe Automobiltechnik, 1993

## Course: Fundamentals in the Development of Passenger Vehicles I [2113810 ]

**Coordinators:** Frech

**Part of the modules:** Vehicle Development (p. 79)[WI4INGMB14]

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

### Learning Control / Examinations

The assessment consists of a written exam (90 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

The students have an overview of the fundamentals of the development of automobiles. They know the development process, the national and the international legal requirements that are to be met. They have knowledge about the thermo-management, aerodynamics and the design of an automobile.

### Content

1. Process of automobile development
2. Conceptual dimensioning and design of an automobile
3. Laws and regulations – National and international boundary conditions
4. Aero dynamical dimensioning and design of an automobile I
5. Aero dynamical dimensioning and design of an automobile II
6. Thermo-management in the conflict of objectives between styling, aerodynamic and packaging guidelines I
7. Thermo-management in the conflict of objectives between styling, aerodynamic and packaging guidelines II

### Media

Lecture script (will be provided during the first lesson).

## Course: Fundamentals in the Development of Passenger Vehicles II [2114842]

**Coordinators:** Frech  
**Part of the modules:** Vehicle Development (p. 79)[WI4INGMB14]

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

### Learning Control / Examinations

The assessment consists of a written exam (90 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

It is recommended to attend the course *Fundamentals in the Development of Passenger Vehicles I* [21810] beforehand.

### Learning Outcomes

The students are familiar with the selection of appropriate materials and the choice of adequate production technology. They have knowledge of the acoustical properties of the automobiles, covering both the interior sound and exterior noise. They have an overview of the testing procedures of the automobiles. They know in detail the evaluation of the properties of the complete automobile.

### Content

1. Application-oriented material and production technology I
2. Application-oriented material and production technology II
3. Overall vehicle acoustics in the automobile development
4. Drive train acoustics in the automobile development
5. Testing of the complete vehicle
6. Properties of the complete automobile

### Media

Lecture script (provided during the first lessons).

## Course: Principles of Information Engineering and Management [2540450]

**Coordinators:** C. Weinhardt  
**Part of the modules:** Information Engineering (p. 37)[WI4BWLISM7]

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

### Learning Control / Examinations

The assessment of this course is a written examination (following §4(2), 1 SPO) and by submitting written papers as part of the exercise (following §4(2), 3 SPO). The total grade for this lecture will consist to 90% of the grade achieved in the written examination and to 10% of the assignments during the exercises.

### Conditions

None.

### Learning Outcomes

The students should be able to understand and analyze the central role of information as an economic good, a production factor, and a competitive factor in today's societies. Students are supposed to be able to identify, evaluate, price, and market information goods with the help of the concepts and methods taught in the lecture. Furthermore, students learn basic aspects about information systems and information flows within and between organizations, as well as their design parameters.

### Content

Information plays a central role in today's society. The resulting structures and processes cannot be explained intuitively with traditional approaches of economic theory. Formerly, information has only been implicitly treated as a production factor; its role as a competitive factor used to be neglected. In order to deal with the central role of information we developed the concept of the "information lifecycle" that systematizes all phases from information generation to information distribution. The single phases of that cycle,

- extraction/generation,
- storage,
- transformation,
- evaluation,
- marketing
- and usage of information

are analyzed from the business administration perspective and the microeconomic perspective. The state of the art of economic theory is presented across this information lifecycle within the lectures. The content of the lecture is deepened in accompanying lecture courses.

### Media

- PowerPoint slides
- eLearning Platform Ilias

### Literature

- Shapiro, C., Varian, H., Information Rules: A Strategic Guide to the Network Economy. Harvard Business School Press 1999.
- Stahlknecht, P., Hasenkamp, U., Einführung in die Wirtschaftsinformatik. Springer Verlag 7. Auflage, 1999.
- Wirth, H., Electronic Business. Gabler Verlag 2001.

**Course: Freight Transport [19308]****Coordinators:** B. Chlond**Part of the modules:** Guided Systems Engineering (p. 108)[WI4INGBGU6], Transportation Systems (p. 109)[WI4INGBGU8]

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

**Learning Control / Examinations**

See module description.

**Conditions**

See module description.

**Learning Outcomes****Content**

**Course: Quantum Functional Devices and Semiconductor Technology [23476]****Coordinators:** M. Walther**Part of the modules:** Optoelectronics and Optical Communication (p. 100)[WI4INGMBIMT6], Nanotechnology (p. 99)[WI4INGMBIMT5]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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.

**Learning Outcomes**

Students

- will be proficient in the basics of optical and electrical devices with carrier confinement
- will understand carrier confinement effects in low-dimensional systems for optical and electrical devices
- acquire knowledge in the technology for realization of modern semiconductor devices
- will deal with future trends and scaling limits in micro- and opto-electronics.

**Content**

Fundamental properties of quantum functional devices  
 Heterostructures and band gap engineering  
 Carrier confinement in 2-, 1- and 0-dim structures  
 Quantum functional compound semiconductor devices  
 High electron mobility transistors  
 Quantum well, quantum dot and quantum cascade lasers  
 Infrared detectors  
 Compound semiconductor technology  
 Epitaxy, lithography, etching and deposition  
 Future trends in microelectronics  
 Scaling limits, Moore's law, devices beyond Moore

**Media**

script

## Course: Commercial and Corporate Law [24011]

**Coordinators:** P. Sester  
**Part of the modules:** Commercial Law (p. 130)[WI4JURA2]

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

### Learning Control / Examinations

Assessment will consist of written exams following §4, Abs. 2, 3 of the examination regulation.

### Conditions

None.

### Learning Outcomes

Based on the lectures on civil law, the students are provided with an overview of the specifics of commercial transactions, commercial agency and the law of merchants. Moreover, the forms of organization available in German company law are outlined.

### 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.

### Media

Slides.

### Literature

Klunzinger, Eugen

- Grundzüge des Handelsrechts, Verlag Vahlen, latest edition
- Grundzüge des Gesellschaftsrechts, Verlag Vahlen, latest edition

### Elective literature:

Will be announced in the lecture.

**Course: High-Voltage Test Technique [23392/23394]****Coordinators:** Badent**Part of the modules:** Generation and transmission of renewable power (p. 118)[WI4INGETIT7]

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

**Learning Control / Examinations**

The assessment consists of an oral exam according to Section 4 (2), 2 of the examination regulation.

**Conditions**

None.

**Recommendations**

High-Voltage-Technology I and II

**Learning Outcomes**

This course familiarizes the students with issues of high voltage testing, calibration and the contents of the international test standards for high voltage testing.

**Content**

- High voltage test technique
- PD-measurement
- Transformer testing
- Cable and garniture
- Switchyard
- Insulators and overhead pipeline fittings
- Computer based test systems in the area of high voltage testing
- Accreditation of test laboratories

**Literature****Elective literature:**

Küchler, A.; Hochspannungstechnik, Springer Verlag 2005

**Remarks**

The credits have been raised to 4,5 in summer term 2011.



**Course: High-Voltage Technology I [23360/23362]**

**Coordinators:** Badent  
**Part of the modules:** High-Voltage Technology (p. 117)[WI4INGETIT6]

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

**Learning Control / Examinations**

The assessment consists of a written exam (120 min) 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**

Basic Network and Field Theory

**Learning Outcomes**

This course familiarizes students with a wide range of issues of High-Voltage Technology. It provides a deep insight in this special field of electrical engineering.

**Content**

- Electric potential fields
- Maxwell's equations
- Calculation of static electric fields, charge simulation method
- Difference method, Finite-Element method, Monte-Carlo method, Boundary-element method
- Graphical field evaluation
- Measurement of electric fields, field energy and field forces
- Polarization, boundary layers, inclusions, DC and AC voltage distribution in imperfect dielectrics
- Frequency and temperature dependency of the dissipation factor
- Generation of high DC/AC and impulse voltages and high impulse currents for testing

**Literature**

Küchler, Andreas; Hochspannungstechnik, Springer Verlag 2. Auflage 2005, ISBN 3-540-21411-9

**Course: High-Voltage Technology II [23361/23363]**

**Coordinators:** Badent  
**Part of the modules:** High-Voltage Technology (p. 117)[WI4INGETIT6]

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

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes**

This course familiarizes students with a wide range of issues of High-Voltage Technology. It provides a deep insight in this special field of electrical engineering.

**Content**

Gas discharges, gaseous electronics, atomic energy niveaus, self-sustained and non-self-sustained discharges  
 Townsend mechanisms, channel mechanism, similarity laws, Paschen's law  
 Glow discharges, sparks, arcs, partial discharges, breakdown of liquid and solid dielectrics Statistics of electrical breakdown  
 Insulation coordination, roots of overvoltage's, trans-mission line equations, travelling wave theory

**Literature****Elective literature:**

Küchler, A. Hochspannungstechnik; Springer Verlag, 2005

**Course: Foundations of Hydrological Planning [19201]****Coordinators:** Ihringer**Part of the modules:** Understanding and Prediction of Disasters I (p. 123)[WI4INGINTER1], Understanding and Prediction of Disasters II (p. 124)[WI4INGINTER2], Understanding and Prediction of Disasters III (p. 125)[WI4INGINTER3]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Remarks**For further information, see [http://www.iwk.uni-karlsruhe.de/kurse\\_vertiefungsstudium.php](http://www.iwk.uni-karlsruhe.de/kurse_vertiefungsstudium.php)

## Course: Information Systems and Supply Chain Management [2118094]

**Coordinators:** C. Kilger

**Part of the modules:** Logistics in Value Chain Networks (p. 87)[WI4INGMB28], Introduction to Logistics (p. 83)[WI4INGMB20], Global Production and Logistics (p. 74)[WI4INGMB31]

ECTS Credits	Hours per week	Term	Instruction language
4	2	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. It is recommended to attend the lecture *Logistics - Organisation, Design, and Control of Logistic Systems*.

### Learning Outcomes

Basic knowledge of information systems for logistics processes will be delivered and the students should be able to identify the requirements of a supply chain and choose an appropriate information system.

### 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

### Literature

#### Elective literature:

Stadtler, Kilger: Supply Chain Management and Advanced Planning, Springer, 4. Auflage 2008

## Course: Information Technology and Business Information [2571162]

**Coordinators:** B. Neibecker  
**Part of the modules:** (p. 44)[WI4BWL MAR7]

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

### Learning Control / Examinations

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

### Conditions

None.

### Learning Outcomes

Students have learned the following outcomes and competences:

- To specify the key terms in marketing research
- To design a market research project
- To identify the main research trends
- To analyze and interpret high level academic articles
- To learn interactive skills to work in teams and to follow a goal-oriented approach
- To gain understanding of methodological research to develop concrete plans for marketing decision-making

### Content

The goal of the course is to create a text that is comprehensive, practical, applied, and managerial and that presents a balanced coverage of both, quantitative and qualitative approaches. It takes the perspective of users of marketing research and set out to reflect the current trends in the use of computers (e.g. statistical packages and online research). The course covers as main topics an introduction to interactive multimedia systems, techniques of internet marketing research, methods of primary data collection including questionnaires and scaling of psychological attributes, methods of observation, program analyzer, psychobiological methods, content analysis and cognitive response approach, experimental designs and panels, secondary data collection, management support systems, a case study in marketing decision support and an overview of philosophy of science.

### Literature

(Literature is in English and German, see German description)

**Course: Engineering Seismology [04055]****Coordinators:** Wenzel/Sokolov**Part of the modules:** Understanding and Prediction of Disasters I (p. 123)[WI4INGINTER1], Understanding and Prediction of Disasters II (p. 124)[WI4INGINTER2], Understanding and Prediction of Disasters III (p. 125)[WI4INGINTER3]

ECTS Credits	Hours per week	Term	Instruction language
5	3/1	Summer term	de

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Remarks**For further information, see <http://www-gpi.physik.uni-karlsruhe.de/>

## Course: Seminar in Engineering Science [SemING]

**Coordinators:** Fachvertreter ingenieurwissenschaftlicher Fakultäten

**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

### Learning Control / Examinations

#### Conditions

None.

### Learning Outcomes

#### Content

#### Literature

Will be announced in the respective seminar.

#### Elective literature:

Will be announced in the seminar.

## Course: Innovationtheory and -policy [2560236]

**Coordinators:** I. Ott

**Part of the modules:** Economic Policy (p. 50)[WI4VWL6], Economic Policy II (p. 51)[WW4VWL3], Innovation and growth (p. 57)[WW4VWLIWW1]

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

Students will be given the opportunity of writing and presenting a short paper during the lecture time to achieve a bonus on the exam grade. If the mandatory credit point exam is passed, the awarded bonus points will be added to the regular exam points. A deterioration is not possible by definition, and a grade does not necessarily improve, but is very likely to (not every additional point improves the total number of points, since a grade can not become better than 1). The voluntary elaboration of such a paper can not countervail a fail in the exam.

### Conditions

None.

### Recommendations

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

### Learning Outcomes

Students shall be given the ability to

- identify the importance of alternative incentive mechanisms for the emergence and dissemination of innovations
- understand the relationships between market structure and the development of innovation
- explain, in which situations market interventions by the state, for example taxes and subsidies, can be legitimized, and evaluate them in the light of economic welfare

### Content

- Incentives for the emergence of innovations
- Patents
- Diffusion
- Impact of technological progress
- Innovation Policy

### Media

- lecture slides
- exercises

### Literature

Excerpt:

- Aghion, P., Howitt, P. (2009), The Economics of Growth, MIT Press, Cambridge MA.
- de la Fuente, A. (2000), Mathematical Methods and Models for Economists. Cambridge University Press, Cambridge, UK.
- Klodt, H. (1995), Grundlagen der Forschungs- und Technologiepolitik. Vahlen, München.
- Linde, R. (2000), Allokation, Wettbewerb, Verteilung - Theorie, UNIBUCH Verlag, Lüneburg.
- Ruttan, V. W. (2001), Technology, Growth, and Development. Oxford University Press, Oxford.
- Scotchmer, S. (2004), Incentives and Innovation, MIT Press.
- Tirole, Jean (1988), The Theory of Industrial Organization, MIT Press, Cambridge MA.

### Remarks

The credits have been changed from 4,5 to 5.



**Course: Insurance Accounting [2530320]****Coordinators:** E. Schwake**Part of the modules:** Insurance Management I (p. 24)[WI4BWLFBV6], Insurance Management II (p. 25)[WI4BWLFBV7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	Winter term	de

**Learning Control / Examinations**

The assessment consists of an oral or a written exam (according to Section 4 (2), 2 or 1 of the examination regulation).

**Conditions**

None.

**Learning Outcomes****Content****Literature****Elective literature:**

K. Küting, C.-P. Weber. Bilanzanalyse, Lehrbuch zur Beurteilung von Einzel- und Konzernabschlüssen. 1997

W. Rockel, E. Helten, H.Loy. Versicherungsbilanzen - Rechnungslegung nach HGB, US-GAAP und IAS/IFRS. 2005

H.Treuberg, B.Angermayer. Jahresabschluss von Versicherungsunternehmen. 1995.

**Remarks**

Block course. To attend the course please register at the secretariat of the chair of insurance science.

**Course: Insurance Marketing [2530323]****Coordinators:** E. Schwake**Part of the modules:** Insurance Management I (p. 24)[WI4BWLFBV6], Insurance Management II (p. 25)[WI4BWLFBV7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	Summer term	de

**Learning Control / Examinations**

The assessment consists of oral presentations (incl. papers) within the lecture (according to Section 4 (2), 3 of the examination regulation) and a final oral exam (according to Section 4 (2), 2 of the examination regulation).

The overall grade consists of the assessment of the oral presentations incl. papers (50 percent) and the assessment of the oral exam (50 percent).

**Conditions**

None.

**Learning Outcomes**

See German version.

**Content**

See German version.

**Literature****Elective literature:**

- Farny, D.. Versicherungsbetriebslehre (Kapitel III.3 sowie V.4). Karlsruhe 2011
- Kurtenbach / Kühlmann / Käßer-Pawelka. Versicherungsmarketing. . . . Frankfurt 2001
- Wiedemann, K.-P./Klee, A. Ertragsorientiertes Zielkundenmanagement für Finanzdienstleister, Wiesbaden 2003

**Remarks**

For organizational reasons, please register with the secretary of the chair: thomas.mueller3@kit.edu.

**Course: Insurance Production [2530324]****Coordinators:** U. Werner**Part of the modules:** Insurance Management I (p. 24)[WI4BWLFBV6], Insurance Management II (p. 25)[WI4BWLFBV7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	Winter / Summer Term	de

**Learning Control / Examinations**

The assessment consists of oral presentations (incl. papers) within the lecture (according to Section 4 (2), 3 of the examination regulation) and a final oral exam (according to Section 4 (2), 2 of the examination regulation).

The overall grade consists of the assessment of the oral presentations incl. papers (50 percent) and the assessment of the oral exam (50 percent).

**Conditions**

None.

**Learning Outcomes**

See German version.

**Content**

See German version.

**Literature****Elective literature:**

P. Albrecht. Zur Risikotransformationstheorie der Versicherung: Grundlagen und ökonomische Konsequenzen. Mannheimer Manuskripte zur Versicherungsbetriebslehre und Risikotheorie Nr. 36

D. Farny. Versicherungsbetriebslehre. 2011.

H. Neugebauer. Kostentheorie und Kostenrechnung für Versicherungsunternehmen. 1995

A. Wiesehan. Geschäftsprozessoptimierung für Versicherungsunternehmen. München 2001

**Remarks**

This course is offered on demand. For further information, see: <http://insurance.fbv.uni-karlsruhe.de>  
For organizational reasons, please register with the secretary of the chair: [thomas.mueller3@kit.edu](mailto:thomas.mueller3@kit.edu).

**Course: Insurance Risk Management [2530335]****Coordinators:** H. Maser**Part of the modules:** Insurance Management II (p. 25)[WI4BWLFBV7], Insurance Management I (p. 24)[WI4BWLFBV6]

ECTS Credits	Hours per week	Term	Instruction language
2,5	2/0	Summer term	de

**Learning Control / Examinations**

The assessment consists of a written or an oral exam (according to Section 4 (2), 1 or 2 of the examination regulation) .

**Conditions**

None.

**Learning Outcomes**

Getting to know basic principles of risk management in insurance companies and credit institutions.

**Content****Literature****Elective literature:**

- "Mindestanforderungen an ein (Bank-)Risikomanagement", [www.bafin.de](http://www.bafin.de)
- V. Bieta, W. Siebe. Strategisches Risikomanagement in Versicherungen. in: ZVersWiss 2002 S. 203-221.
- A. Schäfer. Subprime-Krise, in: VW2008, S. 167-169.
- B. Rudolph. Lehren aus den Ursachen und dem Verlauf der internationalen Finanzkrise, in: zfbf 2008, S. 713-741.

**Remarks**Block course. For organizational reasons, please register with the secretary of the chair: [thomas.mueller3@kit.edu](mailto:thomas.mueller3@kit.edu).

## Course: Integrated Production Planning [2150660]

**Coordinators:** Lanza, Gisela

**Part of the modules:** Integrated Production Planning (p. 73)[WI4INGMB24]

ECTS Credits	Hours per week	Term	Instruction language
9	4/2	Summer term	de

### Learning Control / Examinations

Performance is assessed in the form of one written examination (180 min) during the lecture-free period (as per §4(2), 1 SPO [study and examination regulations]). The examination will take place once every semester and can be retaken at every official examination date.

### Conditions

None.

### Recommendations

It is recommended to attend the course *Manufacturing Technology* [2149657] beforehand.

### Learning Outcomes

The student

- has knowledge of the content covered by this lecture and understands the challenges and the fields of action of integrated production planning,
- is able to apply the methods of integrated production planning he/she has learned about to new problems,
- is able to analyse and evaluate the suitability of the methods, procedures and techniques he/she has learned about for a specific problem.

### Content

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:

1. The basic principles of production planning
2. Links between product planning and production planning
3. Integrating a production site into a production network
4. Steps and methods of factory planning
5. Approach to the integrated planning of manufacturing and assembly plants
6. Layout of production sites
7. Maintenance
8. Material flow
9. Digital factory
10. Process simulation for material flow optimisation
11. Start-up

### Media

Lecture notes of the lecture *Integrated Production Planning*

## Course: Intelligent Systems in Finance [2511402]

**Coordinators:** D. Seese

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

The assessment is a written examination.

See the German part for special requirements to be admitted for the examination.

### Conditions

None.

### Learning Outcomes

- The students acquire abilities and knowledge of methods and systems from the area of machine learning and learn how to use them in the area of finance, which is the core area of application of this lecture.
- It is taught the ability to choose and change these methods and systems adequate to the situation and to use them for problem solving in the area of finance.
- The students get the ability to find strategic and creative answers in their search for solutions for precisely defined, concrete and abstract problems.
- At the same time the lecture aims to give foundational knowledge and methods in the context of their application in practise. On the basis of the basic understanding of concepts and methods of informatics the students should be able to comprehend quickly the new developments in the area and to use them correctly.

### Content

A new generation of computing methods, commonly known as “intelligent systems”, has recently been successfully applied to a variety of business and financial modelling tasks. In many application fields these novel methods outperform traditional statistical techniques. The lecture provides a comprehensive coverage of the area, including foundations and applications. In particular it deals with intelligent software agents, genetic algorithms, neural networks, support vector machines, fuzzy-logic, expert systems and intelligent hybrid systems. The presented applications focus on the finance area and are related to risk management (credit risk, operational risk), financial trading, portfolio management and economic modelling. The lecture is given in cooperation with the company msgGILLARDON. The lecture starts with an introduction of the central problems of application in this area, e.g. decision support for investors, Portfoliosselection under constraints, information retrieval from business reports, automatic development of trading rules for the capital market, modelling of time series at the capital market, explanation of phenomena at capital markets by simulation, decision support in risk management (credit risk, operational risk). After this the basics of intelligent systems are discussed. Basic ideas and essential results for different stochastic heuristics for local search are discussed next, especially Hill Climbing, Simulated Annealing, Threshold Accepting and Tabu Search. After this different population-based approaches of evolutionary methods are presented, e.g. Genetic Algorithms, Evolutionary Strategies and Programming, Genetic Programming, Memetic Algorithms and Ant-Algorithms. It follows an introduction into Neural Networks, Support Vector Machines and Fuzzylogic. Softwareagents and agentbased stock market models are the next topic. The lecture ends with an overview on the complexity of algorithmic problems in the area of finance, giving in this way one of the key reasons for the necessity to use heuristics and intelligent systems. Essential examples and basic applications are chosen from the area of finance.

### Media

Slides.

### Literature

There is no text book covering completely the content of the lecture.

- Z. Michalewicz, D. B. Fogel. How to Solve It: Modern Heuristics. Springer 2000.
- J. Hromkovic. Algorithms for Hard Problems. Springer-Verlag, Berlin 2001.
- Christopher M. Bishop: Pattern Recognition and Machine Learning, Springer 2006
- P. Winker. Optimization Heuristics in Econometrics. John Wiley & Sons, Chichester 2001.
- A. Brabazon, M. O’Neill. Biologically Inspired Algorithms for Financial Modelling. Springer, 2006.
- A. Zell. Simulation Neuronaler Netze. Addison-Wesley 1994.
- R. Rojas. Theorie Neuronaler Netze. Springer 1993.
- N. Cristianini, J. Shawe-Taylor. An Introduction to Support Vector Machines and other kernel-based learning methods. Cambridge University Press 2003.

- G. Klir, B. Yuan. Fuzzy Sets and Fuzzy Logic: Theory and Applications. Prentice-Hall, 1995.
- F. Schlottmann, D. Seese. Modern Heuristics for Finance Problems: A Survey of Selected Methods and Applications. In S. T. Rachev (Ed.) Handbook of Computational and Numerical Methods in Finance, Birkhäuser, Boston 2004, pp. 331 - 359.

Further references will be given in each lecture.

**Elective literature:**

- S. Goonatilake, Ph. Treleaven (Eds.). Intelligent Systems for Finance and Business. John Wiley & Sons, Chichester 1995.
- F. Schlottmann, D. Seese. Financial applications of multi-objective evolutionary algorithms, recent developments and future directions. Chapter 26 of C. A. Coello Coello, G. B. Lamont (Eds.) Applications of Multi-Objective Evolutionary Algorithms, World Scientific, New Jersey 2004, pp. 627 - 652.
- D. Seese, F. Schlottmann. Large grids and local information flow as reasons for high complexity. In: G. Frizelle, H. Richards (eds.), Tackling industrial complexity: the ideas that make a difference, Proceedings of the 2002 conference of the Manufacturing Complexity Network, University of Cambridge, Institute of Manufacturing, 2002, pp. 193-207. (ISBN 1-902546-24-5).
- R. Almeida Ribeiro, H.-J. Zimmermann, R. R. Yager, J. Kacprzyk (Eds.). Soft Computing in Financial Engineering. Physica-Verlag, 1999.
- S. Russel, P. Norvig. Künstliche Intelligenz Ein moderner Ansatz. 2. Auflage, Pearson Studium, München 2004.
- M. A. Arbib (Ed.). The Handbook of Brain Theory and neural Networks (second edition). The MIT Press 2004.
- J.E. Gentle, W. Härdle, Y. Mori (Eds.). Handbook of Computational Statistics. Springer 2004.
- F. Schweitzer. Brownian Agents and Active Particles. Collective Dynamics in the Natural and Social Sciences, Springer 2003.
- D. Seese, C. Weinhardt, F. Schlottmann (Eds.) Handbook on Information Technology in Finance, Springer 2008.
- Further references will be given in the lecture.

**Remarks**

The content of the lecture will permanently be adapted to actual developments. This can be the cause to changes of the described content and schedule.

The course "Intelligent Systems in Finance" will not be offered any more from summer term 2016 on. The examination will be offered latest until summer term 2015 (repeaters only).

**Course: International Marketing [2572155]****Coordinators:** M. Klarmann**Part of the modules:** Marketing Management (p. 42)[WI4BWLMAR5], (p. 44)[WI4BWLMAR7]

ECTS Credits	Hours per week	Term	Instruction language
1,5		Winter term	

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**



**Course: International Risk Transfer [2530353]****Coordinators:** W. Schwehr**Part of the modules:** Operational Risk Management II (p. 27)[WI4BWLFBV10], Operational Risk Management I (p. 26)[WI4BWLFBV9]

ECTS Credits	Hours per week	Term	Instruction language
2,5	2/0	Summer term	de

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes**

Becoming acquainted with the various possibilities of international risk transfer.

**Content**

How are the costs of potential major damages financed and covered on a global scale? Traditionally, direct insurers and, especially, reinsurers are conducting a global business, Lloyd's of London is a turntable for international risks, and global industrial enterprises are establishing captives for self insurance. In addition to this, capital markets and insurance markets are developing innovative approaches to cover risks, which were hard to insure in the past (e.g. weather risk). The lecture will elucidate the functioning and the background of these different possibilities of international risk transfer.

**Literature**

- P. Liebwein. Klassische und moderne Formen der Rückversicherung. Karlsruhe 2000
- Brühwiler/ Stahlmann/ Gottschling. Innovative Risikofinanzierung - Neue Wege im Risk Management. Wiesbaden 1999.
- Becker/ Bracht. Katastrophen- und Wetterderivate. Finanzinnovationen auf der Basis von Naturkatastrophen und Wettererscheinungen, Wien 1999.

**Remarks**

Block course. For organizational reasons, please register at the secretary of the chair: thomas.mueller3@kit.edu.

**Course: International Finance [2530570]****Coordinators:** M. Uhrig-Homburg, Walter**Part of the modules:** Finance 2 (p. 22)[WI4BWLFBV2], Finance 3 (p. 23)[WI4BWLFBV11]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes**

The objective of this course is to become familiar with the basics of investment decisions on international markets and to manage foreign exchange risks.

**Content**

The main aspects of this course are the chances and the risks which are associated with international transactions. We carry out our analysis from two distinct perspectives: First the point of view of an international investor second that, of an international corporation. Several alternatives to the management of foreign exchange risks are shown. Due to the importance of foreign exchange risks, the first part of the course deals with currency markets. Furthermore current exchange rate theories are discussed.

**Literature****Elective literature:**

- D. Eiteman et al. (2004): Multinational Business Finance, 10. Auflage

**Course: International Economic Policy [2560254]**

**Coordinators:** J. Kowalski  
**Part of the modules:** Economic Policy II (p. 51)[WW4VWL3]

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

**Learning Control / Examinations**

The assessment consists of a written exam (60min) 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.

**Recommendations**

Previous visit of the lectures *Economics II: Macroeconomics* [2600014] is recommended.

**Learning Outcomes****Content****Literature****Elective literature:**

- World Bank: "World Development Report". 2008, 2009
- Wagner, M.: „Einführung in die Weltwirtschaftspolitik“. Oldenbourg 1995
- Gerber, J.: „International Economics“, Pearson, 2007, IV Edition weitere Angaben in der Vorlesung

**Remarks**

The credits have been changed to 5.

## Course: Cost and Management Accounting [2530210]

**Coordinators:** T. Lüdecke

**Part of the modules:** Finance 2 (p. 22)[WI4BWLFBV2], Finance 3 (p. 23)[WI4BWLFBV11]

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

### Learning Control / Examinations

The assessment consists of a written exam (60 min) taking place in the recess period (according to §4 (2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

### Conditions

None.

### Learning Outcomes

This course aims at providing students with the understanding of the purposes of alternative costing systems as well as the use of relevant information for decision making. The course will also examine techniques for the purpose of cost management and accounting for control.

### Content

- Design of Cost Systems
- Cost Classifications, Cost Behavior, and Principles of Cost Allocation
- Activity-based Costing
- Product Costing
- Production Decisions
- Cost-based Pricing
- Cost Management
- Decisions under Risk
- Cost Accounting for Control

### Literature

#### Elective literature:

- Coenenberg, A.G. Kostenrechnung und Kostenanalyse, 6. Aufl. 2007.
- Ewert, R. und Wagenhofer, A. Interne Unternehmensrechnung, 7. Aufl. 2008.
- Götze, U. Kostenrechnung und Kostenmanagement. 3. Aufl. 2007.
- Kilger, W., Pampel, J., Vikas, K. Flexible Plankostenrechnung und Deckungsbeitragsrechnung , 11. Aufl. 2002.

**Course: Internet Law [24821]**

**Coordinators:** T. Dreier  
**Part of the modules:** Intellectual Property Law (p. 131)[WI4JURA4]

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

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

It is the aim of this course to give the students 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 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.

**Content**

The course deals with the legal rules that are touched upon when the Internet is used as a means of communications and for doing business. These legal rules range from the law governing domain names, issues concerning the electronic formation of contracts, distance and electronic commerce contracts, to the issue liability and questions of unfair competition. Students shall understand how the legal rules depend upon, and interact with, the economic background, legislative policy and information and communication technologies. Students shall learn about the rules of national, European and international copyright law and to apply these legal rules in practical cases.

**Media**

Slides

**Literature**

Script, Internetrecht (Internet Law)

**Elective literature:**

Additional literature tba in class.

**Remarks**

It is possible that this course will be taught in the summer instead of the winter semester.

**Course: IT for Facility Logistics [2118083]****Coordinators:** F. Thomas**Part of the modules:** Introduction to Logistics (p. 83)[WI4INGMB20], Technical Logistics (p. 85)[WI4INGMB27]

ECTS Credits	Hours per week	Term	Instruction language
6	3/1	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.

**Learning Outcomes**

Students should be familiar with basic concepts of information technology in material handling systems.

**Content**

- Sensors and actuators in material flow
- Control concepts
- Network hierarchies
- Motors
- Coding technique
- Programmable logic controllers
- Computer communication
- Material flow control systems
- Transport control system

**Remarks**

The course was formerly known as *Information Technology for Logistic Systems*.

**Course: [19241]****Coordinators:** J. Winter**Part of the modules:** Environmental Management (p. 111)[WI4INGBGU12]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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****Content**

**Course: Knowledge Discovery [2511302]****Coordinators:** R. Studer**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

**Learning Control / Examinations**

The assessment consists of an 1h written exam following §4, Abs. 2, 1 of the examination regulation. Students can be awarded a bonus on their final grade if they successfully complete special assignments.

**Conditions**

None.

**Learning Outcomes**

Familiarity with fundamentals of Knowledge Discovery, Data Mining and Machine Learning. Standard algorithms, representations, applications and processes needed for knowledge discovery projects are covered.

**Content**

The lecture provides an overview of machine learning and data mining techniques for knowledge discovery from large data sets. These techniques are examined in respect of algorithms, applicability to different data representations and application in the real world. Topics of the lectures comprise the whole Machine Learning and Data Mining process like CRISP, data warehousing, OLAP-techniques, learning algorithms, visualization and empirical evaluation. Covered learning techniques range from traditional approaches like decision trees, neural networks and support vector machines to selected approaches resulting from current research. Discussed learning problems are amongst others feature vector-based learning, text mining and social network analysis.

**Media**

Slides.

**Literature**

- T. Hastie, R. Tibshirani, J. Friedman. The Elements of Statistical Learning: Data Mining, Inference, and Prediction (<http://www-stat.stanford.edu/~tibs/ElemStatLearn/>)
- T. Mitchell. Machine Learning. 1997
- M. Berhold, D. Hand (eds). Intelligent Data Analysis - An Introduction. 2003
- P. Tan, M. Steinbach, V. Kumar: Introduction to Data Mining, 2005, Addison Wesley



## Course: Theory of Business Cycles [25549]

**Coordinators:** M. Hillebrand

**Part of the modules:** Allocation and Equilibrium (p. 47)[WI4VWL7], Macroeconomic Theory (p. 48)[WI4VWL8]

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

### Learning Control / Examinations

According to the attendance the assessment consists of a written or an oral exam at the beginning of the recess period (according to Section 4 (2), 1 or 2 of the examination regulation).

The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

### Conditions

None.

### Recommendations

Basic knowledge in micro- and macroeconomics, as conveyed in the courses *Economics I: Microeconomics* [2600012] and *Economics II: Macroeconomics* [2600014], is assumed.

According the focus of the course quantitativ-mathematical modelling should be in participant's interest.

### Learning Outcomes

#### Content

#### Literature

##### Elective literature:

David Romer, *Advanced Macroeconomics*, 3rd edition, McGraw-Hill (2006)

Lutz Arnold: *Makroökonomik. Eine Einführung in die Theorie der Güter-, Arbeits- und Finanzmärkte* (2003)

**Course: Hospital Management [2550493]****Coordinators:** S. Nickel, Hansis**Part of the modules:** Operations Research in Supply Chain Management and Health Care Management (p. 64)[WI4OR5]

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

**Learning Control / Examinations**

The assessment consists of attendance, a seminar thesis and a final exam (according to §4(2), 1 of the examination regulation). The examination is held in the term of the lecture and the following lecture.

**Conditions**

None.

**Learning Outcomes**

Students gain insight into fundamental work flows in hospitals. They learn that the application of Operations Research methods can also be useful in so-called non-profit-organisations. In addition, the most important application areas for mathematical models, e.g. personnel planning or quality management, will be discussed.

**Content**

The lecture "Hospital management" presents internal organization structures, work conditions and work environments at the example of hospitals und relates this to common and expected conditions of other service industries.

Covered topics include normative environment, intra-organizational structure, personnel management, quality, external networking and market appearance. Students have the possibility to participate in a final exam.

**Remarks**

The lecture is held in every semester.

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

The name of the lecture was changed from "Enterprise Hospital" and updated from 2 to 3 credits.

**Course: Credit Risk [2530565]****Coordinators:** M. Uhrig-Homburg**Part of the modules:** Finance 2 (p. 22)[WI4BWLFBV2], Finance 3 (p. 23)[WI4BWLFBV11]

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

**Learning Control / Examinations**

The assessment consists of a written exam following §4, Abs. 2, 1.

**Conditions**

None.

**Learning Outcomes**

The objective of this course is to become familiar with the credit markets and the credit risk indicators like ratings, default probabilities and credit spreads. The students learn about the components of credit risk (e.g. default time and default rate) and quantify these in different theoretical models to price credit derivatives.

**Content**

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

**Literature**

- Lando, D., Credit risk modeling: Theory and Applications, Princeton Univ. Press, (2004).
- Uhrig-Homburg, M., Fremdkapitalkosten, Bonitätsrisiken und optimale Kapitalstruktur, Beiträge zur betriebswirtschaftlichen Forschung 92, Gabler Verlag, (2001).

**Elective literature:**

- Bluhm, C., Overbeck, L., Wagner, C., Introduction to Credit Risk Modelling, Chapman & Hall, CRC Financial Mathematics Series, (2002).
- Duffie, D., Singleton, K.J., Credit Risk: Pricing, Measurement and Management, Princeton Series of Finance, Prentice Hall, (2003).

**Course: Customer Orientation in Public Transport [19320]****Coordinators:** E. Hohnecker**Part of the modules:** Public Transportation Operations (p. 106)[WI4INGBGU4]

ECTS Credits	Hours per week	Term	Instruction language
1,5	1	Summer term	

**Learning Control / Examinations**

The assessment will consist of a oral exam (20 min) according to §4 (2), 1 of the examination regulation.

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.

**Conditions**

See module description.

**Learning Outcomes****Content**

quality and customer satisfaction; tilting train; physiology; dynamics of vehicles

## Course: Warehouse and Distribution Systems [2118097]

**Coordinators:** M. Schwab, J. Weiblen

**Part of the modules:** Material Flow in networked Logistics Systems (p. 88)[WI4INGMB26], Material Flow in Logistic Systems (p. 86)[WI4INGMB25], Logistics in Value Chain Networks (p. 87)[WI4INGMB28], Introduction to Logistics (p. 83)[WI4INGMB20], Technical Logistics (p. 85)[WI4INGMB27]

ECTS Credits	Hours per week	Term	Instruction language
4	2	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.

### Learning Outcomes

This course provides basics to understand material and information processes in warehouse and distribution systems. The student will also learn to evaluate them quantitatively.

### Content

- Control and organisation of distribution centers
- Analytical models for analysing and dimensioning of warehouse systems
- Distribution Center Reference Model (DCRM)
- Lean Distribution
- The processes from receiving to shipping
- Planning and controlling
- Distribution networks

**Course: Laser Physics [23840]****Coordinators:** M. Eichhorn**Part of the modules:** Microoptics (p. 96)[WI4INGMBIMT3], Optoelectronics and Optical Communication (p. 100)[WI4INGMBIMT6]

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

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes**

- Knows the fundamental relations and background of lasers
- Has the necessary knowledge for understanding and dimensioning of Lasers, laser media, optical resonators and pump strategies
- Understands the pulse fabrication with lasers and their fundamentals
- has the necessary knowledge of several lasers; Gas-, solid state, fibers- and disc- lasers in the visible and middle infrared range

**Content**

- 1 Quantum-mechanical fundamentals of lasers
  - 1.1 Einstein relations and Planck's law
  - 1.2 Transition probabilities and matrix elements
  - 1.3 Mode structure of space and the origin of spontaneous emission
  - 1.4 Cross sections and broadening of spectral lines
- 2 The laser principle
  - 2.1 Population inversion and feedback
  - 2.2 Spectroscopic laser rate equations
  - 2.3 Potential model of the laser
- 3 Optical Resonators
  - 3.1 Linear resonators and stability criterion
  - 3.2 Mode structure and intensity distribution
  - 3.3 Line width of the laser emission
- 4 Generation of short and ultra-short pulses
  - 4.1 Basics of Q-switching
  - 4.2 Basics of mode locking and ultra-short pulses
- 5 Laser examples and their applications
  - 5.1 Gas lasers: The Helium-Neon-Laser
  - 5.2 Solid-state lasers
    - 5.2.1 The Nd<sup>3+</sup>-Laser
    - 5.2.2 The Tm<sup>3+</sup>-Laser
    - 5.2.3 The Ti<sup>3+</sup>:Al<sub>2</sub>O<sub>3</sub> Laser
  - 5.3 Special realisations of lasers
    - 5.3.1 Thermal lensing and thermal stress
    - 5.3.2 The fiber laser
    - 5.3.3 The thin-disc laser

**Media**

Script &amp; tutorial of lecturer

**Literature**

- A. E. Siegman, *Lasers*, (University Science Books).
- B. E. A. Saleh, M. C. Teich, *Fundamentals of Photonics* (Wiley-Interscience).
- F. K. Kneubühl, M. W. Sigrist, *Laser* (Teubner).

## Course: Laser Application in Automotive Engineering [21642]

**Coordinators:** Schneider

**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an oral exam (30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

### Conditions

Basic knowledge of physics, chemistry and material science is assumed.

It is not possible, to combine this lecture with the lecture *Physical Basics of Laser Technology* [21612]

### Learning Outcomes

The student

- comprehends the physical basics and understands the function of laser sources and the interactions between laser radiation and materials surfaces.
- Based on this the student is able to choose appropriate laser sources and laser process techniques for various applications in automotive engineering.

### Content

Based on a short description of the physical basics of laser technology the lecture reviews the most important high power lasers and their various applications in automotive engineering.

### Media

Lecture notes.

### Literature

#### Elective literature:

- R. Poprawe: Lasertechnik für die Fertigung, 2005, Springer
- F. K. Kneubühl, M. W. Sigrist: Laser, 1999, Teubner Studienbücher
- W. M. Steen: Laser Material Processing, 1998, Springer

**Course: Laser Materials Processing [21640]****Coordinators:** Schneider**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

**Learning Control / Examinations**

The assessment consists of an colloquium for every single experiment and an overall final colloquium (according to Section 4(2), 3 of the examination regulation).

**Conditions**

The attendance to one of the courses *Physical Basics of Laser Technology* and *Laser Application in Automotive Engineering* is required.

**Learning Outcomes****Content**



**Course: Food Science and Functionality [22207]****Coordinators:** Watzl**Part of the modules:** Principles of Food Process Engineering (p. 119)[WI4INGCV3], Specialization in Food Process Engineering (p. 120)[WI4INGCV4]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes****Content**

**Course: Logistics - Organisation, Design, and Control of Logistic Systems [2118078]****Coordinators:** K. Furmans**Part of the modules:** Logistics in Value Chain Networks (p. 87)[WI4INGMB28]

ECTS Credits	Hours per week	Term	Instruction language
6	3/1	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**

Required are lectures on "Linear Algebra" and "Stochastic".

**Learning Outcomes**

After successfully finishing this course, the student is able to plan simple material handling and logistic systems and is able to assign the right models to a certain task. He is able to evaluate the performance of the most important elements of material handling and logistic systems.

**Content**

Introduction

- historical overview
- lines of development

Structure of logistics systems

Distribution logistics

- location planning
- Vehicle Routing Planning
- distribution centers

Inventory management

- demand forecasting
- Inventory management policies
- Bullwhip effect

Production logistics

- layout planning
- material handling
- flow control

Supply Management

- information flow
- transportation organization
- controlling and development of a logistics system
- co-operation mechanisms
- Lean SCM
- SCOR model

Identification Technologies

**Media**

Blackboard, LCD projector, in exercises also PCs.

**Literature****Elective literature:**

- Arnold/Isermann/Kuhn/Tempelmeier. Handbuch Logistik, Springer Verlag, 2002 (Neuaufgabe in Arbeit)

- Domschke. Logistik, Rundreisen und Touren, Oldenbourg Verlag, 1982
- Domschke/Drexl. Logistik, Standorte, Oldenbourg Verlag, 1996
- Gudehus. Logistik, Springer Verlag, 2007
- Neumann-Morlock. Operations-Research, Hanser-Verlag, 1993
- Tempelmeier. Bestandsmanagement in Supply Chains, Books on Demand 2006
- Schönsleben. Integrales Logistikmanagement, Springer, 1998

**Remarks**

Formerly, the course was known as *Logistics*.

## Course: Automotive Logistics [2118085]

**Coordinators:** K. Furmans

**Part of the modules:** Material Flow in networked Logistics Systems (p. 88)[WI4INGMB26], Material Flow in Logistic Systems (p. 86)[WI4INGMB25], Logistics in Value Chain Networks (p. 87)[WI4INGMB28], Introduction to Logistics (p. 83)[WI4INGMB20], Global Production and Logistics (p. 74)[WI4INGMB31]

ECTS Credits	Hours per week	Term	Instruction language
4	2	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.

### Learning Outcomes

It is the aim of the course to show the importance and impact of logistic questions in the automotive industry sector.

### Content

A basic model of the automobile production and distribution is used to study the main elements of the automotive supply chain:

- Supply side logistics (Tasks due to disposition and physical accomplishment; methods; solution models)
- Car manufacturing with the specific questions of the interaction of body shell, paint shop and assembly (sequence planning; partial allocation for assembly)
- Car distribution and the connection to sale processes (physical accomplishment; planning and control)

**Course: Airport Logistics [2117056]****Coordinators:** A. Richter**Part of the modules:** Logistics in Value Chain Networks (p. 87)[WI4INGMB28], Material Flow in Logistic Systems (p. 86)[WI4INGMB25], Material Flow in networked Logistics Systems (p. 88)[WI4INGMB26], Introduction to Logistics (p. 83)[WI4INGMB20]

ECTS Credits	Hours per week	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.

**Learning Outcomes**

Giving an inside view of the conveyor and material handling technical activities on airports is the aim of this course. Furthermore an overview of air traffic and the legal situation is given.

**Content**

Development of air traffic:

- Legal basics
- Infrastructure (among other things person, luggage and freight conveyance)
- Supply and disposal activities
- Logistic process networks
- Information logistics

**Remarks**

The course takes place as a block course.

**Course: Air Cargo Networks [19361]**

**Coordinators:** B. Chlond, externe Vortragende  
**Part of the modules:** Transportation Systems (p. 109)[WI4INGBGU8]

ECTS Credits	Hours per week	Term	Instruction language
1	1/0	Winter term	de

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

**Content**

**Course: Management Accounting 1 [2579900]**

**Coordinators:** M. Wouters  
**Part of the modules:** Management Accounting (p. 30)[WI4BWLIBU1]

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

**Learning Control / Examinations**

The assessment consists of a written exam (90 minutes) (following §4(2), 1 of the examination regulation).

**Conditions**

The examination "Business Administration and Management Science C" must have been completed before starting 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 MA1 are: short-term planning, investment decisions, budgeting, activity-based costing, and variance analysis.

We will use mainly international material written in English. Next to that, attention will be given to German cost accounting.

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.

**Literature**

Will be announced in the course.

**Course: Management Accounting 2 [2579902]**

**Coordinators:** M. Wouters  
**Part of the modules:** Management Accounting (p. 30)[WI4BWLIBU1]

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

**Learning Control / Examinations**

The assessment consists of a written exam (90 minutes) (following §4(2), 1 of the examination regulation).

**Conditions**

The examination "Business Administration and Management Science C" must have been completed before starting this course.

**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, customer value propositions, and supply chain management.

We will use mainly international material written in English. Next to that, attention will be given to German cost accounting.

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.

**Literature**

Will be announced in the course.



**Course: Managing New Technologies [2545003]**

**Coordinators:** T. Reiß  
**Part of the modules:** EnTechnon (p. 45)[WI4BWLENT1]

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

**Learning Control / Examinations**

Written exam 100% following §4, Abs. 2.

**Conditions**

None.

**Learning Outcomes**

New technologies can contribute substantially to the international competitiveness of different industrial sectors. This course provides the necessary knowledge for understanding how industrial enterprises and policy-makers are dealing with the challenge to realise in time the potentials of new technologies and to use them most efficiently. Key tasks of the management of new technologies will be practised.

**Content**

The course provides an overview of the international development of a selected number of key technologies such as biotechnology, nanotechnology, neurotechnologies, converging technologies. Methods for monitoring new technologies including foresight approaches will be presented and the economic and social impacts of new technologies will be discussed.

**Media**

Slides.

**Literature**

- Hausschildt/Salomo: Innovationsmanagement; Borchert et al.: Innovations- und Technologiemanagement;
- Specht/Möhrle; Gabler Lexikon Technologiemanagement

## Course: Management of IT-Projects [2511214]

**Coordinators:** R. Schätzle

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

The assessment of this course is a written examination (60 min) in the first week after lecture period according to Section 4(2), 1 of the examination regulation.

### Conditions

None.

### Learning Outcomes

Students know the terminology of IT project management and typical used methods for planning, handling and controlling. They are able to use methods appropriate to current project phases and project contexts and they know how to consider organisational and social impact factors.

### Content

The lecture deals with the general framework, impact factors and methods for planning, handling, and controlling of IT projects. Especially following topics are addressed:

- project environment
- project organisation
- project planning including the following items:
  - plan of the project structure
  - flow chart
  - project schedule
  - plan of resources
- effort estimation
- project infrastruktur
- project controlling
- risk management
- feasibility studies
- decision processes, conduct of negotiations, time management.

### Media

Slides, access to internet resources.

### Literature

- B. Hindel, K. Hörmann, M. Müller, J. Schmied. Basiswissen Software-Projektmanagement. dpunkt.verlag 2004
- Project Management Institute Standards Committee. A Guide to the Project Management Body of Knowledge (PMBok guide). Project Management Institute. Four Campus Boulevard. Newton Square. PA 190733299. U.S.A.

Further literature is given in each lecture individually.

**Course: IT Complexity in Practice [2511404]****Coordinators:** D. Seese, Kreidler**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

**Learning Control / Examinations**

see German version.

**Conditions**

see German version.

**Learning Outcomes**

see German version.

**Content**

see German version

**Literature****Elective literature:**

Will be announced in the lecture.

**Course: Trademark and Unfair Competition Law [24609]****Coordinators:** Y. Matz, P. Sester**Part of the modules:** Intellectual Property Law (p. 131)[WI4JURA4]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Winter / 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 trademark rights in the national as well as the European and International context. The course deals with the structure of trademark rights, especially with the procedures of registration and the claims, that result from the infringements of trademark rights, as well as with the right of other marks in the MarkenG.

**Content**

The course deals with the subject matter of trademark rights: what is a trademark, how can I get the registration of a trademark, what rights and claims do owner of trademarks have, which other marks do exist? The students shall learn about the rules of national, European an international trademark law.

**Literature**

- Berlitz, Wolfgang: Markenrecht, Verlag C.H.Beck, ISBN 3-406-53782-0, neueste Auflage.

## Course: Market Engineering: Information in Institutions [2540460]

**Coordinators:** C. Weinhardt, M. Adam

**Part of the modules:** Electronic Markets (p. 32)[WI4BWLISM2], Applied Strategic Decisions (p. 46)[WI4VWL2], Information Engineering (p. 37)[WI4BWLISM7], Market Engineering (p. 33)[WI4BWLISM3], Communications & Markets (p. 35)[WI4BWLISM5]

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

### Learning Control / Examinations

The assessment of this course is a written examination (following §4(2), 1 SPO) and by submitting written papers as part of the exercise (following §4(2), 3 SPO). The total grade for this lecture will consist to 70% of the grade achieved in the written examination and to 30% of the assignments during the exercises.

### Conditions

None.

### Learning Outcomes

The students

- understand the role of an economist as an engineer to design markets
- compare different markets and market mechanisms to evaluate their efficiency
- apply game theoretic modelling and mechanism design as well as auction theory for interdisciplinary evaluation.

### Content

The ongoing advancements in information technology have revolutionized traditional business processes and given rise to electronic marketplaces. In contrast to physical marketplaces, electronic markets do not just evolve, but must be carefully designed, implemented and monitored and evaluated. Moreover electronic markets demand open and flexible platforms as well as adequate standards and information services. Future Market Engineers must therefore be able to consider the economic, legal and technological dimension of markets simultaneously. The lecture focuses on the discussion of (1) Microstructure, (2) IT infrastructure, and (3) Business Structure of electronic markets. Hence, students will be taught the economic incentives that a market can impose on market participants, development models for implementing markets, and business models for the application of markets.

### Media

- Powerpoint
- eLearning Platform Ilias

### Literature

- Roth, A., The Economist as Engineer: Game Theory, Experimental Economics and Computation as Tools for Design Economics. *Econometrica* 70(4): 1341-1378, 2002.
- Weinhardt, C., Holtmann, C., Neumann, D., Market Engineering. *Wirtschaftsinformatik*, 2003.
- Wolfstetter, E., Topics in Microeconomics - Industrial Organization, Auctions, and Incentives. Cambridge, Cambridge University Press, 1999.
- Smith, V. „Theory, Experiments and Economics“, *The Journal of Economic Perspectives*, Vol. 3, No. 1, 151-69 1989

**Course: Market Research Methods [2571150]****Coordinators:** M. Klarmann**Part of the modules:** Marketing Management (p. 42)[WI4BWL MAR5], Sales Management (p. 43)[WI4BWL MAR6]

ECTS Credits	Hours per week	Term	Instruction language
4,5		Summer term	

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: Market Microstructure [2530240]****Coordinators:** T. Lüdecke**Part of the modules:** Finance 2 (p. 22)[WI4BWLFBV2], Finance 3 (p. 23)[WI4BWLFBV11]

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

**Learning Control / Examinations****Conditions**

Knowledge of the content of the course *Asset Pricing* [2530555] is assumed.

**Learning Outcomes**

This lecture makes students familiar with the fundamental models of trading in financial markets. It starts with generic design features of financial markets which are used to frame price discovery as the key element of the trading process. The link between market design and market quality is pointed out by using alternative measures of market quality. Seminal models of market microstructure are used to show how dealer inventory and/or asymmetric information affect market prices and the pricing of securities. Theoretical models are shown to provide predictions which are consistent with empirical evidence.

**Content**

The focus of this lecture is on the question how the microstructure of financial markets affects price discovery and market quality. First, issues in designing market structure are presented and linked to fundamental dimensions of market quality, i.e. liquidity and trading costs. In particular, the services and privileges of market makers are stressed. The main part of the lecture covers inventory-models of dealer markets and models of information-based trading. The final part gives attention to some econometric models to analyze the short-term behavior of security prices.

**Media**

Slides.

**Literature**

keine

**Elective literature:**

See reading list.

**Remarks**

**This lecture was not exceptionally taught in the winter semester 2011/2012. The corresponding exams however took place as usual.**

**Only in the winter term 2011/2012 the lecture could be replaced by the lecture eFinance: Information Engineering and Management for Securities Trading [2540454] within the corresponding module. Who wanted to replace it in this way had to make the first attempt at passing the examination at the regular examination dates of this winter term 2011/2012. The general regulation concerning the second attempt at passing the examination remains unchanged.**

**Course: Master Seminar in Information Engineering and Management [2540510]**

**Coordinators:** A. Geyer-Schulz  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations**

The assessment of this course is according to §4(2), 3 of the examination regulation in form of an examination of the written seminar thesis and a presentation.

The grade is given, if the presentation is held and the seminar thesis is handed in.

The grade of this course is based on the grade of the seminar thesis. The presentation can improve or worsen the grade of the seminar thesis by up to two grade levels (up to 0.7 grades).

**Conditions**

None.

**Learning Outcomes**

The student is able to

- to perform a literature search for a given topic, to identify, find, value and evaluate the relevant literature.
- to write his seminar thesis of 15-20 pages in a structured scientific manner.
- to communicate his results in a presentation with discussion afterwards.

**Content**

The seminar serves on one hand to improve the scientific working skills. On the other hand, the student should work intensively on a given topic and develop a scientific work, that is based on a profound literature research.



## Course: Material Flow in Logistic Systems [2117051]

**Coordinators:** K. Furmans

**Part of the modules:** Material Flow in Logistic Systems (p. 86)[WI4INGMB25], Introduction to Logistics (p. 83)[WI4INGMB20]

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

### Learning Control / Examinations

The assessment consists of a written exam according to Section 4 (2), 1 of the examination regulation. The grade of the exam may be improved by passing case studies.

### Conditions

None.

### Learning Outcomes

This course provides the basics of material handling systems. The student will learn how to model material handling systems and how to evaluate them according to quantitative aspects.

### Content

- Material handling equipment: conveyor system, diverts, merges
- Modelling of material handling systems by graphs and matrixes
- Queueing theory
- Simulation
- Analysis of the current situation
- Planning of the target state by using material and information flow

### Literature

#### Elective literature:

Arnold, Dieter; Furmans, Kai: Materialfluss in Logistiksystemen, Springer, 2005 (VDI)

### Remarks

The course was formerly known as *Materialflow*.

**Course: Materials and Processes in Automotive Lightweight Construction [2149669]****Coordinators:** Haepf**Part of the modules:** Specialization in Production Engineering (p. 72)[WI4INGMB22]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: Mathematical Theory of Democracy [25539]**

**Coordinators:** A. Melik-Tangyan  
**Part of the modules:** Social Choice Theory (p. 49)[WI4VWL9]

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

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes****Content**

The mathematical theory of democracy deals with the quantitative evaluation of the representative capacity of single decision makers and representative bodies like president, parliament, or council of ministers. The model is used to analyse the Athenian democracy with its selection of representatives by lottery, to estimate the popularity of parties and coalitions in Germany, and to revise Arrow's paradox about the inevitability of a dictator. Moreover, the idea of representativeness is applied to non-societal OR-domains like MCDM, DAX predictions, or traffic control, based on the observation that certain objects can represent properties/behavior of other objects.

**Course: Seminar in Mathematics [SemMath]****Coordinators:** Fachvertreter der Fakultät für Mathematik**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Literature**

Will be announced in the respective seminar.

**Elective literature:**

Will be announced in the seminar.

**Course: Mechanical Models in Railway Engineering [19322]****Coordinators:** E. Hohnecker**Part of the modules:** Guided Systems Engineering (p. 108)[WI4INGBGU6]

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

**Learning Control / Examinations**

The assessment will consist of a oral exam (20 min) according to §4 (2), 1 of the examination regulation.

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.

**Conditions**

See module description.

See module description.

**Learning Outcomes****Content**

calculation of Zimmermann; wheelset-running

**Course: Methods in Analyzing Internal Combustion [21134]**

**Coordinators:** Wagner  
**Part of the modules:** Combustion Engines II (p. 82)[WI4INGMB19]

ECTS Credits	Hours per week	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* [21101] has to be completed beforehand.

**Learning Outcomes****Content**

**Course: Microactuators [2142881]****Coordinators:** M. Kohl**Part of the modules:** Microsystem Technology (p. 98)[WI4INGMBIMT4], BioMEMS (p. 93)[WI4INGMBIMT1], Microoptics (p. 96)[WI4INGMBIMT3]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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**

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

**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: Microactuators [21881]****Coordinators:** Kohl**Part of the modules:** Sensor Technology I (p. 115)[WI4INGETIT3], Sensor Technology II (p. 116)[WI4INGETIT5]

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

**Learning Control / Examinations**

The assessment consists of an oral exam (20 min) according to Section 4(2), 2 of the examination regulation.

The examination takes place in every summer semester. Re-examinations are offered at every ordinary examination date.

**Conditions**

It is recommended to attend the courses *Material Science II* [21782] and *Electrical Engineering II* [23224] beforehand.

**Learning Outcomes****Content****Literature****Elective literature:**

Microactuators, M. Tabib-Azar, Kluwer Academic Publishers London, 1998.

Mechatronik, B. Heimann, W. Gerth, K. Popp, Carl Hanser Verlag München, 1998.

Technischer Einsatz Neuer Aktoren, D. Jendritza, Expert-Verlag Renningen, 1995.



**Course: Microbiology of Food [22209]****Coordinators:** Franz**Part of the modules:** Specialization in Food Process Engineering (p. 120)[WI4INGCV4]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes****Content**

**Course: Mobile Machines [2113073]**

**Coordinators:** M. Geimer  
**Part of the modules:** Mobile Machines (p. 80)[WI4INGMB15]

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

**Learning Control / Examinations**

See modul description.

**Conditions**

Knowledge in Fluid Power are required.

**Recommendations**

It is recommended to attend the course *Fluid Power Systems* [21093] beforehand.

**Learning Outcomes**

The students will learn the basic structure and construction of mobile machines. The basis will be practically introduced by consultants from industry area. Thereby, the typical working process will be described.

**Content**

- Introduction of the required components and machines
- Basics of the structure of the whole system
- Practical insight in the development techniques

**Media**

Lecture notes.

## Course: Modeling Strategic Decision Making [2577908]

**Coordinators:** H. Lindstädt

**Part of the modules:** Strategic Corporate Management and Organization (p. 28)[WI4BWL01], Strategic Decision Making and Organization Theory (p. 29)[WI4BWL03]

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

### Learning Control / Examinations

Written exam 100% following §4, Abs. 2.

### Conditions

None.

### Learning Outcomes

Starting from the basic model of economic decision theory, fundamental decision principles and calculi for multi-attribute decisions in certain and uncertain conditions up to subjective expected utility theory and the economic assessment of information are described. To confront numerous infringements by decision-makers against principles and axioms of this calculus, in addition non-expected utility calculi and advanced models for decisions by economic agents are discussed; these are especially important for management decisions.

Within the chapter concerning leadership frameworks the students are given the possibility to individually analyze their management style on the basis of classical concepts of leadership. These concepts will be presented and discussed in detail.

### Content

- Principles of strategic management decisions
- Leadership: Classical leadership concepts
- Basic economic decision models
- Limits of the basic models and advanced concepts
- Advanced models: individual decisions with uncertainty and vague information

### Media

Slides.

### Literature

- Eisenführ, F.; Weber, M.: *Rationales Entscheiden*. Springer, 4. Aufl. Berlin 2003.[1]
- Laux, H.: *Entscheidungstheorie*. Springer, 6. Aufl. Berlin 2005.[2]
- Lindstädt, H: *Entscheidungskalküle jenseits des subjektiven Erwartungsnutzens*. In: Zeitschrift für betriebswirtschaftliche Forschung 56 (September 2004), S. 495 - 519.
- Scholz, C.: *Personalmanagement*. Vahlen, 5. Aufl. München 2000, Kap. 9.4, S.923 - 948

## Course: Business Process Modelling [2511210]

**Coordinators:** A. Oberweis

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation in the first week after lecture period.

### Conditions

None.

### Learning Outcomes

Students know goals of business process modelling and master different modelling languages. They are able to choose the appropriate modelling language according to a given context and to use the modelling language with suitable modelling tools. They master methods for analysing and assessing process models and methods for analysing them according to specific quality characteristics.

### Content

The proper modeling of relevant aspects of business processes is essential for an efficient and effective design and implementation of processes. This lecture presents different classes of modeling languages and discusses the respective advantages and disadvantages of using actual application scenarios. For that simulative and analytical methods for process analysis are introduced. In the accompanying exercise the use of process modeling tools is practiced.

### Media

Slides, access to internet resources.

### Literature

Literature will be given in the lecture.

**Course: Modern Measurement Techniques for Process Optimization [22218]****Coordinators:** Regier**Part of the modules:** Specialization in Food Process Engineering (p. 120)[WI4INGCV4]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes****Content**

**Course: Morphodynamics of Rivers and Streams [19203]****Coordinators:** F. Nestmann, B. Lehmann**Part of the modules:** Understanding and Prediction of Disasters I (p. 123)[WI4INGINTER1], Understanding and Prediction of Disasters II (p. 124)[WI4INGINTER2], Understanding and Prediction of Disasters III (p. 125)[WI4INGINTER3]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Remarks**For further information, see [http://www.iwk.uni-karlsruhe.de/kurse\\_vertiefungsstudium.php](http://www.iwk.uni-karlsruhe.de/kurse_vertiefungsstudium.php)

**Course: Engine Measurement Technologies [2134137]**

**Coordinators:** Bernhardt  
**Part of the modules:** Combustion Engines II (p. 82)[WI4INGMB19]

ECTS Credits	Hours per week	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. 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* [21101] has to be completed beforehand.

**Learning Outcomes****Content**

**Course: Multidisciplinary Risk Research [2530328]****Coordinators:** U. Werner**Part of the modules:** Operational Risk Management I (p. 26)[WI4BWLFBV9], Operational Risk Management II (p. 27)[WI4BWLFBV10]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	Summer term	de

**Learning Control / Examinations**

The assessment consists of oral presentations (incl. papers) within the lecture (according to Section 4 (2), 3 of the examination regulation) and a final oral exam (according to Section 4 (2), 2 of the examination regulation).

The overall grade consists of the assessment of the oral presentations incl. papers (50 percent) and the assessment of the oral exam (50 percent).

**Conditions**

None.

**Learning Outcomes**

- Getting an overview of the various theoretical, empirical and methodological approaches used in risk research.
- Learning to assess disciplinary perspectives and approaches.
- Detailed examination of at least one theoretical and one methodological approach by the analysis of research papers and case studies.

**Content**

The course consists of two parts:

In the theoretical part risk concepts of various disciplines are discussed as well as categorisations of risk (e.g. technical or natural origin) and of risk carriers. Based on empirical research, processes of risk perception, risk assessment, and risk taking – at the individual, institutional, and global level - are described and explained.

The methodological part of the course deals with hazard research, approaches for identification and mapping of risks and their accumulations, as well as with safety culture research. Using empirical studies, survey methods regarding risk perception and risk assessment are discussed. Specific problems in the context of intercultural research are considered too.

All students participate actively in the lecture. Per person, at least one presentation and one elaboration are expected.

**Literature**

- U. Werner, C. Lechtenbörger. Risikoanalyse & Risikomanagement: Ein aktueller Sachstand der Risikoforschung. Arbeitspapier 2004
- Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (WBGU). Welt im Wandel: Strategien zur Bewältigung globaler Umweltrisiken. Jahresgutachten 1998, [http://www.wbgu\\_jg1998.html](http://www.wbgu_jg1998.html).
- R. Löffstedt, L. Frewer. Risk and Modern Society, London 1998.
- <http://www.bevoelkerungsschutz.ch>

**Elective literature:**

Additional literature is recommended during the course.

**Remarks**

For organizational reasons, please register with the secretary of the chair: [thomas.mueller3@kit.edu](mailto:thomas.mueller3@kit.edu).



**Course: Multivariate Methods [2520317]****Coordinators:** W. Heller**Part of the modules:** Statistical Methods in Risk Management (p. 69)[W14STAT2]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Literature**

- Fahrmeir L., Hamerle A., Tut G.: Multivariate statistische Verfahren; de Gruyter 1996
- Jobson J.D.: Applied Multivariate Data Analysis Vol. I/II, Springer 1991
- Dobson A.J.: An Introduction to Statistical Modelling, Chapman and Hall
- Hosmer D.W., Lemeshow S.: Applied Logistic Regression, J. Wiley 1989
- Jambu M.: Explorative Datenanalyse, G. Fischer 1992

**Course: Nanotechnology with clusters [2143876]****Coordinators:** J. Gspann**Part of the modules:** Microsystem Technology (p. 98)[WI4INGMBIMT4], Nanotechnology (p. 99)[WI4INGMBIMT5]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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.

**Learning Outcomes****Content**

Production and properties of atom clusters (nanoparticles) for either coating or for micro- and nanostructure generation via high-speed cluster erosion are described. The technical significance of nanostructures (Lotus-effect, Gecko-adhesion) as well as the new carbon modifications (Fullerenes, Graphene, Nanotubes) are treated. The concept of the molecular nanotechnology is considered and compared with biological molecular motors.

**Media**

Lecture script

**Course: Nanotechnologie using Scanning Probe Methods [2142860]****Coordinators:** H. Hölscher, M. Dienwiebel, S. Walheim**Part of the modules:** Nanotechnology (p. 99)[WI4INGMBIMT5]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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**

The course is compulsory in the module Nanotechnology and must be examined.

**Recommendations**

Knowledge in physics, mathematics and chemistry.

**Learning Outcomes**

The students has fundamental knowledge in nanotechnology and scanning probe methods.

**Content**

- 1) Introduction into nanotechnology
- 2) History of scanning probe methods
- 3) Scanning tunneling microscopy (STM)
- 4) Atomic force microscopy (AFM)
- 5) Dynamic Modes (DFM, ncAFM, MFM, KPFM, ...)
- 6) Friction force microscopy and nanotribology
- 7) Nanolithography & block copolymeres

**Media**

Slides of the lectures

## Course: Nanotribology and -mechanics [2181712]

**Coordinators:** H. Hölscher, M. Dienwiebel

**Part of the modules:** Microfabrication (p. 95)[WI4INGMBIMT2], Nanotechnology (p. 99)[WI4INGMBIMT5]

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

### Learning Control / Examinations

#### Conditions

None.

#### Recommendations

Knowledge in mechanics and physics.

### Learning Outcomes

The students should get general and special knowledge in the field of nanotribology.

#### Content

Nanotribologie deals with the analysis of friction at the nanoscale. It is the aim of the class to introduce the basic principles, models, and state-of-the art methods of nanotribologie. Topics presented in the lectures include:

1. Nanotechnology
2. Forces at the nanoscale
3. Nanoanalytics
4. Atomic Friction
5. Nanoscale Wear
6. Friction in Microsystems

#### Media

Slides of the lectures

**Course: Nature-inspired Optimisation Methods [2511106]****Coordinators:** S. Mostaghim, P. Shukla**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

**Learning Control / Examinations**

The assessment consists of a written exam (60 min) (according to Section 4(2), 1 of the examination regulation) and an additional written examination called "bonus exam", 60 min (according Section 4(2), 3 of the examination regulation) or a selection of exercises. The bonus exam may be split into several shorter written tests.

The grade of this course is the achieved grade in the written examination. If this grade is at least 4.0 and at most 1.3, a passed bonus exam will improve it by one grade level (i.e. by 0.3 or 0.4).

**Conditions**

None.

**Learning Outcomes**

To learn:

1. Different nature-inspired methods: local search, simulated annealing, tabu search, evolutionary algorithms, ant colony optimization, particle swarm optimization
2. Different aspects and limitation of the methods
3. Applications of such methods
4. Multi-objective optimization methods
5. Constraint handling methods
6. Different aspects in parallelization and computing platforms

**Content**

Many optimization problems are too complex to be solved to optimality. A promising alternative is to use stochastic heuristics, based on some fundamental principles observed in nature. Examples include evolutionary algorithms, ant algorithms, or simulated annealing. These methods are widely applicable and have proven very powerful in practice. During the course, such optimization methods based on natural principles are presented, analyzed and compared. Since the algorithms are usually quite computational intensive, possibilities for parallelization are also investigated.

**Media**

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

**Literature**

F. Glover and M. Laguna. „Tabu Search” In: Handbook of Applied Optimization, P. M. Pardalos and M. G. C. Resende (Eds.), Oxford University Press, pp. 194-208, 2002. G. Raidl and J. Gottlieb: Empirical Analysis of Locality, Heritability and Heuristic Bias in Evolutionary Algorithms: A Case Study for the Multidimensional Knapsack Problem. Evolutionary Computation, MIT Press, 13(4), pp. 441-475, 2005.

**Weiterführende Literatur:**

E. L. Aarts and J. K. Lenstra: „Local Search in Combinatorial Optimization”. Wiley, 1997. D. Corne and M. Dorigo and F. Glover: „New Ideas in Optimization”. McGraw-Hill, 1999. C. Reeves: „Modern Heuristic Techniques for Combinatorial Optimization”. McGraw-Hill, 1995. Z. Michalewicz, D. B. Fogel: „How to solve it: Modern Heuristics”. Springer, 1999. E. Bonabeau, M. Dorigo, G. Theraulaz: „Swarm Intelligence”. Oxford University Press, 1999. A. E. Eiben and J. E. Smith: „Introduction to Evolutionary Computing”. Springer, 2003. K. Weicker: „Evolutionäre Algorithmen”. Teubner, 2002. M. Dorigo, T. Stützle: „Ant Colony Optimization”. MIT Press, 2004. K. Deb: „Multi-objective Optimization using Evolutionary Algorithms”, Wiley, 2003.

**Course: Scientific Bases for Examination and Assessment of Water Quality [22603]**

**Coordinators:** H. Horn, G. Abbt-Braun  
**Part of the modules:** Water Chemistry II (p. 122)[WI4INGCV7]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes**

The lecture gives basics on analytical examination methods which are used to assess water constituents.

**Content**

1. Hydrological cycle, application, problems, ground-, surface-, wastewater, analytical definitions
2. Sampling, quick tests, conservation, on site examinations, organoleptic
3. General examinations
4. Optical characterization
5. Titrations
6. Main constituents, anions
7. Main constituents, cations
8. Metals
9. Organics
10. Polar organic substances, derivatisation
11. Water specific sum parameters
12. Radioactivity
13. Microbiology

**Literature****Elective literature:**

- Cammann, K. Instrumentelle Analytische Chemie. Verfahren, Anwendungen, Qualitätssicherung. Spektrum Verlag, 2001.
- Frimmel, F. H.: Wasser und Gewässer. Ein Handbuch. Spektrum Verlag, 1999.
- Grohmann, A., Hässelbarth, U., Schwerdtfeger, W.(Hrsg.): Die Trinkwasserverordnung. 4. Auflage, E. Schmid, Berlin, 2002.
- Kölle, W.: Wasseranalysen-richtig beurteilt. Grundlagen, Parameter, Wassertypen, Inhaltsstoffe, Grenzwerte nach Trinkwasserverordnung und EU-Trinkwasserrichtlinie. 2. Auflage, Wiley-VCH Verlag, 2004.
- Quentin, K.-E.: Trinkwasser; Untersuchung und Beurteilung von Trink- und Schwimmbadwasser. Springer, Heidelberg, 1988.

## Course: Novel Actuators and Sensors [2141865]

**Coordinators:** M. Kohl, M. Sommer

**Part of the modules:** Optoelectronics and Optical Communication (p. 100)[WI4INGMBIMT6], Nanotechnology (p. 99)[WI4INGMBIMT5], Microsystem Technology (p. 98)[WI4INGMBIMT4]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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

### Media

Script / script of ppt foils (part 2)

**Course: Nonlinear Optimization I [2550111]**

**Coordinators:** O. Stein  
**Part of the modules:** Mathematical Programming (p. 66)[WI4OR6]

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

**Learning Control / Examinations**

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

The exam takes place 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 *Nonlinear Optimization II* [2550113]. In this case, the duration of the written examination takes 120 minutes.

In a combined examination of *Nonlinear Optimization I* [2550111] and *Nonlinear Optimization II* [2550113], upon attaining more than 60% of the exercise points, the grade of the passed examination is improved by a third of a grading step.

In a combined examination of *Nonlinear Optimization I* [2550111] and *Nonlinear Optimization II* [2550113], upon attaining more than 60% of the computer exercise points, the grade of the passed examination is improved by a third of a grading step.

**Conditions**

None.

**Learning Outcomes**

The student

- knows and understands fundamentals of nonlinear optimization,
- is able to choose, design and apply modern techniques of 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 conditions for unconstrained problems
- Optimality conditions for unconstrained convex problems
- Numerical methods for unconstrained problems (line search, steepest descent method, variable metric methods, Newton method, Quasi Newton methods, CG method, trust region method)

Constrained problems are the contents of part II of the lecture.

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

**Literature****Elective literature:**

- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993
- O. Güler, Foundations of Optimization, Springer, 2010
- H.Th. Jongen, K. Meer, E. Triesch, Optimization Theory, Kluwer, 2004
- J. Nocedal, S. Wright, Numerical Optimization, Springer, 2000

**Remarks**

Part I and II of the lecture are held consecutively in the *same* semester.



## Course: Nonlinear Optimization II [2550113]

**Coordinators:** O. Stein  
**Part of the modules:** Mathematical Programming (p. 66)[WI4OR6]

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

### Learning Control / Examinations

The assessment consists of a written exam (120 minutes) according to §4(2), 1 of the examination regulation.

The exam takes place 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 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.

In a combined exam of *Nonlinear Optimization I* [2550111] and *Nonlinear Optimization II* [2550113], upon attaining more than 60% of the exercise points, the grade of the passed exam is improved by a third of a grading step.

In a combined exam of *Nonlinear Optimization I* [2550111] and *Nonlinear Optimization II* [2550113], upon attaining more than 60% of the computer exercise points, the grade of the passed exam is improved by a third of a grading step.

### Conditions

None.

### Learning Outcomes

The student

- knows and understands fundamentals of nonlinear optimization,
- is able to choose, design and apply modern techniques of 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.

### Literature

#### Elective literature:

- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993
- O. Güler, Foundations of Optimization, Springer, 2010
- H.Th. Jongen, K. Meer, E. Triesch, Optimization Theory, Kluwer, 2004
- J. Nocedal, S. Wright, Numerical Optimization, Springer, 2000

### Remarks

Part I and II of the lecture are held consecutively in the *same* semester.

**Course: Public Media Law [24082]**

**Coordinators:** C. Kirchberg  
**Part of the modules:** Public Business Law (p. 133)[WI4JURA6]

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

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

As the traditional media (print, radio, TV) the “new media” (online-services and the Internet) is governed by public law, yet with a different extent of regulation and with apparent effects on private law. The main influences for the media law are constitutional law and European community law. The lectures aims at providing an overview of the common grounds and differences of the current media law regime and of the conceivable perspectives of media convergence. Current developments in politics and economics, which are relevant for public media law, will be used as examples in the lecture. Besides, it is planned to attend a court hearing of the Federal Constitutional Court (Bundesverfassungsgericht) and/or the Federal Court (Bundesgerichtshof).

**Content**

Initially, the lecture will deal with the constitutional basis of the media law regime. i.e. the responsibilities of the Federal and the State legislatures, freedom of speech, freedom of information, constitutional media rights (Art. 5 para. 1 Constitutional Law) and its limitations by general laws, the ban on censorship and the counterstatement law. In addition, the European community principles on broadcasting and media law will be part of the lecture. Next will be an overview of the individual media laws, namely the broadcasting law (especially Rundfunkstaatsvertrag) the press law of the States and the statute on the so-called “telemedia” services. Finally, the protection of minors in the media will be dealt with (Act on Protection of Minors and Treaty on the Protection of Minors in the Media).

**Literature**

To understand the legal framework it is necessary for the students to have the relevant statutes, for example “Telemediarecht, Telekommunikations- und Multimediarecht”, beck-Texte im dtv , 7. Auflage 2007.  
 As an introduction it is recommended to read: Frank Fechner, Medienrecht, Verlag Mohr Siebeck, Verlag Mohr Siebeck, 8. Auflage 2007.

## Course: Operations Research in Health Care Management [2550495]

**Coordinators:** S. Nickel

**Part of the modules:** Operations Research in Supply Chain Management and Health Care Management (p. 64)[WI4OR5]

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

### Learning Control / Examinations

The assessment is a 120 minutes written examination (according to §4(2), 1 of the examination regulation). The examination is held in the term of the lecture and the following lecture.

### Conditions

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

### Learning Outcomes

The target of this lecture is to show possible applications of well-known methods of Operations Research applied to health services. The students gain the ability to use quantitative models for the operations planning and logistics in a hospital environment, e.g. appointment, transportation, operating room planning or nurse rostering as well as inventory management and layout planning. Furthermore the advantages and benefits of simulation models and OR methods to plan home health care services are discussed.

### Content

In the last years reforms of the German health system, e.g. the introduction of the G-DRG-system, have put an increasing cost pressure on hospitals. Therefore their target is to improve quality, transparency, and efficiency of hospital services, e.g. by reducing the length of stay of patients. To achieve this, processes have to be analyzed in order to optimize them if necessary. When looking at the targets of optimization not only efficiency but also quality of care and patient satisfaction (e.g. waiting times) have to be taken into account.

Besides hospitals also home health care services and their planning are discussed in this lecture. Because of the demographic development this is an emerging field in the health care sector. Here, e.g. nurse rosters have to be built which give details about which nurse visits which patient at what time. While doing so different targets have to be regarded, e.g. the continuity of nurse-patient relationship or the minimization of the distances the nurses have to travel.

### Literature

#### Elective literature:

- Fleßa: Grundzüge der Krankenhausbetriebslehre, Oldenbourg, 2007
- Fleßa: Grundzüge der Krankenhaussteuerung, Oldenbourg, 2008
- Hall: Patient flow: reducing delay in healthcare delivery, Springer, 2006

### Remarks

The lecture is planned to be held in the summer term 2014.

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

## Course: Operations Research in Supply Chain Management [2550480]

**Coordinators:** S. Nickel

**Part of the modules:** Operations Research in Supply Chain Management and Health Care Management (p. 64)[WI4OR5]

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

### Learning Control / Examinations

The assessment is a 120 minutes written examination (according to §4(2), 1 of the examination regulation). The examination is held in the term of the lecture and the following lecture.

### Conditions

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

### Recommendations

Advanced knowledge of Operations Research (e.g., as conveyed in the lectures *Facility Location and Strategic SCM, Tactical and operational SCM*) is recommended.

### Learning Outcomes

The lecture conveys basic and advanced modeling techniques playing an important role in today's problem solving occurring in supply networks. The focus is set on mathematical approaches to technical-economical problems, and the derivation of optimal solutions. Students are enabled to classify problems both conceptually and mathematically, and to identify central variables and parameters in a specific problem setting. Additionally, current developments in operations research and supply chain management are reflected and evaluated by students.

### Content

Supply Chain Management constitutes a general tool for logistics process planning in supply networks. To an increasing degree quantitative decision support is provided by methods and models from Operations Research. The lecture "OR in Supply Chain Management" conveys concepts and approaches for solving practical problems and presents an insight to current research topics. The lecture's focus is set on modeling and solution methods for applications originating in different domains of a supply chain. The emphasis is put on mathematical methods like mixed integer programming, valid inequalities or column generation, and the derivation of optimal solution strategies.

In form and content, the lecture addresses all levels of Supply Chain Management: After a short introduction, the tactical and operational level will be discussed with regard to inventory models, scheduling as well as cutting and packing. The strategic level will be discussed in terms of layout planning. Another main focus of the lecture is the application of methods from online optimization. This optimization discipline has gained more and more importance in the optimization of supply chains over the several past years due to an increasing amount of dynamic data flows.

### Literature

- Simchi-Levi, D.; Chen, X.; Bramel, J.: *The Logic of Logistics: Theory, Algorithms, and Applications for Logistics and Supply Chain Management*, 2nd edition, Springer, 2005
- Simchi-Levi, D.; Kaminsky, P.; Simchi-Levi, E.: *Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies*, McGraw-Hill, 2000
- Silver, E. A.; Pyke, D. F.; Peterson, R.: *Inventory Management and Production Planning and Scheduling*, 3rd edition, Wiley, 1998
- Blazewicz, J.: *Handbook on Scheduling - From Theory to Applications*, Springer, 2007
- Pinedo, M. L.: *Scheduling - Theory, Algorithms, and Systems* (3rd edition), Springer, 2008
- Dyckhoff, H.; Finke, U.: *Cutting and Packing in Production and Distribution - A Typology and Bibliography*, Physica-Verlag, 1992
- Borodin, A.; El-Yaniv, R.: *Online Computation and Competitive Analysis*, Cambridge University Press, 2005
- Francis, R. L.; McGinnis, L. F.; White, A.: *Facility Layout and Location: An Analytical Approach*, 2nd edition, Prentice-Hall, 1992

### Remarks

The lecture is planned to be held in the winter term 2013/14.

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

**Course: Optical Communication Systems [23460 / 23461]****Coordinators:** J. Leuthold, W. Freude**Part of the modules:** Optoelectronics and Optical Communication (p. 100)[WI4INGMBIMT6]

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

**Learning Control / Examinations**

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

**Conditions**

The course is compulsory in the module Optoelectronics and Optical Communication and must be examined.

**Recommendations**

Mathematics of a bachelor.

**Learning Outcomes**

The students will:

- Know how a transmitter works
- Know the key modulation formats in optical communications
- Know the receivers, their limitations

**Content**

- Communications fundamentals
  - Modulation Formats:
    - o The transmitter
    - o Digital modulation formats
    - o Optical Modulators
    - o Discussion of selected modulation formats
    - o Comparison of formats
    - o Electronic Coding Techniques
    - o OSNR and Transmission distance
  - Multiplexing Techniques
    - o Orthogonality
    - o WDM/FDM
    - o TDM
    - o OFDM
    - o CDMA
  - Optical Amplifiers
  - pin Photodiodes
  - Noise
- Receivers and detection errors

**Media**

Viewegraph & blackboard lecture  
Lecture notes will be handed out.

**Course: Optical Sources and Detectors [23462/23463]**

**Coordinators:** C. Koos  
**Part of the modules:** Microoptics (p. 96)[WI4INGMBIMT3], Optoelectronics and Optical Communication (p. 100)[WI4INGMBIMT6]

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

**Learning Control / Examinations**

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

**Conditions**

This lecture can not be combined with lecture Optoelectronic Components [23486 / 23487].

**Recommendations**

Basic knowledge of semiconductor physics and electrodynamics is recommended.

**Learning Outcomes**

The student understands basic principles of optoelectronic components and can mathematically describe their dynamic behaviour. He/she has an overview on source and detector technologies that are used in state-of-the-art optical communication systems.

**Content**

- Optical processes in semiconductors
- Light-emitting diodes
- Lasers and optical amplifiers
- Pin-photodiodes
- Avalanche photodiodes
- Optical receivers and noise

**Media**

Lecture notes, lecture slides, problem sets

**Literature**

Will be announced in the lecture.

## Course: Optical Waveguides and Fibers [23464/23465]

**Coordinators:** C. Koos

**Part of the modules:** Microoptics (p. 96)[WI4INGMBIMT3], Optoelectronics and Optical Communication (p. 100)[WI4INGMBIMT6]

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

### Learning Control / Examinations

#### Conditions

This lecture can not be combined with lecture Optoelectronic Components [23486 / 23487].

#### Recommendations

Basic knowledge of electrodynamics is recommended.

### Learning Outcomes

The student understands basic principles of optical waveguiding and can mathematically describe wave propagation in waveguides. He/she has an overview on today's fiber and waveguide technologies.

### Content

- Optical communications - an overview
- Fundamentals of wave propagation
- Slab waveguides
- Optical fibers
- Integrated optical waveguides
- Planar lightwave circuits

### Media

Lecture notes, lecture slides, problem sets

### Literature

Will be announced in the lecture.

**Course: Optimization in a Random Environment [25687]****Coordinators:** K. Waldmann**Part of the modules:** Stochastic Modelling and Optimization (p. 67)[WI4OR7]

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

**Learning Control / Examinations**

The assessment consists of an 1h written exam following §4(2), 1 SPO. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.3 ( §4(2), 3 SPO).

**Conditions**

None.

**Learning Outcomes**

Students are enabled to apply their knowledge about techniques and methodology on current problems such as the measurement and evaluation of operational risk as required by the Basel II accord.

Subject matter of the course will be announced in due time.

**Content**

The course is concerned with the quantitative analysis of selected problems arising in economics, engineering, and natural sciences. Subject matter of the course will be announced in due time.

**Media**

Blackboard, Slides, Flash Animations, Simulation Software

**Literature**

Lecture Notes.

**Elective literature:**

problem-oriented

**Remarks**

The lecture is offered irregularly. The curriculum of the next two years is available online.



**Course: Optimization of Dynamic Systems [23180]**

**Coordinators:** S. Hohmann  
**Part of the modules:** Control Engineering I (p. 113)[WI4INGETIT1]

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

**Learning Control / Examinations**

The assessment consists of a written exam (120 min) taking place at the beginning 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**

The prior attendance of the course *System Dynamics and Control Engineering* [23155] is assumed.

**Learning Outcomes**

Have still to be defined.

**Content**

Subjects are not available yet.

**Remarks**

The lecture will be offered the first time in winter term 2011/12.

**Course: Optoelectronic Components [23486 / 23487]**

**Coordinators:** W. Freude  
**Part of the modules:** Microsystem Technology (p. 98)[WI4INGMBIMT4]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2 / 1	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).

**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: OR-oriented modeling and analysis of real problems (project) [25688]****Coordinators:** K. Waldmann**Part of the modules:** Stochastic Modelling and Optimization (p. 67)[WI4OR7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	1/0/3	Winter / Summer Term	de

**Learning Control / Examinations**

Presentation and documentation of the results.

**Conditions**

None.

**Learning Outcomes**

Students are enabled to apply their knowledge about techniques and methodology on real problems and to develop a practically oriented solution in an OR-lab; e.g. in the public health sector.

Subject matter of the course will be announced in due time.

**Content**

The course is concerned with the quantitative analysis of selected problems arising in economics, engineering, and natural sciences. Subject matter of the course will be announced in due time.

**Media**

Blackboard, Slides, OR-Lab

**Literature**

Problem oriented

**Elective literature:**

problem-oriented

**Remarks**

The lecture is offered irregularly. The curriculum of the next two years is available online.

**Course: Organic Computing [2511104]****Coordinators:** H. Schmeck, S. Mostaghim**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

**Learning Control / Examinations**

The assessment of this course consists of a written examination (60 min) (following §4(2), 1 SPO) and of submitting written exercises that recapitulate the content of the course. The exercises include theoretical questions as well as practical programming. For providing a successful solution to all exercises, a bonus will be granted, improving the grade of a passed exam by one grade-step (0.3 or 0.4, respectively, following §4(2), 3 SPO). The course will be offered every second semester (summer term) and exams may be repeated at every ordinary exam date.

**Conditions**

None.

**Learning Outcomes**

The student acquires the ability to master methods and concepts of Organic Computing and to demonstrate innovation skills regarding the used methods.

Therefore the course aims at the teaching of fundamentals and methods of Organic Computing within the context of its applicability in practice. On the basis of a fundamental understanding of the taught concepts and methods the students should be able to choose the adequate methods and concepts, if necessary further develop them according to the situation and use them properly when facing related problems in their later job. The students should be capable of finding arguments for the chosen solutions and express them to others.

**Content**

The mission of Organic Computing is to tame complexity in technical systems by providing appropriate degrees of freedom for self-organized behaviour adapting to changing requirements of the execution environment, in particular with respect to human needs. According to this vision an organic computer system should be aware of its own capabilities, the requirements of the environment, and it should be equipped with a number of "self-x" properties allowing for the anticipated adaptiveness and for a reduction in the complexity of system management. These self-x properties are self-organisation, self-configuration, self-optimization, self-healing, self-protection and self-explanation. In spite of these self-x properties, an organic system should be open to external control actions which might be necessary to prevent undesired behaviour.

**Media**

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

**Literature**

- *Autonomic Computing: Concepts, Infrastructure and Applications*. M. Parashar and S. Hariri (Ed.), CRC Press. December 2006.
- *Self-Organization in Biological Systems*. S. Camazine, J. Deneubourg, N. R. Franks, J. Sneyd, G. Theraulaz and E. Bonabeau. Princeton University Press, 2003.
- *Complex Adaptive Systems: An Introduction*. H. G. Schuster, Scator Verlag, 2001.
- *Introduction to Evolutionary Computing*. A. E. Eiben and J. E. Smith. Natural Computing Series, Springer Verlag, 2003. *Swarm Intelligence: From Natural to Artificial Systems*. Eric Bonabeau, Marco Dorigo and Guy Theraulaz. Oxford University Press, 1999.
- *Control of Complex Systems*. K. Astrom, P. Albertos, M. Blanke, A. Isidori and W. Schaufelberger. Springer Verlag, 2001.

**Elective literature:**

- **Adaptive and Self-organising Systems**, Christian Müller-Schloer, Moez Mnif, Emre Cakar, Hartmut Schmeck, Urban Richter, June 2007. Preprint. Submitted to ACM Transactions on Autonomous and Adaptive Systems (TAAS)
- **Organic Computing - Addressing Complexity by Controlled Self-organization**, Jürgen Branke, Moez Mnif, Christian Müller-Schloer, Holger Prothmann, Urban Richter, Fabian Rochner, Hartmut Schmeck, In Tiziana Margaria, Anna Philippou, and Bernhard Steffen, *Proceedings of ISoLA 2006*, pp. 200-206. Paphos, Cyprus, November 2006.
- *Evolutionary Optimization in Dynamic Environments*. J. Branke. Kluwer Academic Publishers, 2002.
- *Self-star Properties in Complex Information Systems: Conceptual and Practical Foundations (Lecture Notes in Computer Science)*. O. Babaoglu, M. Jelasity, A. Montresor, C. Fetzer, S. Leonardi, A. van Moorsel and M. van Steen. Springer Verlag, 2005.

- Design and Control of Self-organizing Systems. C. Gershenson. PhD thesis, Vrije Universiteit Brussel, Brussels, Belgium, 2007.
- VDE / ITG / GI - Positionspapier: Organic Computing - Computer- und Systemarchitektur im Jahr 2010. Juli 2003. it - Information Technology, Themenheft Organic Computing, Oldenbourg Verlag. Volume: 47, Issue: 4/2005.

further references will be announced in class

## Course: Managing Organizations [2577902]

**Coordinators:** H. Lindstädt

**Part of the modules:** Strategic Corporate Management and Organization (p. 28)[WI4BWL01]

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

### Learning Control / Examinations

The assessment will consist of a written exam (60 min) taking place at the beginning of the recess period (according to Section 4 (2), 2 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

### Conditions

None.

### Learning Outcomes

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 organisational 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.

### Content

- Principles of organisational management
- Managing organisational structures and processes: the selection of design parameters
- Ideal-typical organisational structures: choice and effect of parameter combinations
- Managing organisational changes

### Media

Slides.

### Literature

- Laux, H.; Liermann, F.: *Grundlagen der Organisation*, Springer. 6. Aufl. Berlin 2005.
- Lindstädt, H.: *Organisation*, in Scholz, C. (Hrsg.): *Vahlens Großes Personalexikon*, 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.

## Course: Organization Theory [2577904]

**Coordinators:** H. Lindstädt

**Part of the modules:** Strategic Corporate Management and Organization (p. 28)[WI4BWL01], Strategic Decision Making and Organization Theory (p. 29)[WI4BWL03]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2	Winter term	de

### Learning Control / Examinations

The assessment consists of a written exam following §4, Abs. 2, 1 of the examination regulation.

### Conditions

None.

### Learning Outcomes

The participants are made familiar with mostly classical principles of economic organisational theory and institutional economics. This includes transaction cost theory and agency-theory approaches, models for the function and design of organisational information and decision-making systems, transfer price models to coordinate the exchange of goals and services within companies, models on incentive systems and relative performance tournaments as well as selected OR optimisation approaches to designing organisational structures. The course therefore lays the basis for a deeper understanding of the advanced literature on this key economic area.

### Content

- Basic considerations and institution-economic principles of organisational theory
- Transfer prices and internal market-price relationships
- Design and coordination without conflicting objectives
- Economic evaluation of information
- Organisation under asymmetric information and conflicting objectives: agency theory principles

### Media

Folien.

### Literature

- Laux, H.; Liermann, F.: Grundlagen der Organisation. Springer, 5. Aufl. Berlin 2003.
- Milgrom, P.; Roberts, J.: Economics, Organization and Management. Prentice Hall, Englewoods Cliffs 1992.

The relevant excerpts and additional sources are made known during the course.

**Course: Oxidation Processes in Drinking Water Technology [22612]**

**Coordinators:** H. Horn  
**Part of the modules:** Water Chemistry II (p. 122)[WI4INGCV7]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes****Content**

Part I: Theoretical basics of the main methods:

1. Disinfection with chlorine ( $\text{Cl}_2$ ./HOCl,  $\text{ClO}_2$ ), UV-irradiation, silver ( $\text{Ag}^+$ ), ozone ( $\text{O}_3$ )
2. Oxidation with Ozone  $\text{O}_3$ , potassium permanganate  $\text{KMnO}_4$ , hydrogen peroxide  $\text{H}_2\text{O}_2$ , combined oxidation methods UV/ $\text{H}_2\text{O}_2$ , UV/ $\text{O}_3$ ,  $\text{H}_2\text{O}_2$ / $\text{O}_3$ , oxygen  $\text{O}_2$
3. Detection reactions of oxidants ( $\text{O}_3$ ,  $\text{H}_2\text{O}_2$ ,  $\text{Cl}_2$ )
4. Water constituents and their interaction in the treatment steps: THM- and AOX-formation, AOC
5. Special problems: CKW, nitrate,  $\text{Br}^-/\text{BrO}_3^-$

Part II: Introduction of selected treatment plants: Functional principles (schematic), discussion of the methods applied with advantages and disadvantages

**Literature****Elective literature:**

- Crittenden, J. [Ed.]: Water Treatment. Principles and Design. 2nd ed. Wiley & Sons, 2005.
- DVGW: Wasseraufbereitung - Grundlagen und Verfahren. In: Lehr- und Handbuch Wasserversorgung Bd.6. Oldenbourg Industrieverlag, 2004.
- Frimmel, F. H.: Wasser und Gewässer. Ein Handbuch. Spektrum Verlag, 1999.
- Grombach, P., Haberer, K., Merkl, G., Trüeb, E. U.: Handbuch der Wasserversorgungstechnik. 3. Auflage, R. Oldenbourg-Verlag, München, 2000.
- Hancke, K.: Wasseraufbereitung, Chemie und chemische Verfahrenstechnik. 5. Auflage, Springer, Heidelberg, 2000.



**Course: Patent Law [24656]**

**Coordinators:** P. Bittner  
**Part of the modules:** Intellectual Property Law (p. 131)[WI4JURA4]

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

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

It is the aim of this course to provide students with knowledge in the area of patent law and the business of technical intellectual property that builds upon, and goes beyond the knowledge the students have already acquired in the general lecture of *Industrial and intellectual property law*. Students shall understand how the legal rules depend upon, and interact with, the economic background and the legislative policy in the field of technical intellectual property, particularly in the field of information and communication technologies. Students shall learn about the rules of national, European and international patent law as well as know-how protection law and to apply these legal rules in practical cases, in particular in the area of utilizing technical intellectual property through agreements and lawsuits. The conflict between the monopoly of a patent and the antitrust law policies in Europe will be reviewed with the students.

**Content**

The course deals with the subject matter of the law of technical intellectual property, in particular inventions, patents, utility models, design patents, know-how, the rights and obligations of employees as creators of technical IP, licensing, limitations and exceptions to patenting, term of protection, enforcement of the rights and defence against these in invalidation and revocation actions. The course does not merely focus on German patent law, but likewise puts European, US and international patent law into perspective. Students shall understand how the legal rules depend upon, and interact with, the economic background and the legislative policy in the field of technical intellectual property, particularly in the field of information and communication technologies. Students shall learn about the rules of national, European and international patent law as well as know-how protection law and to apply these legal rules in practical cases, in particular in the area of utilizing technical intellectual property through agreements and lawsuits. The conflict between the monopoly of a patent and the antitrust law policies in Europe will be reviewed with the students.

**Media**

transparencies

**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: [24186]**

**Coordinators:** K. Melullis, Markus Dammler  
**Part of the modules:** Intellectual Property Law (p. [131](#))[WI4JURA4]

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

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

**Content**

**Course: Personalization and Recommender Systems [2540506]****Coordinators:** A. Geyer-Schulz**Part of the modules:** Advanced CRM (p. 31)[WI4BWLISM1], Business & Service Engineering (p. 34)[WI4BWLISM4]

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

**Learning Control / Examinations**

Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation.

The course is considered successfully taken, if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 25) from exercise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	113
1.3	106
1.7	99
2.0	92
2.3	85
2.7	78
3.0	71
3.3	64
3.7	57
4.0	50
4.7	40
5.0	0

**Conditions**

None.

**Learning Outcomes**

The student

- knows the options and opportunities of personalization especially in the area of Internet based services
- is proficient in different statistical, data-mining, and game theory methods of computing implicit and explicit recommendations
- evaluates recommender systems and compares these with related services

**Content**

At first, an overview of general aspects and concepts of personalization and its relevance for service providers and customers is given. Next, different categories of recommender systems are discussed. This includes explicit recommendations like customer reviews as well as implicit services based on behavioral data. Furthermore, the course gives a detailed view of the current research on recommender systems at the Chair of Information Services and Electronic Markets.

**Media**

Folien, Aufzeichnung der Vorlesung im Internet.

**Literature**

Rakesh Agrawal, Tomasz Imielinski, and Arun Swami. Mining association rules between sets of items in large databases. In Sushil Jajodia Peter Buneman, editor, Proceedings of the ACM SIGMOD International Conference on Management of Data, volume 22, Washington, D.C., USA, Jun 1993. ACM, ACM Press.

Rakesh Agrawal and Ramakrishnan Srikant. Fast algorithms for mining association rules. In Proceedings of the 20th Very Large Databases Conference, Santiago, Chile, pages 487 – 499, Sep 1994.

Asim Ansari, Skander Essegaiar, and Rajeev Kohli. Internet recommendation systems. Journal of Marketing Research, 37:363 – 375, Aug 2000.

Christopher Avery, Paul Resnick, and Richard Zweckhauser. The market for evaluations. American Economic Review, 89(3):564 – 584, 1999.

Ibrahim Cingil, Asuman Dogac, and Ayca Azgin. A Broader Approach to Personalization. Communications of the ACM, 43(8):136 – 141, Aug 2000.

Richard O. Duda, Peter E. Hart, and David G. Stork. Pattern Classification. Wiley-Interscience, New York, 2 edition, 2001.

Andreas Geyer-Schulz, Michael Hahsler, and Maximilian Jahn. A customer purchase incidence model applied to recommender services. In R. Kohavi et al., editor, *Proceedings of the WebKDD 2001 – Mining log data across all customer touchpoints*, volume 2356 of *Lecture Notes in Artificial Intelligence LNAI*, pages 25–47, Berlin, 2002. ACM, Springer-Verlag.

Jon M. Kleinberg. Authoritative sources in a hyperlinked environment. *JACM*, 46(5):604–632, sep 1999.

Joseph Konstan, Bradley Miller, David Maltz, Jonathan Herlocker, Lee Gordon, and John Riedl. Grouplens: Applying Collaborative Filtering to Usenet News. *Communications of the ACM*, 40(3):77 – 87, Mar 1997.

Paul Resnick, Neophytos Iacovou, Peter Bergstrom, and John Riedl. Grouplens: An open architecture for collaborative filtering of netnews. In *Proceedings of the conference on Computer supported cooperative work*, pages 175 – 186. ACM Press, 1994.

#### **Elective literature:**

Antoinette Alexander. The return of hardware: A necessary evil? *Accounting Technology*, 15(8):46 – 49, Sep 1999.

Christopher Avery and Richard Zeckhauser. Recommender systems for evaluating computer messages. *Communications of the ACM*, 40(3):88 – 89, Mar 1997.

Steven Bellman, Gerald Lohse, and Eric Johnson. Predictors of Online Buying Behavior. *Communications of the ACM*, 42(12):32 – 38, Dec 1999.

Thomas J. Blischok. Every transaction tells a story. *Chain Store Age Executive with Shopping Center Age*, 71(3):50–56, Mar 1995.

Hans Hermann Bock. *Automatische Klassifikation*. Vandenhoeck und Ruprecht, Göttingen, 1974.

Andrew S.C. Ehrenberg. *Repeat-Buying: Facts, Theory and Applications*. Charles Griffin & Company Ltd, London, 2 edition, 1988.

Wolfgang Gaul, Andreas Geyer-Schulz, Michael Hahsler, and Lars Schmidt-Thieme. eMarketing mittels Recommendersystemen. *Marketing ZFP*, 24:47 – 55, 2002.

Andreas Geyer-Schulz, Michael Hahsler, and Maximilian Jahn. myvu: a next generation recommender system based on observed consumer behavior and interactive evolutionary algorithms. In W. Gaul, O. Opitz, and M. Schader, editors, *Data Analysis – Scientific Modeling and Practical Applications*, volume 18 of *Studies in Classification, Data Analysis and Knowledge Organization*, pages 447 – 457, Heidelberg, Germany, 2000. Springer.

Andreas Geyer-Schulz, Michael Hahsler, and Maximilian Jahn. Educational and scientific recommender systems: Designing the information channels of the virtual university. *International Journal of Engineering Education*, 17(2):153 – 163, 2001.

Mark-Edward Grey. *Recommendersysteme auf Basis linearer Regression*, 2004.

John A. Hartigan. *Clustering Algorithms*. John Wiley and Sons, New York, 1975.

Kevin Kelly. *New Rules for the New Economy: 10 Radical Strategies for a Connected World*. Viking, 1998.

Taek-Hun Kim, Young-Suk Ryu, Seok-In Park, and Sung-Bong Yang. An improved recommendation algorithm in collaborative filtering. In K. Bauknecht, A. Min Tjoa, and G. Quirchmayr, editors, *E-Commerce and Web Technologies, Third International Conference, Aix-en-Provence, France*, volume 2455 of *Lecture Notes in Computer Science*, pages 254–261, Berlin, Sep 2002. Springer-Verlag.

Ron Kohavi, Brij Masand, Myra Spiliopoulou, and Jaideep Srivastava. Web mining. *Data Mining and Knowledge Discovery*, 6:5 – 8, 2002.

G. S. Maddala. *Introduction to Econometrics*. John Wiley, Chichester, 3 edition, 2001.

Andreas Mild and Martin Natter. Collaborative filtering or regression models for Internet recommendation systems? *Journal of Targeting, Measurement and Analysis for Marketing*, 10(4):304 – 313, Jan 2002.

Andreas Mild and Thomas Reutterer. An improved collaborative filtering approach for predicting cross-category purchases based on binary market basket data. *Journal of Retailing & Consumer Services*, 10(3):123–133, may 2003.

Paul Resnick and Hal R. Varian. Recommender Systems. *Communications of the ACM*, 40(3):56 – 58, Mar 1997.

Badrul M. Sarwar, Joseph A. Konstan, Al Borchers, Jon Herlocker, Brad Miller, and John Riedl. Using filtering agents to improve prediction quality in the grouplens research collaborative filtering system. In *Proceedings of ACM Conference on Computer-Supported Cooperative Work, Social Filtering, Social Influences*, pages 345 – 354, New York, 1998. ACM Press.

J. Ben Schafer, Joseph Konstan, and Jon Riedl. Recommender Systems in E-commerce. In *Proceedings of the 1st ACM conference on Electronic commerce*, pages 158 – 166, Denver, Colorado, USA, Nov 1999. ACM.

Upendra Shardanand and Patti Maes. Social information filtering: Algorithms for automating “word of mouth”. In *Proceedings of ACM SIGCHI*, volume 1 of *Papers: Using the Information of Others*, pages 210 – 217. ACM, 1995.

## Course: Photovoltaic Systems Technology [23380]

**Coordinators:** Schmidt  
**Part of the modules:** Generation and transmission of renewable power (p. 118)[WI4INGETIT7]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	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

The goal is to relay theoretical fundamentals.

The fundamentals of photovoltaic systems technology will be presented.

### Content

- Introduction
- Ways of solar energy utilisation
- The terrestrial solar radiation
- Solar radiation measuring principles
- Fundamentals of solar cells
- Overview of typical cell technologies
- Efficiency values
- Equivalent circuit diagram of solar cells
- Properties of solar cells and solar modules
- Series and parallel connection of solar cells
- Matching of solar generators and loads
- MPP-Tracking
- Construction of PV-modules
- Partial shading, bypass-technologies
- Overview of different System configurations
- Batteries for PV applications
- Charge controllers
- Battery peripherals
- Inverters for stand-alone systems
- Inverters for grid connected systems
- European efficiency
- Safety and EMC aspects
- Annual yield of PV systems
- Economic evaluation of PV systems
- Examples of realised PV systems

### Media

Copies of the main transparencies will be distributed each lecture.

### Literature

#### Elective literature:

„Regenerative Energiesysteme“, Volker Quaschnig, ISBN: 978-3-446-40973-6  
 „Photovoltaik“, Heinrich Häberlin, ISBN:978-3-8007-3003-2

**Course: Physics for Engineers [2142890 / 2142891]****Coordinators:** P. Gumbsch, A. Nesterov-Müller, D. Weygand, A. Last**Part of the modules:** Microsystem Technology (p. 98)[WI4INGMBIMT4], Microfabrication (p. 95)[WI4INGMBIMT2]

ECTS Credits	Hours per week	Term	Instruction language
6	2/2	Summer term	de

**Learning Control / Examinations**

The assessment consists of a written exam (90 minutes) (following §4(2), 1 of the examination regulation).

**Conditions**

None.

**Recommendations**

Knowledge of bases in mechanics and optics are necessary.

**Learning Outcomes**

Orientation in topics of modern physics.

**Content**

Laser, superconductivity and transistor will be presented from the point of view of quantum phenomena up to technical applications.

**Media**

script

**Literature**

Bergmann-Schäfer, Lehrbuch der Experimentalphysik, Band I-III.

## Course: Physical Basics of Laser Technology [2181612]

**Coordinators:** Schneider

**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an oral exam (30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

### Conditions

Basic knowledge of physics, chemistry and material science is assumed.

It is not possible, to combine this lecture with the lecture *Laser Application in Automotive Engineering* [21642]

### Learning Outcomes

The student

- comprehends the physical basics and understands the function of laser sources and the interactions between laser radiation and materials surfaces.
- Based on this the student is able to choose appropriate laser sources and laser process techniques for various applications in materials processing.

### Content

Based on the description of the physical basics about the formation and the properties of laser light the lecture goes through the different types of laser beam sources used in industry these days. The lecture focus on the usage of lasers especially in materials engineering. Other areas like measurement technology or medical applications are also mentioned.

An excursion to the laser laboratory of the Institute for Materials Research (IMF I) at the Forschungszentrum Karlsruhe (FZK) will be offered.

### Media

Lecture notes.

### Literature

#### Elective literature:

- F. K. Kneubühl, M. W. Sigrist: *Laser*, 1999, Teubner Studienbücher
- J. Eichler, H.-J. Eichler: *Laser: Bauformen, Strahlführung, Anwendungen*, 2003, Springer
- R. Poprawe: *Lasertechnik für die Fertigung*, 2005, Springer
- H. Hügel: *Strahlwerkzeug Laser*; 1992, Teubner Studienbücher

## Course: Simulation Game in Energy Economics [2581025]

**Coordinators:** W. Fichtner

**Part of the modules:** Energy Economics and Energy Markets (p. 40)[WI4BWLIIIP4]

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

### Learning Control / Examinations

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

### Conditions

Visiting the course "Introduction to Energy Economics"

### Learning Outcomes

Understanding for market mechanisms, pricing and investment decisions in a liberalised electricity market.

### Content

#### Media

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

#### Literature

##### Elective literature:

Möst, D. und Genoese, M. (2009): Market power in the German wholesale electricity market. The Journal of Energy Markets (47–74). Volume 2/Number 2, Summer 2009



**Course: Polymerengineering I [2173590]****Coordinators:** P. Elsner**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes**

The field of Polymer Engineering includes synthesis, material science, processing, construction, design, tool engineering, production technology, surface engineering and recycling. The aim is, to equip the students with knowledge and technical skills, and to use the material "polymer" meeting its requirements in an economical and ecological way.

**Content**

1. Economical aspects of polymers
2. Introduction of mechanical, chemical and electrical properties
3. Processing of polymers (introduction)
4. Material science of polymers
5. Synthesis

**Literature**

Recommended literature and selected official lecture notes are provided in the lecture

**Course: Polymerengineering II [2174596]****Coordinators:** P. Elsner**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes**

The field of Polymer Engineering includes synthesis, material science, processing, construction, design, tool engineering, production technology, surface engineering and recycling. The aim is, to equip the students with knowledge and technical skills, and to use the material "polymer" meeting its requirements in an economical and ecological way. Also the manifold production processes are discussed and compared regarding the component design .

**Content**

1. Processing of polymers
2. Properties of polymer components  
Based on practical examples and components
  - 2.1 Selection of material
  - 2.2 Component design
  - 2.3 Tool engineering
  - 2.4 Production technology
  - 2.5 Surface engineering
  - 2.6 Sustainability, recycling

**Literature**

Recommended literature and selected official lecture notes are provided in the lecture

**Course: Portfolio and Asset Liability Management [2520357]****Coordinators:** Y. Kim**Part of the modules:** Mathematical and Empirical Finance (p. 68)[WI4STAT1], Statistical Methods in Risk Management (p. 69)[WI4STAT2]

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

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes**

Introduction and deepening of various portfolio management techniques in the financial industry.

**Content**

Portfolio theory: principles of investment, Markowitz- portfolio analysis, Modigliani-Miller theorems and absence of arbitrage, efficient markets, capital asset pricing model (CAPM), multi factorial CAPM, arbitrage pricing theory (APT), arbitrage and hedging, multi factorial models, equity-portfolio management, passive strategies, active investment

Asset liability: statistical portfolio analysis in stock allocation, measures of success, dynamic multi seasonal models, models in building scenarios, stochastic programming in bond and liability management, optimal investment strategies, integrated asset liability management

**Media**

transparencies, exercises.

**Literature**

To be announced in lecture.

**Elective literature:**

To be announced in lecture.

**Remarks**

The course Portfolio and Asset Liability Management [2520357] will not be offered any more from summer term 2013 on. The examination will be offered latest until summer term 2012.

## Course: Experimental Laboratories in Sensors and Actuators [23232]

**Coordinators:** W. Menesklou

**Part of the modules:** Sensor Technology I (p. 115)[WI4INGETIT3], Sensor Technology II (p. 116)[WI4INGETIT5]

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

### Learning Control / Examinations

Assessment consists of written examinations about basics of the experiment, the evaluation of the practical implementation, and the evaluation of the protocols.

The overall grade consists of the partial grades of the all examinations.

### Conditions

See module description.

Successful completion of sensors [23231].

### Recommendations

The number of participants is limited, early registration is recommended.

### Learning Outcomes

The student should acquire fundamental principles in material science and device technology of sensors and actors to be able to apply materials and sensors from the viewpoint of an application or development engineer.

### Content

In groups of three, the students measure autonomously the relevant characteristics of materials, sensors and actuators. Insights may be gained into the fundamental physical mechanism and also the factors determining the design and development of components utilizing these materials. The students should acquire the capability to analyze and present experimental data, and should be able to discuss the technological and economical boundary conditions.

Content: Impedance spectroscopy, Piezoelectric sensor and actuator, Temperature sensors (NTC, PTC), Exhaust gas sensors, (lambda probes), Magnetic sensors (Hall sensor), Intelligent shock absorber (adaptronic system), Scientific presentation.

### Media

Online material is available at <http://www.iwe.kit.edu>

## Course: Computing Lab Information Systems [PraBI]

**Coordinators:** A. Oberweis, D. Seese, R. Studer

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

The assessment of this course are practical work, presentations and a written thesis according to §4(2), 3 of the examination regulation. Practical work, presentations and a written thesis are weighted according to the course.

### Conditions

None.

### Learning Outcomes

Students are able to

- implement a prototype at the computer based on the given topic.
- write the thesis with a minimal learning curve by using format requirements such as those recommended by well-known publishers.
- give presentations in a scientific context in front of an auditorium. These techniques are presented and learn during the course.
- present results of the research in written form generally found in scientific publications.

### Content

The lab intensifies and extends specific topics which are discussed within corresponding lectures. Knowledge of these lecture topics is an advantage but not a precondition.

### Media

Slides, Access to internet resources

### Literature

Literature will be given individually.

### Remarks

The title of this course is a generic one. Specific titles and the topics of offered seminars will be announced before the start of a semester in the internet at <http://www.aifb.uni-karlsruhe.de/Lehre>

**Course: Advanced Lab in Efficient Algorithms [25700p]****Coordinators:** H. Schmeck**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

ECTS Credits	Hours per week	Term	Instruction language
4	3	Winter / Summer Term	de

**Learning Control / Examinations**

The assessment consists of (according Section 4(2), 3 of the examination regulation):

- practical work
- oral presentation of the results
- written report
- discussion and collaboration

**Conditions**

None.

**Learning Outcomes****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 methods presented in the lectures are practiced during this laboratory in teamwork including implementation tasks. The results should be presented by an oral presentation and a written report.

The topics of the laboratory are introduced around the end of the former semester on the board A12 of the institute AIFB (building 11.40) and in Internet <http://www.aifb.kit.edu/web/SeminarePraktika>

**Literature****Elective literature:**

Will be announced at the beginning of the computer lab.

**Remarks**

There is a limited number of participants. Therefore students have to register for the lab.

**Course: Computing Lab in Intelligent Systems in Finance [25762p]****Coordinators:** D. Seese**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

ECTS Credits	Hours per week	Term	Instruction language
4	3	Winter / Summer Term	de

**Learning Control / Examinations**

see German version

**Conditions**

see German version

**Learning Outcomes**

see German version

**Content**

see German version

**Literature****Elective literature:**

Literature will be announced in the first meeting.

**Remarks**

see German version

**Course: Computing Lab in Complexity Management [25818]****Coordinators:** D. Seese**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

ECTS Credits	Hours per week	Term	Instruction language
4	3	Winter / Summer Term	de

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Literature**

Will be announced in the computing lab.



## Course: Practical Course in Engineering Ceramics [21751]

**Coordinators:** Porz

**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an colloquium and a report to every single experiment (according to Section 4(2), 3 of the examination regulation).

### Conditions

Attendance of one course in the area of ceramics is assumed.

### Learning Outcomes

The aim of the course is to learn the experimental techniques and to understand the scientific background. In a report the results have to be discussed. The practical course takes place during the week after the end of the semester.

### Content

The course is focused on aspects of processing of a ceramic part. Characterisation of starting powder, forming and sintering, microstructural and mechanical characterisation are the basic topics

**Course: Laboratory - Process Engineering in Water Quality Management [19054p]****Coordinators:** E. Hoffmann**Part of the modules:** Water Supply and Sanitation (p. 112)[WI4INGBGU13]

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

**Learning Control / Examinations**

See module description.

**Conditions**Attendance of *Process Engineering in Water Quality Management* [19054]**Learning Outcomes****Content**

- Research on “unit processes”
- Gas exchange (oxygenation)
- Phase transition process
- Adsorption/ ion exchange
- Separation processes

**Course: Lab Class Web Services [25820]****Coordinators:** S. Tai**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

**Learning Control / Examinations**

The assessment of this course is according to §4(2), 3 of the examination regulation in form of an examination of the written seminar thesis, a presentation and a project. The final mark is based on the examination of the written seminar thesis and the project but can be upgraded or downgraded according to the quality of the presentation.

**Conditions**

None.

**Recommendations**

The lectures *Service Oriented Computing 1* and/or *Cloud Computing* are recommended.

**Learning Outcomes**

Students will acquire the technical expertise to apply service-oriented platforms and tools. Thereby, they will be enabled to develop practical solutions for concrete problems of constructing service-oriented IT infrastructure for provision of electronic services over the Internet.

**Content**

The "Praktikum (lab class) Web Services" provides a practical introduction to fundamental Web service technologies and their application to support applications on the Internet. Based on concrete application scenarios, the class focuses on the development of software solutions for specific aspects of service-oriented IT-infrastructure. This includes the complete development lifecycle of a large-scale software project and its implementation in small project teams.

**Literature**

Will be announced in the lecture.

**Course: Exercises in Knowledge Management [25740p]****Coordinators:** R. Studer**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatics (p. 62)[WI4INFO3]

ECTS Credits	Hours per week	Term	Instruction language
4	3	Winter / Summer Term	de

**Learning Control / Examinations**

Assessment is based on equal parts on (acc. to §4(2), 3 SPO)

- Essay
- Presentation
- Implementation

**Conditions**

Attending the lecture "Wissensmanagement" [25860] is required.

**Learning Outcomes**

To autonomously comprehend and work on a topic in the area of knowledge management.

**Content**

This "Praktikum" covers one of the following topics (the topics rotate annually):

- Ontologie-based Knowledge Management
- Semantic Web and Linked Data Applications
- Social Software and Collaboration Tools
- Data and Web Mining
- Personal Knowledge Management
- Case-based Reasoning

**Literature****Elective literature:**

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 1999.

S. Staab, R. Studer. Handbook on Ontologies. Springer Verlag 2004.

R. Baeza-Yates, B. Ribeiro-Neto. Modern Information Retrieval. ACM Press 1999.

## Course: Practical training in basics of microsystem technology [2143875]

**Coordinators:** A. Last

**Part of the modules:** Microsystem Technology (p. 98)[WI4INGMBIMT4], Microoptics (p. 96)[WI4INGMBIMT3], Nanotechnology (p. 99)[WI4INGMBIMT5], BioMEMS (p. 93)[WI4INGMBIMT1], Microfabrication (p. 95)[WI4INGMBIMT2]

ECTS Credits	Hours per week	Term	Instruction language
3		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

Practical training in micro structure technology

### Content

Five different practical exercises in microsystem technological themes per student are offered.

### Media

Each student gets a booklet for the preparation of the practical exercise with descriptions of the experiments at the end of the Microsystem technology I respectively II - lecture.

### Literature

- Micro system technology for engineers, W. Menz und J. Mohr, VCH Verlagsgesellschaft, Weinheim 2005.
- Fundamentals of Microfabrication, M. Madou, CRC Press, Boca Raton 1997

### Remarks

The registration for the practical exercises takes place in the course Microsystem technology I respectively II. There are two fixed examination dates per year, both Thursdays, in the second complete week in September and the second week after Ash Wednesday in March or April.

**Course: Practical seminar: Health Care Management (with Case Studies) [2550498]****Coordinators:** S. Nickel**Part of the modules:** Operations Research in Supply Chain Management and Health Care Management (p. 64)[WI4OR5]

ECTS Credits	Hours per week	Term	Instruction language
7	2/1/2	Winter / Summer Term	de

**Learning Control / Examinations**

The assessment consists in a case study, the writing of a corresponding paper, and an oral exam (according to §4(2), 2 of the examination regulation).

**Conditions**

None.

**Recommendations**

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

**Learning Outcomes**

The practical seminar will take place in a hospital in Karlsruhe such that the students are confronted with real problems. The target of this seminar is to develop solutions for these problems using well-known methods of Operations Research. Consequently the students' ability to analyze processes and structures, to collect relevant data as well as to develop and solve models will be promoted.

**Content**

Processes in a hospital are often grown historically ("We have always done it this way"), so that there has not been the need to analyze processes until reforms of the health system have put increasing pressure on hospitals. Consequently, nowadays hospitals look for possibilities to improve their processes. The students are confronted with case studies and are asked to develop a solution. Therefore they have to collect and analyze relevant data, processes and structures. When developing the solution the students have to bear in mind that besides the economic efficiency also the quality of care and patient satisfaction (e.g. measured in waiting time) may not be neglected in the health care sector.

**Literature****Elective literature:**

- Fleßa: Grundzüge der Krankenhausbetriebslehre, Oldenbourg, 2007
- Fleßa: Grundzüge der Krankenhaussteuerung, Oldenbourg, 2008
- Hall: Patient flow: reducing delay in healthcare delivery, Springer, 2006

**Remarks**

The lecture is offered every term.

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

**Course: Pricing [2572157]****Coordinators:** M. Klarmann**Part of the modules:** Sales Management (p. 43)[WI4BWLMAR6], (p. 44)[WI4BWLMAR7]

ECTS Credits	Hours per week	Term	Instruction language
3		Winter term	

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: Principles of Insurance Management [2550055]**

**Coordinators:** U. Werner  
**Part of the modules:** Insurance Management I (p. 24)[WI4BWLFBV6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	Summer term	de

**Learning Control / Examinations**

The assessment consists of oral presentations (incl. papers) within the lecture (according to Section 4 (2), 3 of the examination regulation) and a final oral exam (according to Section 4 (2), 2 of the examination regulation).

The overall grade consists of the assessment of the oral presentations incl. papers (50 percent) and the assessment of the oral exam (50 percent).

**Conditions**

None.

**Learning Outcomes**

See German version.

**Content**

See German version.

**Literature**

- D. Farny. *Versicherungsbetriebslehre*. Karlsruhe 2011.
- P. Koch. *Versicherungswirtschaft - ein einführender Überblick*. 2005.
- M. Rosenbaum, F. Wagner. *Versicherungsbetriebslehre. Grundlegende Qualifikationen*. Karlsruhe 2002.
- U. Werner. *Einführung in die Versicherungsbetriebslehre. Skript zur Vorlesung*.

**Elective literature:**

Will be announced during the lecture.

**Remarks**

For organizational reasons, please register with the secretariat of the chair: thomas.mueller3@kit.edu.



**Course: Private and Social Insurance [2530050]****Coordinators:** W. Heilmann, K. Besserer**Part of the modules:** Insurance Management II (p. 25)[WI4BWLFBV7], Insurance Management I (p. 24)[WI4BWLFBV6]

ECTS Credits	Hours per week	Term	Instruction language
2,5	2/0	Winter term	de

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes**

Getting to know basic terms and functioning of private and social insurance.

**Content**

Basic terms of insurance, i.e. characteristics, judicial and political background and functioning of private and social insurance as well as their economic and societal and political meaning.

**Literature****Elective literature:**

- F. Büchner, G. Winter. Grundriss der Individualversicherung. 1995.
- P. Koch. Versicherungswirtschaft. 2005.
- Jahrbücher des GDV. Die deutsche Versicherungswirtschaft:  
<http://www.gdv.de/2011/11/jahrbuch-der-deutschen-versicherungswirtschaft-2011/>

**Remarks**Block course. For organizational reasons, please register with the secretariat of the chair: [thomas.mueller3@kit.edu](mailto:thomas.mueller3@kit.edu)

## Course: Exercises in Civil Law [24017]

**Coordinators:** P. Sester, T. Dreier  
**Part of the modules:** Commercial Law (p. 130)[WI4JURA2]

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

### Learning Control / Examinations

Assessment will consist of five written exams following §4, Abs. 2, 3 of the SPO. At least two exams have to be passed, to pass the course. The final grade is calculated as the median of the two exams that have been passed with the best grades.

### Conditions

Students must have attended the course *Civil Law for Beginners* [24012] or a comparable introduction into (German) civil law. It is highly recommended that students have likewise attended the courses *Advanced Civil Law* [24504] and *Commercial and Corporation Law* [24011].

### Learning Outcomes

It is the aim of this course to enable students to solve legal cases by way of the appropriate legal technique (so-called Subsumtion). At the same time, the legal knowledge which students have acquired in the courses "Civil Law for Beginners", "Advanced Civil Law" and "Commercial and Corporation Law" will be repeated and deepened. This shall enable students to solve practical legal problems in a methodologically correct way.

### Content

In 5 sessions the substantive law which 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 deepened. Moreover, 5 sessions are reserved to written exam problems which cover the totality of what students have learned so far. Additional sessions are reserved for the subsequent in-class discussion of the exam problems.

### Media

Slides

### Literature

tba in the course.

**Course: Product and Innovation Marketing [2571154]****Coordinators:** M. Klarmann**Part of the modules:** Marketing Management (p. 42)[W14BWLMAR5]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: Product, Process and Ressource Integration in the Automotive Development [2123364]****Coordinators:** S. Mbang**Part of the modules:** Virtual Engineering A (p. 89)[WW4INGMB29], Virtual Engineering B (p. 90)[WW4INGMB30]

ECTS Credits	Hours per week	Term	Instruction language
4	2/1	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**

None.

**Learning Outcomes****Content**

## Course: Production and Logistics Management [2581954]

**Coordinators:** M. Fröhling, F. Schultmann  
**Part of the modules:** Industrial Production III (p. 39)[WI4BWLIIIP6]

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

### Learning Control / Examinations

The examination will be in form of a written exam acc. to §4(2), 1 ER. Exams are offered in every semester and can be re-examined at every ordinary examination date.

### Conditions

This course is compulsory in module "Industrial Production III" [WI4BWLIIIP6].

### Learning Outcomes

- Students discuss the basic tasks of an operative production and logistics management.
- Students discuss approaches to solve these tasks and shall be able to apply certain ones.
- Students explain the interdependencies between the tasks and methods to solve.
- Students discuss possible IT tools for production and logistics management.
- Students describe emerging trends in production and logistics management.

### Content

This course covers central tasks and challenges of operational production and logistics management. Systems analytically, central planning tasks are discussed. Exemplary solution approaches for these tasks are presented. Further practical approaches are explained. Students get to know the set-up and mode of operation of planning systems such as PPS-, ERP- and Advanced Planning Systems to cope with the accompanying planning tasks. Alongside to MRP II, students will be introduced to integrated supply chain management approaches in Supply Chain Management.

### Media

Media will be provided on the e-learning platform.

### Literature

will be announced in the course

## Course: Production Systems and Production Technology in Major Assembly Production [2150690]

**Coordinators:** Stauch  
**Part of the modules:** Global Production and Logistics (p. 74)[WI4INGMB31]

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

### Learning Control / Examinations

Performance is assessed in the form of one written examination (60 min) (as per §4(2), 1 or 2 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

Attendance of the lecture *Manufacturing Engineering* [2149657] is recommended prior to attending this lecture.

### Learning Outcomes

The student

- understands the challenges a global automotive company is facing in current times
- knows the possibilities of modern manufacturing engineering and is aware of specific application examples from major assembly production
- is able to apply the methods and approaches covered by the lecture to problems from the context of the lecture.

### Content

This lecture has a clear focus on real-life situations and conditions, provides many recent examples from industry and illustrates these examples by means of a study trip to Daimler's Untertürkheim plant. In addition to the technological aspects of major assembly production (engines, axles, transmissions), management-related aspects (HR management of approximately 20,000 employees), logistics-related aspects and other important general conditions (e.g. environmental requirements) will be addressed.

Main topics of the lecture:

- Facts and figures of the Daimler group and of the Untertürkheim plant
- Overview over the MDS and the major assembly process
- Powertrain systems
- Factory planning, start-up and total cost of ownership
- MPS - Mercedes Benz Production System
- Logistics
- Occupational health and safety and environmental protection
- Management and HR
- Quality management
- Study trip to the Untertürkheim plant

### Media

Lecture notes (available at the lecture).

### Remarks

The maximum number of participants is limited to 70. The dates for the sessions will be made known in time. The credits were changed to 4 CP.

**Course: Project Work in Risk Research [2530393]****Coordinators:** U. Werner**Part of the modules:** Operational Risk Management II (p. 27)[WI4BWLFBV10], Operational Risk Management I (p. 26)[WI4BWLFBV9]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3	Winter / Summer Term	de

**Learning Control / Examinations**

The assessment consists of oral presentations and papers on the topics presented (50%) as well as of the participation in group work (50%), according to Section 4 (2), 3 of the examination regulation.

**Conditions**

None.

**Recommendations**

Willingness to study literature beforehand in order to prepare for the work project at hand. Depending on the topic at hand, specific knowledge is required for being admitted to the course.

**Learning Outcomes**

Learn how to integrate knowledge from individual and collective group work for developing ideas and creating solutions for current problems in risk research.

**Content**

Project work with topic from current risk research.

Topics covered so far:

- Risk perception of extreme natural events
- Terrorism: Prevention, Provention, Perception
- Damage potential of man-made hazards
- Risk communication
- Cross-cultural comparison of risk perception
- Scenario-based hazard assessment
- Improving citizens' emergency preparedness
- Innovative insurance products for adapting to climate change
- Developing a questionnaire regarding risk perception of climate change
- Evaluation of the PROSA-project of DRV-BW

**Literature**

Indicated during the course for the selected topic.

**Elective literature:**

Indicated during the course for the selected topic.

**Remarks**

This course is normally offered each semester.

For further information, see: <http://insurance.fbv.kit.edu>

For organizational reasons, please register with the secretary of the chair: [thomas.mueller3@kit.edu](mailto:thomas.mueller3@kit.edu). Please include a list of courses taken so far.

## Course: Project Workshop-Automotive Engineering [2115817]

**Coordinators:** F. Gauterin

**Part of the modules:** Handling Characteristics of Motor Vehicles (p. 78)[WI4INGMB6], Vehicle Development (p. 79)[WI4INGMB14], Automotive Engineering (p. 77)[WI4INGMB5]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3	Winter / Summer Term	de

### Learning Control / Examinations

The assessment consists of a project presentation at the end of the lecture period (according to Section 4(2), 3 of the examination regulation) and an oral exam (30-40 min) in the recess period (according to Section 4(2), 2 of the examination regulation). Re-examinations are offered at every ordinary examination date.

The overall grade of the course consists of the weighted grades of both assessments

- Processing and results of the project: 75%
- Oral exam: 25 percent

### Conditions

None.

### Learning Outcomes

The students are familiar with typical industrial development processes and working style. They are able to apply knowledge gained at the university to a practical task.

### Content

During the Project Workshop Automotive Engineering a team of six persons will work on a task given by an German industrial partner using the instruments of project management. The task is relevant for the actual business and the results are intended to be industrialized after the completion of the project workshop. The team will generate approaches in its own responsibility and will develop solutions for practical application. Coaching will be supplied by both, company and institute. At the beginning in a start-up meeting goals and structure of the project will be specified. During the project workshop there will be weekly team meetings. Also a milestone meeting will be held together with persons from the industrial company. In a final presentation the project results will be presented to the company management and to institute representatives.

### Media

Course script (will be supplied during the start-up meeting).

### Literature

#### Elective literature:

Steinle, Claus; Bruch, Heike; Lawa, Dieter (Hrsg.), Projektmanagement, Instrument moderner Innovation, FAZ Verlag, Frankfurt a. M., 2001, ISBN 978-3929368277



**Course: Projectseminar [SozSem]**

**Coordinators:** Bernart, Kunz, Pfaff, Haupt, Grenz, Eisewicht

**Part of the modules:** Sociology (p. 134)[WI4SOZ1]

ECTS Credits	Hours per week	Term	Instruction language
4	2	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.

**Course: Public Management [2561127]****Coordinators:** B. Wigger, Assistenten**Part of the modules:** Strategic Decision Making and Organization Theory (p. 29)[WI4BWL03]

ECTS Credits	Hours per week	Term	Instruction language
6	2/1	Winter term	de

**Learning Control / Examinations**

The assessment consists of an 1h written exam following Art. 4, para. 2, clause 1 of the examination regulation. The grade for this course equals the grade of the written exam.

**Conditions**

Basic knowledge of Public Finance is required.

**Learning Outcomes****Content**

The lecture „Public Management“ deals with the economic theory of public sector administration. It is divided into four parts. The first section gives an overview of the legal framework of governmental administration in the Federal Republic of Germany and introduces the classical theory of administration as developed by Weber. Part two studies concepts of public decision-making, which have a significant impact on the operation of public sector administrations and where one focus is on consistency problems of collective decision-making. The third chapter deals with efficiency problems arising in conventionally organized public administrations and companies. X-inefficiency, information and control problems, the isolated consideration of income-spending-relations as well as rent-seeking problems will be considered. In section four the concept of New Public Management, which is a new approach to public sector administration that is mainly based in contract theory, is introduced. Its foundations in institutional economics are developed, with a focus on the specific incentive structures in self-administered administrations. Finally, the achievements of New Public Management approaches are discussed.

**Literature****Elective literature:**

- Damkowski, W. and C. Precht (1995): Public Management; Kohlhammer
- Richter, R. and E.G. Furubotn (2003): Neue Institutionenökonomik; 3rd edition; Mohr
- Schedler, K. and I. Proeller (2003): New Public Management; 2nd edition; UTB
- Mueller, D.C. (2009): Public Choice III; Cambridge University Press
- Wigger, B.U. (2006): Grundzüge der Finanzwissenschaft; 2nd edition; Springer

## Course: High Performance Powder Metallurgy Materials [2126749]

**Coordinators:** R. Oberacker

**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an oral exam (20-30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

### Conditions

None.

### Recommendations

Knowledge of basic material science is assumed. Therefore it is recommended to attend the courses Material Science I [21760] and Material Science II [21782] beforehand.

### Learning Outcomes

The students know the basics of powder metallurgy. They are able to assess the conditions for applying either powder metallurgy or competing production methods. They have knowledge on production, properties and application of the most important PM materials.

### Content

The lecture gives an overview on production, properties and application structural and functional powder metallurgy material. The following groups of materials are presented: PM High Speed Steels, Cemented Carbides, PM Metal Matrix Composites, PM Specialities, PM Soft Magnetic and Hard Magnetic Materials.

### Literature

#### Elective literature:

W. Schatt ; K.-P. Wieters ; B. Kieback. „Pulvermetallurgie: Technologien und Werkstoffe“, Springer, 2007

R.M. German. “Powder metallurgy and particulate materials processing. Metal Powder Industries Federation, 2005

F. Thümmeler, R. Oberacker. “Introduction to Powder Metallurgy”, Institute of Materials, 1993

## Course: Quality Management [2149667]

**Coordinators:** Lanza, Gisela

**Part of the modules:** Specialization in Production Engineering (p. 72)[WI4INGMB22], Global Production and Logistics (p. 74)[WI4INGMB31]

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

### Learning Control / Examinations

Performance is assessed in the form of one written examination (60 min) (as per §4(2), 1 or 2 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.

### Learning Outcomes

The student

- has **knowledge** of the content covered by the lecture,
- **understands** the quality philosophies covered by the lecture,
- is able to **apply** the QM tools and methods he/she has learned about in the lecture **to** new problems from the context of the lecture,
- is able to **analyse** and **evaluate** the suitability of the methods, procedures and techniques he/she has learned about in the lecture for a specific 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-specific fields 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 certification possibilities and legal quality aspects.

Main topics of the lecture:

1. The term "quality"
2. Total Quality Management (TQM) and Six Sigma
3. Universal methods and tools
4. QM during early product stages - product definition
5. QM during product development and in procurement
6. QM in production - manufacturing metrology
7. QM in production - statistical methods
8. QM in service
9. Quality management systems
10. Legal aspects of QM

### Media

Lecture notes (available at the Institute of Production Science)

### Remarks

The credits were changed to 4 CP.

**Course: Quality Control I [2550674]****Coordinators:** K. Waldmann**Part of the modules:** Stochastic Modelling and Optimization (p. 67)[WI4OR7]

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

**Learning Control / Examinations**

The assessment consists of an 2h written exam following §4(2), 1 SPO combined with Quality Control II. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.3.

**Conditions**

None.

**Learning Outcomes**

The lecture provides students with knowledge of modern techniques in quality management. Students learn to use the techniques, such as control charts, experimental design, efficiently and targeted.

**Content**

Topics overview: Introduction to TQM, Statistical Process Control (control charts), Acceptance Sampling (sampling plans), Design and Analysis of Experiments

**Media**

Blackboard, Slides, Flash Animations.

**Literature**

Lecture Notes

**Elective literature:**

- Montgomery, D.C. (2005): Introduction to Statistical Quality Control (5e); Wiley.

**Remarks**

The lecture is offered irregularly. The curriculum of the next two years is available online.

**Course: Quality Control II [25659]****Coordinators:** K. Waldmann**Part of the modules:** Stochastic Modelling and Optimization (p. 67)[WI4OR7]

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

**Learning Control / Examinations**

The assessment consists of an 2h written exam following §4(2), 1 SPO combined with Quality Control I. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.3.

**Conditions**

None.

**Learning Outcomes**

The lecture provides students with knowledge of modern techniques in reliability engineering.

**Content**

Topics overview: Reliability Theory (structure function, reliability of complex systems, modeling and estimating lifetime distributions, systems with repair), Maintenance

**Media**

Blackboard, Slides, Flash Animations.

**Literature**

Lecture Notes

**Elective literature:**

- ROSS, S.M.: Introduction to Probability Models (5 ed). Academic Press, 1993.
- KOHLAS, J.: Zuverlässigkeit und Verfügbarkeit. B.G. Teubner, Stuttgart, 1987.
- BIROLINI, A: Qualität und Zuverlässigkeit technischer Systeme, Springer, Berlin, 1991.

**Remarks**

The lecture is offered irregularly. The curriculum of the next two years is available online.

**Course: Quality Management of Food Processing [22205/6]****Coordinators:** Schuchmann**Part of the modules:** Principles of Food Process Engineering (p. 119)[WI4INGCV3], Specialization in Food Process Engineering (p. 120)[WI4INGCV4]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes****Content**

## Course: Quantitative Methods for Supply Chain Risk Management [2118090]

**Coordinators:** A. Cardeneo

**Part of the modules:** Safety Science II (p. 127)[WI4INGINTER5], Safety Science I (p. 126)[WI4INGINTER4], Logistics in Value Chain Networks (p. 87)[WI4INGMB28], Introduction to Logistics (p. 83)[WI4INGMB20], Safety Science III (p. 128)[WI4INGINTER6]

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

Knowledge in Logistics and Operations Research are recommended (linear and mixed integer optimization, simple graph theory, and basic knowledge of statistics).

### Learning Outcomes

The student

- identifies, analyzes and assigns risks of logistic systems
- plans location and transport decisions under uncertainty
- knows risk-relevant elements and knows adequate countermeasures for planning processes (regarding procurement, demand, infrastructure, continuity management)

### Content

The planning and the operation of logistics systems are strongly connected with uncertainty: It is the unknown demand, varying transportation times, unexpected delays, irregularly production yield or volatile rates of exchange: Quantities, times, qualities and prices are uncertain values. Therefore it is necessary to deal with particular these uncertain values to avoid negative effects . In this lecture we mostly work with mathematical models and methods to control the various kinds of risks.

### Literature

Will be announced in the lecture.



**Course: Computer Integrated Planning of New Products [2122387]****Coordinators:** R. Kläger**Part of the modules:** Virtual Engineering A (p. 89)[WW4INGMB29], Virtual Engineering B (p. 90)[WW4INGMB30]

ECTS Credits	Hours per week	Term	Instruction language
4	2/0	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**

None.

**Learning Outcomes****Content**

## Course: Control of Linear Multivariable Systems [23177]

**Coordinators:** M. Kluwe  
**Part of the modules:** Control Engineering II (p. 114)[WI4INGETIT2]

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

### Learning Control / Examinations

The assessment consists of a written exam (120 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.

### Recommendations

Knowledge of system dynamics and control engineering (as given in the lecture *System Dynamics and Control Engineering* [23155]) is assumed.

### Learning Outcomes

Based on general knowledge of system dynamics and control engineering the course teaches students basic knowledge and skills to analyze linear multivariable dynamic systems (described both with I/O-models in frequency domain and mainly state space models) and to design linear controllers and observers. The students are enabled to apply these methods in order to solve practical controller design problems like poor sensor information or disturbances and uncertainties.

### Content

- *Modelling of linear and time-invariant Multivariable systems*  
Input-output-models in frequency domain, time continuous and time discrete state space models;
- *Analyses of linear and time-invariant Multivariable systems*  
State transformations, stability, controllability and observability, poles and zeroes;
- *Control of linear and time-invariant Multivariable systems*  
Control of input-output models in frequency domain (decoupling control), control of time continuous and time discrete state space models (basic structure with steady state filter and state feedback, basic principle of pole placement, selective design methods: modal control, decoupling control, Vollständige Modale Synthese, dead beat state space control);
- *Synthesis of state space observers* Luenberger observer, reduced observer;
- *Synthesis of output feedback controllers; Synthesis of controllers for long term disturbances;* disturbance control, use of disturbance models, PI state space controller;
- *Synthesis of output feedback controllers*
- *Synthesis of dynamic state space controllers*
- *Synthesis of robust controllers by pole area placement*  
definition and pole-area stability, pole area placement via Konigorski, design of robust output feedback;
- *Reduction of the order of high-order models*  
task and principles, modal reduction of order, construction of the reduced model via Litz

### Media

Supplemental sheets  
 Demonstration with Matlab/Simulink

### Literature

Föllinger, Otto: Regelungstechnik, Hüthig-Verlag, 8. Auflage

### Elective literature:

- Lunze, Jan: Regelungstechnik 2, Springer-Verlag, 1997
- Föllinger, O.: Regelungstechnik. 10. Auflage, Hüthig Verlag, 2008

**Course: Regulation Theory and Practice [2560234]****Coordinators:** K. Mitusch**Part of the modules:** Network Economics (p. 52)[WI4VWL4], Energy Economics and Energy Markets (p. 40)[WI4BWLIP4]

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

**Learning Control / Examinations**

Result of success is made by a 60 minutes written examination during the semester break (according to §4(2), 1 ERSC). Examination is offered every semester and can be retried at any regular examination date.

**Conditions**

May not be examined, when the examination of *Regulation* [26026] was already taken.

**Recommendations**

Basic knowledge and skills of microeconomics from undergraduate studies (bachelor's degree) are expected. Particularly helpful but not necessary: Industrial Economics and Principal-Agent- or Contract theories. Prior attendance of the lecture *Competition in Networks* [26240] is helpful in any case but not considered a formal precondition.

**Learning Outcomes**

The lecture provides insights into the regulation of network or infrastructure industries. Students should learn the basic aims and possibilities as well as the problems and limits of regulation. A central goal is to achieve an understanding of regulation as an incentive system under problems of severe asymmetric information. The lecture is suited for all students who want to work in companies of the network sectors – or who would like to become active on the side of regulators or in the respective political areas. Students should be able to apply general formal methods to the practice of regulation.

**Content**

In network industries – like transport, utilities or communication – the forces of competition often fail in certain critical areas, so that monopolies will arise. In these cases the usual competition laws often turn out to be insufficient. Then they are complemented by special regulation laws. Accordingly, the regulation authority (in Germany the federal network agency, Bundesnetzagentur) is in charge for network industries side by side with the Federal Cartel Office as another supervisory authority. The lecture begins with a short description of the general competition laws and competition policies. Then it turns to the aims, the possibilities and the practice of regulation which are presented and analyzed critically. This happens from both a theoretical (microeconomic modelling) perspective as well as from a practical perspective with the help of various examples.

**Literature**

Literature and lecture notes are handed out during the course.

## Course: Capability maturity models for software and systems engineering [2511216]

**Coordinators:** R. Kneuper

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

ECTS Credits	Hours per week	Term	Instruction language
4	2	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 master the basics of capability maturity models, oversee the whole process in project management and development processes according to CMMI and SPICE. They know how to use capability maturity models for quality assurance.

### Content

Capability maturity models like CMMI and SPICE are an important tool for assessing and improving software development. A significantly increasing number of companies use these models in their own approach to improve their development and to demonstrate a certain minimum quality and effective external presentation. This is the case in Germany, especially in the automotive industry, but also many other industries.

Preliminary Structure of the lecture:

1. Introduction and Overview, motivation
2. Project management according to CMMI
3. Development processes according to CMMI
4. Process management and supporting processes according to CMMI
5. Differences between SPICE and CMMI
6. Introduction of capability maturity models
7. Assessments and Appraisals
8. Costs and benefits of capability maturity models

### Media

Slides, access to internet resources.

### Literature

Literature is given in each lecture individually.

## Course: Replication processes in micro system technologies [2143893]

**Coordinators:** M. Worgull

**Part of the modules:** Microfabrication (p. 95)[W14INGMBIMT2], BioMEMS (p. 93)[W14INGMBIMT1]

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

### Learning Control / Examinations

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

### Conditions

None.

### Recommendations

This Lecture can be combined with "Chemical, physical and material science aspects of plastics in the micro technology" [2143500]

Intermediate examination or bachelor degree of mach/wing necessary.

Basic knowledge of the micro-system technology (but not a requirement) and interdisciplinary interest are favourable.

### Learning Outcomes

The students will get an overview over the replication technologies with focus on the replication of microscopic parts.

The students will finally having an expertise to compare the different processes based on scientific and technical items. This includes also aspects of

- quality of the moulded parts,
- material properties,
- technologies,
- mould design,
- cost efficiency.

### Content

Replication – Introduction and overview

- Diversity of replication
- Historic examples of (micro)replication .
- Materials for replication
- Overview of replication processes – content of the lesson

Polymers – Properties and their theoretical description

- Classification of polymers
- Mechanical and thermal behaviour
- Rheologic behaviour of polymer melts
- Measurement of thermal behaviour
- Viscoelasticity – fundamentals

Mikrostructured mould inserts

- Requirements on mould inserts
- Fabrication technologies
- Electroplating of mould inserts
- Materials for mould inserts
- Mould design

Replication processes - Processes and techniques

- Overview and characteristics
- Micro injection moulding
- Injection compression moulding
- Reaction injection moulding

- Thermoforming
- Hot embossing
- Comparison of processes
- Nanoimprinting

Characterisation of replicated parts

- Quality criteria
- Lateral precision
- Quality of surfaces
- Classification of cases of damage

Process simulation (Hot embossing)

- General aspects of process simulation
- Analytic model
- FEM – Basic aspects
- Simulation of a hot embossing cycle
- Excursion to labs in Campus Nord

**Media**

Printouts of the lecture presentation, if applicable further scientific articles.

**Course: Product Design [22215]****Coordinators:** Schuchmann**Part of the modules:** Specialization in Food Process Engineering (p. 120)[WI4INGCV4]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes****Content**

**Course: Risk Communication [2530395]****Coordinators:** U. Werner**Part of the modules:** Operational Risk Management I (p. 26)[WI4BWLFBV9], Operational Risk Management II (p. 27)[WI4BWLFBV10]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	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. papers (50 percent) and the assessment of the oral exam (50 percent).

**Conditions**

None.

**Learning Outcomes**

See German version.

**Content**

See German version.

**Literature****Elective literature:**

R. Löfstedt, L. Frewer (Hrsg.). The Earthscan Reader in Risk &amp; Modern Society. London 1998.

B.-M. Drottz-Sjöberg. Current Trends in Risk Communication - Theory and Practice. Hrsg. v. Directorate for Civil Defence and Emergency Planning. Norway 2003.

Munich Re. Risikokommunikation. Was passiert, wenn was passiert? www.munichre.com

O.-P. Obermeier. Die Kunst der Risikokommunikation - Über Risiko, Kommunikation und Themenmanagement. München 1999. Fallstudien unter www.krisennavigator.de

**Remarks**

To attend the course please register with the secretary of the chair: thomas.mueller3@kit.edu



## Course: Risk Management in Industrial Supply Chain Networks [2581992]

**Coordinators:** T. Comes  
**Part of the modules:** Industrial Production III (p. 39)[WI4BWLIP6]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0		en

### Learning Control / Examinations

The examination will be in form of an oral or written exam acc. to §4(2), 1 ER. Exams are offered in every semester and can be re-examined at every ordinary examination date.

### Conditions

None.

### Learning Outcomes

Students shall learn methods and tools to manage risks in complex and dynamically evolving supply chain networks. Students learn the characteristics of modern logistics and supply chain management including trends such as globalization, lean production and e-business and learn to identify and analyze the arising risks. On the basis of this overview on supply chain management, the students gain knowledge about approaches and methods of industrial risk management. These approaches will be adapted to answer the specific questions arising in supply chain management. Key aspects include the identification of major risks, which provide the basis for the development of robust networks, and the design of strategic and tactic risk prevention and mitigation measures. In this manner, students will gain knowledge in designing and steering of robust internal and external value-creating networks.

### Content

- supply chain management: introduction, aims and trends
- industrial risk management
- definition und characterization of risks: sourcing and procurement, demand, production and infrastructure
- identification of risks
- risk controlling
- risk assessment and decision support tools
- risk prevention and mitigation strategies
- robust design of supply chain networks
- supplier selection
- capacity management
- business continuity management

### Media

Media will be provided on the e-learning platform.

### Literature

will be announced in the course

## Course: Risk Management of Microfinance and Private Households [26354]

**Coordinators:** U. Werner

**Part of the modules:** Operational Risk Management I (p. 26)[WI4BWLFBV9], Operational Risk Management II (p. 27)[WI4BWLFBV10]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	Winter / Summer Term	de

### Learning Control / Examinations

The assessment consists of oral presentations and term 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

- Becoming acquainted with starting points for analysing the special risk situation of private households and micro enterprises;
- learning to synchronize various risk coping instruments, identifying risks of microfinance products and learning to design innovative microfinance products.

### Content

The course consists of two interlocking parts:

In the first part the socio-economic framework as well as the goals and strategies of private-sector risk management are discussed, with an emphasis on insurance decisions. In the second part the issue of small entrepreneurial entities and their specific risk related problems in covering their financial requirements is addressed. Typically their size and other specific characteristics lead to high risks for financial services institutions.

After an introduction to the economic principles of microfinance, the institutions working in this sector are presented as well as innovative credit-, savings-, and insurance products (which are often combined). We'll discuss approaches for performance measurement from the perspectives of customers, suppliers, and investors.

### Media

Scriptum.

### Literature

- H.-U. Vollenweider. *Risikobewältigung in Familie und Haushalt - eine sicherheitsökonomische Studie*. 1986.
- P. Zweifel, R. Eisen. *Versicherungsökonomie*. 2003
- J. Ledgerwood, I. Johnson, J.M. Severino. *Microfinance Handbook: An Institutional and Financial Perspective*. 2001.
- B.M. de Aghion, J. Morduch. *The Economics of Microfinance*. 2005.

### Remarks

This course is 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](mailto:thomas.mueller3@kit.edu)

**Course: Scale up in Biology and Engineering [22417]****Coordinators:** Hausmann**Part of the modules:** Specialization in Food Process Engineering (p. 120)[WI4INGCV4]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes****Content**

## Course: Failure Analysis [21562]

**Coordinators:** Poser-Keppler

**Part of the modules:** Safety Science I (p. 126)[WI4INGINTER4], Safety Science III (p. 128)[WI4INGINTER6], Safety Science II (p. 127)[WI4INGINTER5], Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an oral exam (20-30 min) according to Section 4 (2), 2 of the examination regulation at an agreed date. The exam takes place in the recess period.

The re-examination is offered upon agreement.

### Conditions

Basic knowledge in materials science (e.g. lectures *Materials Science I and II*) are required.

### Learning Outcomes

The students are able to discuss damage evaluation and to perform damage investigations. They know the common necessary investigation methods and can regard failures considering load and material resistance. Furthermore they can describe and discuss the most important types of failure and damage appearance.

### Content

- Aim, procedure and content of examining failure
- Examination methods
- Types of failure:
  - Failure due to mechanical loads
  - Failure due to corrosion in electrolytes
  - Failure due to thermal loads
  - Failure due to tribological loads
- Damage systematics

### Literature

- Lange: Systematische Beurteilung technischer Schadensfälle, ISBN 3-527-30417-7
- Grosch: Schadenskunde im Maschinenbau, ISBN 3-8169-2179-5
- Kieselbach: Schäden an Bauteilen aus Metall - ingenieurmässig analysiert, UB 2000 E 627
- Broichhausen: Schadenskunde: Analyse u. Vermeidung von Schäden in Konstruktion, Fertigung u. Betrieb, ISBN 3-446-13409-3

### Remarks

For further information, see <http://www.iwk1.kit.edu/28.php>

**Course: Public Transit in Cities and Regions [19327s]****Coordinators:** E. Hohnacker**Part of the modules:** Public Transportation Operations (p. 106)[WI4INGBGU4]

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

**Learning Control / Examinations**

The assessment will consist of a oral exam (20 min) according to §4 (2), 1 of the examination regulation.

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.

**Conditions**

See module description.

**Learning Outcomes****Content**

queuing theory; timetabling; max-plus-algebra; advanced dynamics

## Course: Welding Technology I/II [21565/21570]

**Coordinators:** Spies

**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an oral exam (40 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation).

### Conditions

basics of material science (iron- and non-iron alloys), of electrical engineering, of production processes.

### Learning Outcomes

- knowledge and understanding of the most important welding processes and its industrial application.
- recognition, understanding and handling of problems occurring during the application of different welding processes relating to design, material and production.
- classification and importance of welding technology within the scope of connecting processes (advantages/disadvantages, alternatives).
- recognition, understanding and handling of problems occurring during the application of different welding processes relating to design, material and production.
- consolidation of knowledge of material behaviour during welding
- design and properties of welded constructions
- quality assurance for welding processes

### Content

#### Welding Technologies I

- definition, application and differentiation: welding, welding processes, alternative connecting technologies.
- history of welding technology
- sources of energy for welding processes
- Survey: fusion welding, pressure welding.
- seam preparation/design
- welding positions
- weldability
- gas welding, thermal cutting
- manual metal-arc welding
- submerged arc welding
- IV characteristics: arc/sources of energy
- gas-shielded metal-arc welding

#### Welding Technologies II

- narrow gap welding
- TIG-welding
- plasma arc welding
- electron beam welding
- laser welding
- spot welding / projection welding
- heat flow at welding
- welding of low-alloy steel / time-temperature-transformation curve.
- welding of high-alloy steel / austenite / Schaefflerdiagramm
- low temperature steels

- welding of cast iron
- heat treatment for welding
- welding of aluminium alloys
- residual welding stress
- methods of testing
- design of welded constructions

**Literature****Elective literature:**

- Ruge: Handbuch der Schweißtechnik, Springer-Verlag, 1985
- Dilthey: Schweißtechnische Fertigungsverfahren I, Augustinus, Aachen, 1991
- Fachbände des Deutschen Verlags für Schweißtechnik

## Course: Semantic Web Technologies I [2511304]

**Coordinators:** R. Studer, S. Rudolph, E. Simperl

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

The assessment consists of an 1h written exam following §4, Abs. 2, 1 of the examination regulation or of an oral exam (20 min) following §4, Abs. 2, 2 of the examination regulation.

The exam takes place every semester and can be repeated at every regular examination date.

### Conditions

Lectures on Informatics of the Bachelor on Information Management (Semester 1-4) or equivalent.

### Learning Outcomes

- Basic knowledge about the main ideas and the realisation of Semantic Web Technologies

### Content

"Semantic Web" denotes an extension of the World Wide Web by meta data and applications in order to make the meaning (semantics) of data on the web usable by intelligent systems, e.g. in e-commerce and internet portals. Central to this is the representation and processing of knowledge in form of ontologies. This lecture provides the foundations for knowledge representation and processing for the corresponding technologies and presents example applications. It covers the following topics:

- Extensible Markup Language (XML)
- Resource Description Framework (RDF) and RDF Schema
- Web Ontology Language (OWL)
- Rule Languages
- Applications

### Media

Slides.

### Literature

- Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, York Sure: Semantic Web - Grundlagen, Springer, 2008 (ISBN 978-3-540-33993-9)
- S. Staab, R. Studer (Editors). Handbook on Ontologies. International Handbooks in Information Systems. Springer 2003.

### Elective literature:

1. Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, Foundations of Semantic Web Technologies. Textbooks in Computing, Chapman and Hall/CRC Press, 2009.
2. G. Antoniou, Grigoris Antoniou, Frank Van Harmelen, A Semantic Web Primer, MIT Press, 2004
3. Uwe Schöning. Logik für Informatiker. Spektrum Akademischer Verlag, 5. Auflage 2000
4. Steffen Hölldobler. Logik und Logikprogrammierung. Synchron Verlag, 3. Auflage 2003
5. Dieter Fensel. Spinning the Semantic Web. 2003 (ISBN 0262062321).
6. Handschuh, Staab. Annotation for the Semantic Web. 2003 (ISBN 158603345X).
7. J. Sowa. Knowledge Representation. Brooks/Cole 1999
8. Tim Berners-Lee. Weaving the Web. Harper 1999 geb. 2000 Taschenbuch.
9. Ian Jacobs, Norman Walsh. Architecture of the World Wide Web, Volume One. W3C Recommendation 15 December 2004. <http://www.w3.org/TR/webarch/>



## Course: Semantic Web Technologies II [2511306]

**Coordinators:** E. Simperl, A. Harth, S. Rudolph, Daniel Oberle

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

Lectures on Informatics of the Bachelor on Information Management (Semester 1-4) or equivalent. *Semantic Web Technologies* / [2511304] is recommended.

### Learning Outcomes

- Acquisition of basic competencies in Linked Data and data integration on the web
- Acquisition of advanced knowledge in knowledge representation with ontologies
- Acquisition of detailed knowledge of acquisition and evaluation of ontologies
- Analysis of typical usage scenarios and industry applications

### Content

Central components of the Semantic Web are explained in detail. Linked Data foundations, crawling, querying and applications; knowledge representation, ontology modelling; ontology development and evaluation; Further, benefits and challenges of semantic technologies are discussed.

### Media

Slides.

### Literature

- Pascal Hitzler, Sebastian Rudolph, Markus Krötzsch: Foundations of Semantic Web Technologies. Chapman & Hall/CRC 2009.
- Steffen Staab, Rudi Studer (Editors). Handbook on Ontologies. International Handbooks in Information Systems. Springer 2003.
- John Domingue, Dieter Fensel, James A. Hendler (Editors). Handbook of Semantic Web Technologies. Springer 2011.

### Elective literature:

1. Grigoris Antoniou, Frank Van Harmelen. A Semantic Web Primer. MIT Press, 2004
2. Uwe Schöning. Logik für Informatiker. Spektrum Akademischer Verlag, 2000
3. Steffen Hölldobler. Logik und Logikprogrammierung. Synchron Verlag, 2003
4. Dieter Fensel. Spinning the Semantic Web. MIT Press, 2003
5. John Sowa. Knowledge Representation. Brooks/Cole, 1999
6. Tim Berners-Lee. Weaving the Web. HarperOne, 1999
7. Dean Allemang. Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL. Morgan Kaufmann, 2008
8. Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernando Lopez: Ontological Engineering: with examples from the areas of Knowledge Management, e-Commerce and the Semantic Web. Springer, 2004
9. Nicola Guarino and Chris Welty. Identity, Unity, and Individuation: Towards a Formal Toolkit for Ontological Analysis. Proceedings of ECAI-2000: The European Conference on Artificial Intelligence. IOS Press, 2000
10. Nicola Guarino and Chris Welty. Evaluating Ontological Decisions with OntoClean. Communications of the ACM. 45(2):61-65, 2000
11. Tom Heath and Chris Bizer. Linked Data: Evolving the Web into a Global Data Space. Synthesis Lectures on the Semantic Web: Theory and Technology, 2011

## Course: Seminar in Enterprise Information Systems [SemAIFB1]

**Coordinators:** R. Studer, A. Oberweis, T. Wolf, R. Kneuper

**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

### Learning Control / Examinations

The assessment of this course is according to §4(2), 3 SPO in form of an examination of the written seminar thesis and a presentation.

The final mark is based on the examination of the written seminar thesis but can be upgraded or downgraded according to the quality of the presentation.

The seminar is for bachelor as well as master students. The differentiation will be made by selection of different topics and different standards of evaluation.

### Conditions

See corresponding module information.

### Learning Outcomes

Students 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

The seminar intensifies and extends specific topics which are discussed within corresponding lectures. Knowledge of these lecture topics is an advantage but not a precondition.

Specific titles and the topics of offered seminars will be announced before the start of a semester in the internet at <http://www.aifb.uni-karlsruhe.de/Lehre>

### Literature

Literature will be given individually in the specific seminar.

## Course: Seminar Management accounting for industrial engineers [2577916]

**Coordinators:** M. Wouters  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

### Learning Control / Examinations

The final grade of the course is the grade awarded to the paper.

### Conditions

The LV "Allgemeine Betriebswirtschaftslehre C" (2600026) must have been completed before starting this seminar.

### Learning Outcomes

Students are familiar with topics in management accounting literature and practice that are most relevant to their studies and to their research projects.

### 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. Meetings are concentrated in three weeks that are spread throughout the semester.

Week 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.

Week 2: 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.

Week 3: In the third week we are going to present and discuss the final papers.

### Media

The instructor uses a LCD projector and makes the slides available for the students. Students should have their own notebook computer with the usual software for spreadsheets, word processing, internet, etc.

### Literature

Will be announced in the course.

### Remarks

Maximum of 24 students.

**Course: Seminar Efficient Algorithms [SemAIFB2]**

**Coordinators:** H. Schmeck  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations**

The assessment consists of a talk (presentation of 45-60 minutes) about the research topic of the seminar together with discussion, a written summary about the major issues of the topic (approx. 15 pages) and attending the discussions of the seminar (according Section 4(2), 3 of the examination regulation).

The grade of this course is achieved by the weighted sum of the grades (talk 50%, written summary 30% and discussion 20%). This seminar is for bachelor as well as master students. The difference between them is calculated according to different evaluation mechanisms for the written summary work and the talk.

**Conditions**

See corresponding module information.

**Learning Outcomes**

The students should learn to work on research papers by searching for new topics in computer science and by presenting the major issues of the papers.

The master students should deepen their ability to develop independent insight into new scientific topics and to communicate them through oral presentation and written summary to others.

The students will learn to deal with critical discussions on scientific presentations and written summaries through active participation in the seminar.

**Content**

Topics include the new research issues of the research group "applied Informatics". The new topics are in the area Organic Computing, Nature-inspired optimization and service oriented architectures.

The topics of the seminars are introduced around the end of the former semester on the board A12 of the institute AIFB (building 11.40) and in Internet <http://www.aifb.kit.edu/web/SeminarePraktika>

**Literature**

Will be announced at the beginning of the semester.

**Remarks**

There is a limited number of participants. The students have to register for the seminar.

**Course: Seminar Energy Economics [SemEW]****Coordinators:** W. Fichtner, P. Jochem, A. Eßer-Frey, M. Genoese**Part of the modules:** Seminar Module (p. [135](#))[WW4SEM]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: Seminar eOrganization [SemAIFB5]**

**Coordinators:** S. Tai  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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**

None.

**Learning Outcomes**

Research in the field of eOrganization adhering to scientific standards.

**Content**

The seminar explores current research topics of Cloud Service Engineering (including service computing, service engineering, cloud computing and service networks). Each time, a particular focus theme will be chosen.

**Course: Seminar Public Finance [2560130]**

**Coordinators:** B. Wigger, Assistenten  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations****Conditions**

See module description.  
Adequate for students in an advanced stage of their studies.

**Learning Outcomes****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.

**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. 135)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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

None.

### Learning Outcomes

The student gets an opportunity to learn how to work academically. By delving into a scientific topic the student learns to do research and to argue specially in logistics and material handling. Through the presentation of his work the student will learn technical basics of presentation and basics of academic argumentation. Also rhetorical competence will be acquired.

### 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.



**Course: [SemTuE1]****Coordinators:****Part of the modules:** Seminar Module (p. [135](#))[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
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**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: Seminar in Highway Engineering - Mitigation of an accident black spot [19314]****Coordinators:** M. Zimmermann**Part of the modules:** Safety, Computing and Law in Highway Engineering (p. 105)[WI4INGBGU3]

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

**Learning Control / Examinations**

See module description.

**Conditions**

See corresponding module information.

**Learning Outcomes****Content****Literature****Elective literature:**

Lecture materials "Sicherheitsmanagement im Straßenwesen"

**Course: Seminar in Finance [2530293]**

**Coordinators:** M. Uhrig-Homburg, M. Ruckes  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations****Conditions**

None.

**Recommendations**

Knowledge of the content of the module *F1 (Finance)* [WI4BWLFBV1] is assumed.

**Learning Outcomes**

The student gets in touch with scientific work. Through profound working on a specific scientific topic the student is meant to learn the foundations of scientific research and reasoning in particular in finance.

Through the presentations in this seminar the student becomes familiar with the fundamental techniques for presentations and foundations of scientific reasoning. In addition, the student earns rhetorical skills.

**Content**

Within this seminar different topics of current concern are treated. These topics have their foundations in the contents of certain lectures.

The topics of the seminar are published on the website of the involved finance chairs at the end of the foregoing semester.

**Literature**

Will be announced at the end of the foregoing semester.

**Course: Seminar in International Economy [SemiWW2]****Coordinators:** J. Kowalski**Part of the modules:** Seminar Module (p. [135](#))[WW4SEM]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: [SemiIWW3]****Coordinators:** I. Ott**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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****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 Development and Growth in a globalized World (SS 2011)

**Literature**

Todaro, Michael P. und Stephen C. Smith (2009). Economic Development, Tenth Edition, Pearson Education Ltd., Essex.

## Course: Seminar in Industrial Production [SemIIP2]

**Coordinators:** F. Schultmann, M. Fröhling, T. Comes

**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

### Learning Control / Examinations

Assessment acc. to §4 (2), No.3 ER by assessing the written seminar thesis (approx. 20 pages), the oral presentation and active participation in public discussions. The final grade will be formed by weighing the individual assessment grades.

### Conditions

Students should have completed the modules „Industrial Production I“ [WW3BWLIIIP], „Industrial Production II“ [WI4BWLIIIP2] or “Industrial Production III” [WW3BWLIIIP6].

### Learning Outcomes

Students shall gain insights into selected research of the Institute of Industrial Production (IIP).

- Students search for, identify, review and evaluate relevant literature.
- Students prepare their seminar thesis (and later on bachelor/master thesis) with a minimum expense in becoming acquainted with their topic and general layout.
- Students produce an oral presentation in a scientific context by using the outlined techniques of scientific presentation.
- Students learn to present their written results in an adequate form for scientific publishing.

Students in M.Sc. studies will have to put special emphasis on a critical discussion and evaluation of their topic, since they will have to look into actual scientific results in the field of industrial production.

### Content

This seminar covers actual topics of industrial production, logistics, environmental science, project management and similar fields. We recommend a successful attendance of previous IIP modules (not compulsory!).

Actual topics covered in this seminar will be published before the start of semester.

## Course: Seminar Information Engineering and Management [SemiW]

**Coordinators:** C. Weinhardt  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

See corresponding module information.

### Recommendations

*Business Engineering/Economics Engineering:* At least one module offered by the institute should have been chosen before attending this seminar.

### Learning Outcomes

The student should be able to do a literature review based on a predefined topic in the context of information engineering and management. 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 a academic level. This process gives him the knowledge and practice for further research work like a master thesis or a doctoral thesis

### Content

In the seminar the student should learn to apply the research methods to a predefined topic area. The topics are based on research questions in Information Engineering and Management across different industry sectors. This problem analysis requires a interdisciplinary examination.

### Media

- Powerpoint
- eLearning 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: <http://www.iism.kit.edu/im/lehre> .

**Course: Seminar Complexity Management [SemAIFB3]****Coordinators:** D. Seese**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations**

see German version

**Conditions**

None.

**Learning Outcomes**

see German version

**Content**

see German version

**Literature**

Will be announced in the seminar.

**Remarks**

The number of participants is limited. Please take notice about the inscription procedure at the institutes website. Specific titles and the topics of offered seminars will be announced before the start of a semester on the website of AIFB.



**Course: Seminar Public Sector Risk Management [2530355]****Coordinators:** U. Werner, S. Hochrainer**Part of the modules:** Operational Risk Management I (p. 26)[WI4BWLFBV9], Operational Risk Management II (p. 27)[WI4BWLFBV10]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: Seminar Service Science, Management & Engineering [2590470]****Coordinators:** C. Weinhardt, R. Studer, S. Nickel, H. Fromm**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations**

The assessment of this course is according to §4(2), 3 SPO in form of an examination of the written seminar thesis (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* [2540466] is recommended.

**Learning Outcomes**

Autonomously deal with a special topic in the Service Science, Management and Engineering field adhering to scientific standards.

**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: <http://www.ksri.kit.edu>

**Literature**

The student will receive the necessary literature for his research topic.

**Course: Seminar Stochastic Models [SemWIOR1]****Coordinators:** K. Waldmann**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations**

The assessment of this course is in form of an examination of the written seminar thesis and a presentation. The final mark is the result of both the paper and its presentation.

**Conditions**

None.

**Learning Outcomes**

In case studies students comprehend stochastic relationships and gain deep knowledge of modelling, evaluation, and optimization of stochastic systems. In group presentations, students learn basic academic presentation and argument skills.

**Content**

The actual topic as well as the contemporary issues are available online.

**Media**

Power Point and related presentation techniques.

**Literature**

Will be presented with the actual topic.

**Course: Seminar Business Ethics [SemIIP3]****Coordinators:** A. Wollert**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

## Course: Seminar Knowledge Management [SemAIFB4]

**Coordinators:** R. Studer  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

### Learning Control / Examinations

The success monitoring is done through a presentation about a research topic from the current topic of the seminar (45-60 minutes) followed by a discussion, a written summary of the main points (approx. 15 pages) and of active participation in discussions (in accordance with §4(2),3 SPO).

The total mark is composed of the graded and weighted success controls (50% lecture, 30% written paper, and 20% participation and discussion).

The seminar can be attended by both bachelor and master students. A differentiation is made by different topic assignment and evaluation standards for seminar paper and presentation.

### Conditions

See module description.

### Learning Outcomes

The students will learn to perform literature searches on current topics in computer science and holistic knowledge management as well as preparing and presenting the contents of scientific publications.

During the work on the seminar topics the master students will deepen their skills to autonomously comprehend current scientific knowledge and to convey it to others through oral presentations and written summaries.

Through active participation in the seminar, students acquire skills in critical appraisal of research topics and in oral and written presentation of independently developed research content.

### Content

Each year, the seminar will cover topics from a different selected subfield of knowledge management, e.g.:

- Ontology-based knowledge management,
- Information Retrieval and Text Mining,
- Data Mining,
- Personal Knowledge Management,
- Case Based Reasoning (CBR),
- Collaboration and Social Computing,
- Business-process Oriented Knowledge Management.

### Media

Slides.

### Literature

- I. Nonaka, H. Takeuchi: The Knowledge Creating Company. Oxford University Press 1995
- G. Probst et al.: Wissen managen - Wie Unternehmen ihre wertvollste Ressource optimal nutzen. Gabler Verlag, Frankfurt am Main/ Wiesbaden, 1999
- Pascal Hitzler, Markus Krötzsch, Sebastian Rudolf, York Sure: Semantic Web - Grundlagen, Springer, 2008 (ISBN 978-3-540-33993-9)
- S. Staab, R. Studer: Handbook on Ontologies, ISBN 3-540-40834-7, Springer Verlag, 2004
- Modern Information Retrieval, Ricardo Baeza-Yates & Berthier Ribeiro-Neto. New York, NY: ACM Press; 1999; 513 pp. (ISBN: 0-201-39829-X.)

### Remarks

The number of students is limited. Students have to observe the designated registration process.

## Course: Seminar in Insurance Management [SemFBV1]

**Coordinators:** U. Werner  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

### Learning Control / Examinations

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

### Conditions

See corresponding module information.

The seminar is held within the courses of *Risk and Insurance Management and Insurance Management* ([WW3BWLFBV3], [WW3BWLFBV4] and [WW4BWLFBV6/7]), respectively.

A course taken as a seminar cannot be chosen as a part of a course module (and vice versa).

### Recommendations

The seminar fits well with the bachelor modules *Risk and Insurance Management* [WW3BWLFBV3] as well as with the master modules *Insurance Management I* [WI4BWLFBV6] and *Insurance Management II* [WI4BWLFBV7]. 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 Accounting ? (s.o.)
- Insurance Marketing
- Insurance Production
- Service Management

For their contents refer to the information given for these courses.

### Literature

Will be announced at the beginning of the lecture period.

### Remarks

Some of the courses mentioned above are offered on demand. For further information, see: <http://insurance.fbv.kit.edu>. To attend the course please register with the secretary of the chair: [thomas.mueller3@kit.edu](mailto:thomas.mueller3@kit.edu)

## Course: Seminar in Operational Risk Management [SemFBV2]

**Coordinators:** U. Werner  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

### Learning Control / Examinations

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

### Conditions

See corresponding module information.

The seminar is held within the courses of *Risk and Insurance Management* [WW3BWLFBV3] and *Operational Risk Management I/II* [WW4BWLFBV9/10??].

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 module *Risk and Insurance Management* [WW3BWLFBV3] as well as with the master modules *Operational Risk Management I* [WW4BWLFBV8] and *Operational Risk Management II* [WI4BWLFBV9]. These modules, though, are not required to be taken.

### Learning Outcomes

See German version.

### Content

The seminar is offered within the following courses:

- Enterprise Risk Management
- Multidisciplinary Risk Research
- Risk Communication
- Risk Management of Microfinance and Private Households
- Project Work in Risk Research

For their contents refer to the information given for these courses.

### Literature

Will be announced at the beginning of the course 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](mailto:thomas.mueller3@kit.edu)

**Course: Seminar in strategic and behavioral marketing [2572197]**

**Coordinators:** B. Neibecker  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations**

The student is evaluated based on the written work, a presentation of the results in front of an audience and his contribution to the discussion

**Conditions**

None.

**Learning Outcomes**

At the seminar (with a "Referat" as its goal) the student should be able to do a literature review based on a predefined topic in the context of marketing research. 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 a academic level.

**Content**

In the seminar the student should learn to apply the research methods to a predefined topic area. The topics are based on research questions in marketing. This problem analysis requires a interdisciplinary examination. As a special option, the implementation of methodological solutions for market research can be accomplished and discussed with respect to its application.

**Literature**

Will be allocated according the individual topics.

**Remarks**

- Students from Bachelor and Master Course can visit the seminar. The research topic as well as the evaluation of the work and the presentation will have a different focus between Bachelor and Master Course.



**Course: Seminar in Discrete Optimization [2550491]**

**Coordinators:** S. Nickel  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations**

The assessment consists of a written seminar thesis of 20-25 pages and a presentation of 40-60 minutes (according to §4(2), 3 of the examination regulation).

The final mark for the seminar is the weighted average of the marks for the assessed assignments (seminar thesis 50 %, presentation 50%).

The seminar can be attended both by Bachelor and Master students. A differentiation will be achieved by different valuation standards for the seminar thesis and presentation.

**Conditions**

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

**Learning Outcomes**

The seminar aims at the presentation, critical evaluation and exemplary discussion of recent questions in discrete optimization. The focus lies on optimization models and algorithms, also with regard to their applicability in practical cases (especially in Supply Chain and Health Care Management).

The students get in touch with scientific working: The in-depth work with a special scientific topic makes the students familiar with scientific literature research and argumentation methods. As a further aspect of scientific work, especially for Master students the emphasis is put on a critical discussion of the seminar topic.

Regarding the seminar presentations, the students will be familiarized with basic presentational and rhetoric skills.

**Content**

The topics of the seminar will be announced at the beginning of the term in a preliminary meeting. Dates will be announced on the internet.

**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:** C. Puppe

**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

### Learning Control / Examinations

Term paper and presentation

### Conditions

See corresponding module information.

A course in the field of Game Theory should be attended beforehand.

### Learning Outcomes

The seminar wants to deepen the methods of scientific work. Students shall learn to discuss critical the latest research results in Experimental Economics.

Students learn the technical basics of presentation and to argument scientifically. Also rethoric skills shall be amplified.

### Content

The seminar's topic will be announced before the beginning of each semester on the internet ([http://www.wior.uni-karlsruhe.de/LS\\_Berninghaus/Studium/](http://www.wior.uni-karlsruhe.de/LS_Berninghaus/Studium/)).

### Media

Slides.

### Literature

Will be announced at the end of the recess period.

**Course: Seminar in Continuous Optimization [2550131]**

**Coordinators:** O. Stein  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations**

The assessment is composed of a 15-20 page paper as well as a 40-60 minute oral presentation according to §4(2), 3 of the examination regulation.

The total grade is composed of the equally weighted grades of the written and oral assessments.

The seminar is appropriate for bachelor as well as for master students. Their differentiation results from different assessment criteria for the seminar paper and the seminar presentation.

**Conditions**

See corresponding module information.

Attendance is compulsory.

Preferably at least one module offered by the institute should have been chosen before attending this seminar.

**Learning Outcomes**

The seminar aims at describing, evaluating, and discussing recent as well as classical topics in continuous optimization. The focus is on the treatment of optimization models and algorithms, also with respect to their practical application.

The student is introduced to the style of scientific work. By focussed treatment of a scientific topic the student learns the basics of scientific investigation and reasoning.

For further development of a scientific work style, master students are particularly expected to critically question the seminar topics.

With regard to the oral presentations the students become acquainted with presentation techniques and basics of scientific reasoning. Also rethoric abilities may be improved.

**Content**

The current seminar topics are announced under <http://kop.ior.kit.edu> at the end of the preceding semester.

**Literature**

References and relevant sources are announced at the beginning of the seminar.

**Course: Seminar on Macroeconomic Theory [SemETS3]**

**Coordinators:** M. Hillebrand  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2		

**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****Content****Literature**

Will be announced at the end of the recess period.

**Course: Seminar on Network Economics [2560263]****Coordinators:** K. Mitusch**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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 discussion 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 student

- can acquire a scientific article to an economic topic,
- deepens his/her knowledge in network economics,
- gets 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)

**Course: [2561209]****Coordinators:****Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: Seminar „Business Planning“ [2545005]**

**Coordinators:** O. Terzidis, A. Presse  
**Part of the modules:** EnTechnon (p. 45)[WI4BWLENT1]

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

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

**Content**

**Course: Seminar „Innovation Management“ [2545006]**

**Coordinators:** O. Terzidis, B. Kneisel, A. Presse  
**Part of the modules:** EnTechnon (p. 45)[WI4BWLENT1]

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

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

**Content**



**Course: Service-oriented Innovation Systems [2545007]**

**Coordinators:** O. Terzidis, R. Eichin, A. Presse  
**Part of the modules:** EnTechnon (p. 45)[WI4BWLENT1]

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

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

**Content**

**Course: Seminar „From Invention to Innovation“ [2545008]**

**Coordinators:** O. Terzidis, Presse, André, Fahrenberg, Jens, Blattner, Rolf  
**Part of the modules:** EnTechnon (p. 45)[WI4BWLENT1]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: Seminar: Legal Studies [RECHT]****Coordinators:** Inst. ZAR**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: Seminar: Sensorik [23233/23234]****Coordinators:** W. Menesklou**Part of the modules:** Sensor Technology I (p. 115)[WI4INGETIT3], Sensor Technology II (p. 116)[WI4INGETIT5]

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

**Learning Control / Examinations**

The assessment consists of a term paper (ca. 30 pages) as well as an oral presentation and the discussion of the term paper results according to Section 4 (2), 3 of the examination regulation.

The overall grade consists of the of the grade of the term paper (40 percent) and the grade of the oral presentation (30 percent) and the discussion (30 percent).

**Conditions**

Successful completion of the courses Electrical Engineering II [23224] and sensors [23231].

**Learning Outcomes**

The student will learn how to deal with a scientific topic, to analyze literature, to summarize the published results and to present them in a talk.

**Content**

This course is aimed to graduate students in electrical and business engineering. The student has to analyze scientific literature related to sensors. The results of this literature study have to be summarized in a paper and presented in a talk.

**Literature**

Will be announced in the lecture.

**Course: Seminar: Management and Organization [2577915]**

**Coordinators:** H. Lindstädt  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations**

Term paper (50%) and presentation (50%).

**Conditions**

See corresponding module information.

**Learning Outcomes**

The aim of the seminar is to describe corporate and organisational management approaches, to assess them critically and clarify them using practical examples. The focus is on assessing the models with a view to their applicability and theoretical limits.

**Content**

The subjects are redefined each semester on the basis of current issues.

**Media**

Slides.

**Literature**

The relevant sources are made known during the course.

## Course: Seminar paper “Production Engineering” [21690sem]

**Coordinators:** V. Schulze, Lanza, Fleischer  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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* [WI4INGMB23], *Integrated Production Planning* [WI4INGMB24] 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

Complex analysis and addressing of production engineering related problem areas

### 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.

### Media

Lecture notes of the Institute of Production Science.

## Course: Practical Seminar Knowledge Discovery [25810]

**Coordinators:** R. Studer

**Part of the modules:** Electives in Informatic (p. 62)[WI4INFO3], Emphasis in Informatics (p. 60)[WI4INFO2], Informatics (p. 58)[WI4INFO1]

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

### Learning Control / Examinations

#### Conditions

None.

#### Recommendations

Knowledge of algorithms in the area of knowledge discovery is assumed. Therefore it is recommended to attend the course [2511302] Knowledge Discovery beforehand.

### Learning Outcomes

Implementation of an own knowledge discovery project. Includes familiarization with, prototypical implementation, experiments and presentation of a topic from the fields of knowledge discovery and data mining adhering to scientific standards.

### Content

The practical course will cover topics in the field of knowledge discovery. Each term, a different topic is covered, e.g.: text mining or learning with semantic data. Details will be announced every semester.

### Media

Slides.

**Course: Practical Seminar Service Innovation [2595477]****Coordinators:** G. Satzger, A. Neus, M. Kohler, H. Fromm**Part of the modules:** Business & Service Engineering (p. 34)[WI4BWLISM4], Seminar Module (p. 135)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
5	3		de

**Learning Control / Examinations**

The assessment of this course is according to §4(2), 3 SPO in form of a written documentation, a presentation of the outcome of the conducted practical components and an active participation in class.

Please take into account that, beside the written documentation, also a practical component (such as a survey or an implementation of an application) is part of the course. Please examine the course description for the particular tasks.

The final mark is based on the graded and weighted attainments (such as the written documentation, presentation, practical work and an active participation in class).

**Conditions**

None.

**Recommendations**

Knowledge of Service Innovation Methods is assumed. Therefore it is recommended to attend the course Service Innovation [2540468] beforehand.

**Learning Outcomes**

The student should be able to do a literature review based on a given topic in the context of service innovation. The approach comprises the identification of relevant literature according to the topic and an analysis as well as the evaluation of the methods presented in the literature. The practical work components should enable the student to learn about and independently use scientific methods employed e.g. in case studies or experiments. The student learns to present his results in a paper and in front of an audience on an academic level. This process is helpful for further scientific work like the master or doctoral thesis.

**Content**

The Practical Seminar Service Innovation conveys both a theoretical foundation and practical methods. Using a case example of real-world challenges in the area of Service Innovation, application and adaptation of innovation methods are taught and the results are presented. This project work applies conceptual, analytical and creative methods.

**Literature**

The foundational literature will be announced together with the individual topics.

**Remarks**

Due to the project work, the number of participants is limited and participation requires knowledge about models, concepts and approaches that are taught in the Service Innovation lecture. Having taken the Service Innovation lecture or demonstrating equivalent knowledge is a prerequisite for participating in this Practical Seminar. Details for registration will be announced on the web pages for this course.



**Course: Sensors [23231]**

**Coordinators:** W. Menesklou  
**Part of the modules:** Sensor Technology I (p. 115)[WI4INGETIT3]

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

**Learning Control / Examinations**

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

**Conditions**

See module description.

**Learning Outcomes**

The student should acquire fundamental principles in material science and device technology of sensors to be able to apply materials and sensors from the viewpoint of an application or development engineer.

**Content**

Mechanical Sensors (strain gauges, piezoelectric sensors), Thermal Sensors, Optical Sensors, Magnetic sensors, Acoustic Sensors, Gas Sensors (Lambda Probes, Taguchi, Electronic Nose), Bio and Chemical Sensors.

**Media**

Online material is available.

**Literature****Elective literature:**

Schaumburg, H.: Sensoren. Stuttgart, Teubner 1992  
 Tränkler, H.-R., Obermeier, E. (Hrsg.): Sensortechnik. Springer, Berlin Heidelberg 1998

**Course: Sensor Systems (Integrated Sensor Actuator Systems) [23240]****Coordinators:** Wersing**Part of the modules:** Sensor Technology I (p. 115)[WI4INGETIT3], Sensor Technology II (p. 116)[WI4INGETIT5]

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

**Learning Control / Examinations**

The assessment consists of an oral exam (20 min) according to Section 4(2), 2 of the examination regulation.

The examination takes place in every summer semester. Re-examinations are offered at every ordinary examination date.

**Conditions**

It is recommended to attend the courses *Material Science II* [21782] and *Electrical Engineering II* [23224] beforehand.

**Learning Outcomes****Content****Literature****Elective literature:**

- Piezoelectricity: Evolution and Future of a Technology (Springer Series in Materials Science), W. Heywang, K. Lusitz, W. Wersing; Springer 2008
- Principles and Applications of Ferroelectrics and Related Materials, M.E. Lines, A.M. Glas, Clarendon Press, Oxford, 1977.
- Einführung in die Ferroelektrizität, A.S. Sonin, B.A. Strukow, Vieweg Verlag, Braunschweig, 1974
- Piezoelectricity, G.W. Taylor, Gordon Breach Verlag, London, 1977

## Course: Service Analytics [2595501]

**Coordinators:** T. Setzer, H. Fromm

**Part of the modules:** Advanced CRM (p. 31)[WI4BWLISM1], Service Management (p. 36)[WI4BWLISM6]

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

### Learning Control / Examinations

The assessment of this course is a written examination (following §4(2), 1 SPO) and by submitting written papers as part of the exercise (following §4,(2), 3 SPO). The total grade for this lecture will consist to 80 % of the grade achieved in the written examination and to 20 % of the assignments during the exercises.

### Conditions

None.

### Recommendations

The lecture is addressed to students with interests and basic knowledge in the topics of Operations Research, descriptive and inductive statistics.

### Learning Outcomes

Participants are able to structure large sets of available data and to use that data for planning, operation, personalization of complex services, in particular for IT services. They learn a step-by-step approach starting with analyzing possibly incomplete data, techniques of multivariate statistics to filter data and to extract data features, forecast techniques, and robust planning and control procedures for enterprise decision support.

### Content

Today's service-oriented companies are starting to optimize the way services are planned, operated, and personalized by analyzing vast amounts of data from customers, IT-systems, or sensors. As the statistical learning and business optimization world continues to progress, skills and expertise in advanced data analytics and data and fact-based optimization become vital for companies to be competitive. In this lecture, relevant methods and tools will be considered as a package, with a strong focus on their inter-relations. Students will learn to analyze and structure large amounts of potentially incomplete and unreliable data, to apply multivariate statistics to filter data and to extract key features, to predict future behavior and system dynamics, and finally to formulate data and fact-based service planning and decision models.

More specifically, the lessons of this lecture will include:

- Co-Creation of Value Across Enterprises
- Instrumentation, Measurement, Monitoring of Service Systems
- Descriptive, predictive, and prescriptive Analytics
- Usage Characteristics and Customer Dynamics
- Big Data, Dimensionality Reduction, and Real-Time Analytics
- System Models and What-If-Analysis
- Robust Mechanisms for Service Management
- Industry Applications of Service Analytics

### Tutorials:

Students will conduct lecture accompanying, guided exercises throughout the semester.

### Media

- Power Point
- eLearning platform Ilias

### Literature

- Business Forecasting, Wilson, J. H., Keating, B., McGraw-Hill, 2002
- Multivariate Data Analysis, Hair, J. F., Black, B., Babin, B., Anderson, R. E., 2008
- Analytics at Work, Davenport, T. H., Harris, J. G., Morion, R., Harvard Business Press, 2010
- Business Analytics for Managers, Jank, W., Springer, 2011

Online Sources:

- The data deluge, The Economist, Feb. 2010
- Competing on Analytics, T. Davenport in Harvard Business Review, Feb. 2007

- Mit Advanced Analytics können Händler Kundendaten optimal nutzen, McKinsey Handelsmarketing, Feb. 2011

Further readings will be provided in the lecture.

**Remarks**

This is a new lecture first offered in the summer term of 2012.

**Course: Service Innovation [2540468]****Coordinators:** G. Satzger, A. Neus, M. Kohler**Part of the modules:** Business & Service Engineering (p. 34)[WI4BWLISM4], Service Management (p. 36)[WI4BWLISM6]

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

**Learning Control / Examinations**

The assessment consists of an 1h written exam following §4(2), 3 SPO and of assignments during the course as an "Erfolgskontrolle anderer Art" following §4(2), 3 SPO.

**Conditions**

None.

**Learning Outcomes**

Understand the difference between innovation and invention, and how disruptive effects can be fast and wide-reaching.

Know examples for innovation in processes, organization and business models; understand how service and product innovation differ.

Understand the link between risk and innovation; be aware of obstacles to innovation and know how to overcome them.

**Content**

While innovation in manufacturing or agriculture can leverage a considerable body of research, experience and best practice, innovation in services has not reached the same level of maturity. In practice, while many organizations have a well-understood process for innovating in the product business, innovating in services is often still a fuzzy and complex undertaking. In this lecture we will discuss the state of research, compare product and service innovation, understand how innovation diffusion works, examine case studies on service innovation, compare open vs. closed innovation, learn how to leverage user communities to drive innovation and understand obstacles as well as enablers and how to manage, incentivize and foster service innovation.

**Literature**

- Barras, Richard (1986) Towards a theory of innovation in services. *Research Policy* 15, 161-173
- Hauschildt, Jürgen und Salomo, Sören (2007) *Innovationsmanagement*. 4. Auflage, München: Vahlen.
- von Hippel, Erich (2007) Horizontal innovation networks - by and for users. *Industrial and Corporate Change*, 16:2
- Sundbo, Jon (1997) Management of Innovation in Services. *The Service Industries Journal*, Vol. 17, No. 3, pp. 432-455

**Elective literature:**

- Benkler, Yochai (2006) *The Wealth of Networks: How Social Production Transforms Markets and Freedom*. Yale University Press. (Online: <http://www.benkler.org>)
- Christensen, Clayton M. (2003) *The Innovator's Dilemma*, Harper Collins.
- Kanerva, M.; Hollanders, H. & Arundel, A. (2006) *TrendChart Report: Can we Measure and Compare Innovation in Services?*
- von Hippel, Erich (2005) *Democratizing Innovation*. The MIT Press, Cambridge, MA. (Online: <http://web.mit.edu/evhippel/www/books/>)
- Howells, Jeremy & Tether, Bruce (2004) *Innovation in Services: Issues at Stake and Trends*. Commission of the European Communities, Brussels/Luxembourg. (Online: <http://www.isi.fhg.de/publ/downloads/isi04b25/inno-3.pdf>)
- Miles, I. (2008) Patterns of innovation in service industries. *IBM Systems Journal*, Vol. 47, No 1
- Morison, Elting E. (1966) *Gunfire at Sea: A Case Study of Innovation*. In: *Men, Machines and Modern Times*. The MIT Press, pp. 17-44.

**Course: Service Management [26327]****Coordinators:** U. Werner**Part of the modules:** Insurance Management I (p. 24)[WI4BWLFBV6], Insurance Management II (p. 25)[WI4BWLFBV7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	Winter / Summer Term	de

**Learning Control / Examinations**

The assessment consists of oral presentations and term 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 and term papers (50 percent) and the assessment of the oral exam (50 percent).

**Conditions**

None.

**Learning Outcomes**

See German version.

**Content**

See German version.

**Literature****Elective literature:**

Ch. Belz, T. Bieger. Dienstleistungskompetenz und innovative Geschäftsmodelle, St. Gallen 2002.

M. Bruhn. Qualitätsmanagement für Dienstleistungen. 6. Aufl. Berlin 2008.

H. Corsten, R. Gssinger. Dienstleistungsmanagement, 5. Aufl. München/Wien 2007.

A. Lehmann. Dienstleistungsmanagement: Strategien und Ansatzpunkte zur Schaffung von Service... 1995.

H. Meffert, M. Bruhn. Dienstleistungsmarketing: Grundlagen - Konzepte – Methoden. Wiesbaden 2006

**Remarks**This course is offered on demand. For further information, see: <http://insurance.fbv.kit.edu.de>To attend the course please register with the secretariat of the chair: [thomas.mueller3@kit.edu](mailto:thomas.mueller3@kit.edu)

## Course: Service Oriented Computing 1 [2511500]

**Coordinators:** S. Tai

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

The assessment of this course is a written examination (60min.) in the first week after lecture period (nach §4(2), 1 SPO).

### Conditions

None.

### Recommendations

Lecture A/2 [2511032] is recommended.

### Learning Outcomes

The course introduces concepts, methods, and techniques of “service-oriented computing”, including languages for (Web) service description, methods and tools for the development of services, and platforms (middleware, runtimes) for the Web-based deployment, delivery, and execution of services. The course provides a solid technical foundation that enables the student to address the increasingly relevant challenges of developing “service-oriented architectures (SOA)” in the industry.

### Content

Web services represent the next-generation of Web technology, and are an evolution of conventional distributed middleware. They enable new and improved ways for enterprise computing, including application interoperability and integration, and business process management. Modern software systems are being designed as service-oriented architectures (SOA), introducing increased agility and flexibility at both the software systems and the business level. Web services and SOA thus have a profound impact on software development and the businesses that they support. The course “Service-oriented Computing” introduces the concepts, methods and technology that provide a solid foundation in this area. Topics include:

- Service description
- Service engineering, including development and implementation
- Service composition (aggregation), including process-based service orchestration
- Interoperability formats and protocols
- Service platforms and runtimes (middleware)

### Media

Slides, access to internet resources.

### Literature

Will be announced in the lecture.

## Course: Service Oriented Computing 2 [2511308]

**Coordinators:** R. Studer, S. Agarwal, B. Norton

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

The assessment consists of an 1h written exam following §4, Abs. 2, 1 of the examination regulation or of an oral exam (20 min) following §4, Abs. 2, 2 of the examination regulation.

### Conditions

It is recommended to attend the course *Service-oriented Computing 1* [2511500] beforehand.

### Learning Outcomes

Students will extend their knowledge and proficiency in the area of modern service-oriented technologies. Thereby, they acquire the capability to understand, apply and assess concepts and methods that are of innovative and scientific nature.

### Content

Building upon basic Web service technologies the lecture introduces select topics of advanced service computing and service engineering. In particular, focus will be placed on new Web-based architectures and applications leveraging Web 2.0, Cloud Computing, Semantic Web and other emerging technologies.

### Literature

Literature will be announced in the lecture.



**Course: Safety Management in Highway Engineering [19315]****Coordinators:** M. Zimmermann**Part of the modules:** Safety, Computing and Law in Highway Engineering (p. 105)[WI4INGBGU3]

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

**Learning Control / Examinations**

See module description.

**Conditions**

See corresponding module information.

**Learning Outcomes****Content****Remarks**For further information, see <http://www.ise.uni-karlsruhe.de/16.php>

**Course: Safety Engineering [2117061]****Coordinators:** H.-P. Kany**Part of the modules:** Introduction to Logistics (p. 83)[WI4INGMB20], Technical Logistics (p. 85)[WI4INGMB27]

ECTS Credits	Hours per week	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.

**Learning Outcomes****Content**

The course provides basic knowledge of safety engineering. In particular the basics of health at the working place, job safety in Germany, national and European safety rules and the basics of safe machine design are covered. The implementation of these aspects will be illustrated by examples of material handling and storage technology. This course focuses on: basics of safety at work, safety regulations, basic safety principles of machine design, protection devices, system security with risk analysis, electronics in safety engineering, safety engineering for storage and material handling technique, electrical dangers and ergonomics. So, mainly, the technical measures of risk reduction in specific technical circumstances are covered.

**Course: Safety in Construction [19404]****Coordinators:** Hirschberger, Sittinger**Part of the modules:** Safety Science I (p. 126)[WI4INGINTER4], Safety Science II (p. 127)[WI4INGINTER5], Safety Science III (p. 128)[WI4INGINTER6]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Remarks**Block course. For further information, see <http://www.tmb.uni-karlsruhe.de/676.php>

## Course: Simulation of coupled systems [2114095]

**Coordinators:** M. Geimer

**Part of the modules:** Vehicle Development (p. 79)[WI4INGMB14], Mobile Machines (p. 80)[WI4INGMB15]

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

### Learning Control / Examinations

Assessment for the module *Mobile Machines*: See module description.

Assessment for the module *Automotive Engineering*: The assessment consists of an oral exam (20 min) taking place in 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

It is recommended to have:

- Knowledge of ProE (ideally in actual version)
- Basic knowledge of Matlab/Simulink
- Basic knowledge of dynamics of machines
- Basic knowledge of hydraulics

### Learning Outcomes

The limitation of the simulation programs and the related problems will be introduced by using the example of the working movement of a wheel loader. As a solution the coupled simulation of multiple programs by using the mentioned example will be shown.

### Content

- Knowledge of the basics of multi-body and hydraulic simulation programs
- Possibilities of coupled simulations
- Development of a simulation model by using the example of a wheel loader
- Documentation of the results in a short report

### Literature

#### Elective literature:

- miscellaneous guides according the software-tools pdf-shaped
- information to the wheel-type loader

**Course: Simulation I [2550662]****Coordinators:** K. Waldmann**Part of the modules:** Stochastic Modelling and Optimization (p. 67)[WI4OR7]

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

**Learning Control / Examinations**

The assessment consists of an 1h written exam according to Section 4(2), 1 of the examination regulation. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.3 (according to Section 4(2), 3 of the examination regulation).

**Conditions**

Foundations in the following fields are required:

- Operations Research, as lectured in *Introduction to Operations Research I* [2550040] and *Introduction to Operations Research II* [2530043].
- Statistics, as lectured in *Statistics I* [25008/25009] and *Statistics II* [25020/25021].

**Learning Outcomes**

The lecture provides insights into the typical process in planning and conducting simulation studies.

**Content**

As the world is getting more complex it is often not possible to analytically provide key figures of interest without overly simplifying the problem. Thus efficient simulation techniques become more and more important. In the lecture important basic concepts are presented in terms of selected case studies.

Topics overview: Discrete event simulation, generation of random numbers, generating discrete and continuous random variables, statistical analysis of simulated data.

**Media**

Blackboard, Slides, Flash Animations, Simulation Software

**Literature**

- Lecture Notes
- K.-H. Waldmann / U. M. Stocker: *Stochastische Modelle - Eine anwendungsorientierte Einführung*; Springer (2004).

**Elective literature:**

- A. M. Law / W. D. Kelton: *Simulation Modeling and Analysis* (3rd ed); McGraw Hill (2000)

**Remarks**

The lecture is offered irregularly. The curriculum of the next two years is available online.

**Course: Simulation II [2550665]****Coordinators:** K. Waldmann**Part of the modules:** Stochastic Modelling and Optimization (p. 67)[WI4OR7]

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

**Learning Control / Examinations**

The assessment consists of an 1h written exam following §4(2), 1 SPO. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.3 ( §4(2), 3 SPO).

**Conditions**

Foundations in the following fields are required:

- Operations Research, as lectured in *Introduction to Operations Research I* [2550040] and *Introduction to Operations Research II* [2530043].
- Statistics, as lectured in *Statistics I* [25008/25009] and *Statistics II* [25020/25021].
- *Simulation I*[2550662]

not any

**Learning Outcomes**

The lecture provides insights into the typical process in planning and conducting simulation studies.

**Content**

As the world is getting more complex it is often not possible to analytically provide key figures of interest without overly simplifying the problem. Thus efficient simulation techniques become more and more important. In the lecture important basic concepts are presented in terms of selected case studies.

Topics overview: Variance reduction techniques, simulation of stochastic processes, case studies.

**Media**

Blackboard, Slides, Flash Animations, Simulation Software

**Literature**

- Lecture Notes

**Elective literature:**

- A. M. Law / W. D. Kelton: Simulation Modeling and Analysis (3rd ed); McGraw Hill (2000)
- K.-H. Waldmann / U. M. Stocker: Stochastische Modelle - Eine anwendungsorientierte Einführung; Springer (2004).

**Remarks**

The lecture is offered irregularly. The curriculum of the next two years is available online.

**Course: Simulation of Spray and Mixture Formation in Internal Combustion Engines [21114]****Coordinators:** Baumgarten**Part of the modules:** Combustion Engines II (p. 82)[WI4INGMB19]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Winter 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* [21101] has to be completed beforehand.

**Learning Outcomes****Content**

**Course: Simulation Methods for Transport Modelling [19305]****Coordinators:** P. Vortisch**Part of the modules:** Transportation Planning and Engineering (p. 110)[WI4INGBGU12]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes****Content**



**Course: Application of Simulation Tools [19309]****Coordinators:** P. Vortisch, M. Kagerbauer, N. Mallig**Part of the modules:** Transportation Planning and Engineering (p. 110)[WI4INGBGU12]

ECTS Credits	Hours per week	Term	Instruction language
1,5	0/1	Summer term	de

**Learning Control / Examinations**

The assessment is a not graded certificate of attendance (according to §4(2), 3 of the examination regulation).

**Conditions**

None.

**Learning Outcomes****Content**

## Course: Software Engineering [2511206]

**Coordinators:** A. Oberweis, D. Seese

**Part of the modules:** Electives in Informatic (p. 62)[WI4INFO3], Emphasis in Informatics (p. 60)[WI4INFO2], Informatics (p. 58)[WI4INFO1]

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

### Learning Control / Examinations

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

### Conditions

Modul "Introduction to Informatics" [WW1INFO] is precondition

### Learning Outcomes

Students

- are familiar with the concepts and principles of software engineering
- know important and common software development process models
- know methods for requirements analysis and know how to model and evaluate use case models
- know models for systems structuring and controlling as well as architecture principles of software systems.
- 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.

### 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.

### Media

Slides, access to internet resources.

### Literature

#### Elective literature:

- H. Balzert. Lehrbuch der Software-Technik. Spektrum Verlag 1996.
- B. Boehm. Software Engineering Economics. Englewood Cliffs, N.J.: Prentice-Hall 1981.
- P. Brössler, Johannes Siedersleben. Softwaretechnik. Hanser Verlag 2000.
- E. Denert. Software-Engineering. Springer-Verlag 1991.
- Frühauf, K., J. Ludewig, H. Sandmayr. Software-Projektmanagement und – Qualitätssicherung. Teubner 1991.
- E. Gamma et al.. Design Patterns. Addison Wesley 1995.

Further literature is given in the course.

**Course: Software Laboratory: OR Models II [2550497]****Coordinators:** S. Nickel**Part of the modules:** Operations Research in Supply Chain Management and Health Care Management (p. 64)[WI4OR5],  
Mathematical Programming (p. 66)[WI4OR6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	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**

Successful completion of the course *Software Laboratory: OR-Models I* [2550490].

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

**Learning Outcomes**

The course is based on the first part of the software laboratory. The students advance to detailed modelling knowledge and use the software for the implementation of more complex solution methods. An important aspect lies on the practical application possibilities of OR software in combinatorial and nonlinear optimization problems.

**Content**

The task of solving combinatorial and nonlinear optimization problems imposes much higher requirements on suggested solution approaches as in linear programming.

During the course of this software laboratory, students get to know important methods from combinatorial optimization, e.g. Branch & Cut- or Column Generation methods and are enabled to solve problems with the software system IBM Optimization Studio and the corresponding modeling language OPL. In addition, issues of nonlinear optimization, e.g. quadratic optimization, are addressed. As an important part of the software laboratory, students get the possibility to model combinatorial and nonlinear problems and implement solution approaches in the software system.

The software laboratory also introduces some of the most frequently used modelling and programming languages that are used in practice to solve optimization problems.

**Remarks**

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

**Course: Software Technology: Quality Management [2511208]****Coordinators:** A. Oberweis**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

**Learning Control / Examinations**

The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation in the first week after lecture period.

**Conditions**

Programming knowledge in Java and basic knowledge of computer science are expected.

**Learning Outcomes**

Students are familiar with basic concepts and principles of software quality and software quality management. They know key measures and models for certification of quality in software development. They are aware of different test methods and evaluation methods. Furthermore, they are able to assess quality management aspects in different standard process models.

**Content**

This lecture imparts fundamentals of active software quality management (quality planning, quality testing, quality control, quality assurance) and illustrates them with concrete examples, as currently applied in industrial software development. Keywords of the lecture content are: software and software quality, process models, software process quality, ISO 9000-3, CMM(I), BOOTSTRAP, SPICE, software tests.

**Media**

Slides, access to internet resources.

**Literature**

- Helmut Balzert: Lehrbuch der Software-Technik. Spektrum-Verlag 1998
- Peter Liggesmeyer: Software-Qualität, Testen, Analysieren und Verifizieren von Software. Spektrum Akademischer Verlag 2002

**Elective literature:**

Further literature is given in lectures.

**Course: Social Network Analysis in CRM [2540518]**

**Coordinators:** A. Geyer-Schulz  
**Part of the modules:** Advanced CRM (p. 31)[WI4BWLISM1]

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

**Learning Control / Examinations**

Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation.

The course is considered successfully taken, if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 25) from exercise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	113
1.3	106
1.7	99
2.0	92
2.3	85
2.7	78
3.0	71
3.3	64
3.7	57
4.0	50
4.7	40
5.0	0

**Conditions**

None.

**Learning Outcomes**

The objectives of this course are to give students an introduction to and overview of social network analysis as a methodological approach for analysis in different areas of business administration, especially customer relationship management. Theory as well as application of social network analysis will be discussed. Students will learn how to perform and interpret analysis results.

**Content**

The trend to view economic and social structures as networks allows to analyze these networks by well established and new methods from mathematics, business administration, sociology and physics. The goal of these analyses are to understand different aspects of these networks: In organizations (internal Marketing): Here networks analysis kann help to detect whether hierarchies and official structures are 'alive' or if so called 'hidden organizations' have evolved. In addition such results can reveal inefficient procedures or structures within an organization. In CRM: Within analytical CRM the concept of customer value can be enriched by enclosing the network value that customer offers to the company (Customer Network Value). In Marketing: To successfully implement a virale marketing strategy the knowledge of the structure of customer networks is essential. The dynamics on these networks are relevant if one wants to use these networks for marketing purposes. Internetstructure: For information services, such as e.g. search engines, the identification of relevant nodes and clusters is a the major service provided and thus relevant for business success.

The analysis should identify the relevant (central) nodes in a network, find cliques, describe their connections and, if relevant, describe also the direction of information flow within the network. To achieve this different methods will be discussed during the course.

**Media**

Folien

**Literature**

Christian Grönroos. Service Management and Marketing : A Customer Relationship Management Approach. Wiley, Chicester, 2 edition, 2000.

Sabrina Helm. Viral marketing: Establishing customer relationships by word-of-mouth. Electronic Markets, 10(3):158–161, Jul 2000.

Dieter Jungnickel. Graphs, Networks and Algorithms. Number 5 in Algorithms and Computation in Mathematics. Springer Verlag, Berlin, 1999.

Leo Katz. A new status index derived from sociometric analysis. Psychometrika, 18(1):39–43, Mar 1953.

Jon M. Kleinberg. Authoritative sources in a hyperlinked environment. *JACM*, 46(5):604–632, sep 1999.

Barry Wellman Laura Garton. Social impacts of electronic mail in organizations: A review of research literature. *Communication Yearbook*, 18:434–453, 1995.

Carl D. Meyer. *Matrix Analysis and Applied Linear Algebra*. Society for Industrial and Applied Mathematics, Philadelphia, 2000.

Andrew Richards, William ; Seary. Eigen analysis of networks. *Journal of Social Structure*, 1(2), Feb 2000.

Pacey C. Foster Stephen P. Borgatti. The network paradigm in organizational research: A review and typology. *Journal of Management*, 29(6):991–1013, 2003.

Mani R. Subramani and Balaji Rajagopalan. Knowledge-sharing and influence in online social networks via viral marketing. *Communications of the ACM*, 46(12):300–307, Dec 2003.

Stanley Wasserman and Katherine Faust. *Social Network Analysis: Methods and Applications*, volume 8 of *Structural Analysis in the Social Sciences*. Cambridge University Press, Cambridge, 1 edition, 1999.

Barry Wellman. Computer networks as social networks. *Science*, 293:2031–2034, Sep 2001.

**Remarks**

The course is currently not offered.

## Course: Spatial Economics []

**Coordinators:** I. Ott

**Part of the modules:** Concentration, convergence, and divergence (p. 56)[WI4VWL12], Transport infrastructure policy and regional development (p. 55)[WI4VWL11]

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

### Learning Control / Examinations

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

### Conditions

None.

### Learning Outcomes

#### Content

Geography, trade and development  
 Geography and economic theory  
 Core models of economic geography and empirical evidence  
 Agglomeration, home market effect, and spatial wages  
 Applications and extensions

## Course: Special Topics in Information Engineering & Management [2540478]

**Coordinators:** C. Weinhardt

**Part of the modules:** Business & Service Engineering (p. 34)[WI4BWLISM4], Communications & Markets (p. 35)[WI4BWLISM5], Information Engineering (p. 37)[WI4BWLISM7]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3	Winter / Summer Term	de

### Learning Control / Examinations

The assessment of this course is according to §4(2), 3 SPO in form of a written documentation, a presentation of the outcome of the conducted practical components and an active participation in class.

Please take into account that, beside the written documentation, also a practical component (such as a survey or an implementation of an application) is part of the course. Please examine the course description for the particular tasks.

The final mark is based on the graded and weighted attainments (such as the written documentation, presentation, practical work and an active participation in class)

### Conditions

None.

### Learning Outcomes

The student should be able to do a literature review based on a predefined topic in the context of information engineering and management. 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 practical work components should enable the student to learn and independently use scientific methods employed e.g. in case studies or experiments.

The student learns to present his results in a paper and in front of an audience on an academic level. This process is helpful for further scientific work like the master or doctoral thesis.

### Content

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 a 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 encompasses a documentation of the implemented work.

### Media

- Power Point
- eLearning Plattform Ilias
- Software tools for development , if needed

### Literature

The basic literature will be made available to the student according to the respective 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](http://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 "Business Engineering" and "Economics Engineering" also have the chance of getting practical experience and enhance their scientific capabilities.

The Special Topics Information Engineering and Management can be chosen instead of a regular lecture (see module description). Please take into account, that this course can only be accounted once per module.



## Course: Special Topics of Enterprise Information Systems [SBI]

**Coordinators:** A. Oberweis

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### 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 are able to handle methods and instruments in a subarea of “Enterprise Information Systems” and to show the capability to be innovative with regard to applied methods.

The course will impart knowledge of basics and methods in the context of their application in practice. Based on the understanding of the imparted concepts and methods students will be able to choose the appropriate methods and apply them in the right way for problems they will face in their professional life.

Students will be enabled to find arguments for solution approaches and to argue for them.

### Content

This course is a placeholder for special courses that are offered in an irregular sequence and cover selected topics in the field of enterprise information systems. These topics include in particular the design and the management of database systems, the computer-support of business processes and strategic planning of information systems and their organization.

### Literature

Will be announced at the beginning of the course.

**Course: Special Topics of Efficient Algorithms [25700sp]****Coordinators:** H. Schmeck**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

**Learning Control / Examinations**

The assessment consists of assignments or of a bonus exam (wrt §4 (2), 3 SPO), and a written exam (60 min.) in the week after the end of the lecturing periodwrt (§4 (2), 1 SPO). The exam will be offered in every semester and can be repeated on regular examination dates.

If the mark obtained in the written exam is in between 1.3 and 4.0, a successful completion of the assignments or the bonus exam will improve the mark by one level (i.e. by 0.3 or 0.4).

**Conditions**

None.

**Learning Outcomes**

The student will learn how to use methods and concepts of efficient algorithms and how to demonstrate adequate innovative capabilities with respect to the used methods.

This course emphasizes the teaching of advanced concepts in relation to their applicability in the real world. Based on a fundamental understanding of the covered concepts and methods, students should know how to select appropriate concepts and methods for problem settings in their professional life, and, if necessary, to extend and apply them in an adequate form. The students should be enabled to find adequate arguments for justifying their chosen problem solutions.

**Content**

This course emphasizes the new topics in the area of algorithms, data structures, and computer infrastructures. The exact topics can vary according to the audiences and the time it is held.

**Literature****Elective literature:**

Will be announced in the lecture.

**Remarks**

This course can be particularly used for recognising the external courses with the topics in the area of algorithms, data-structures and computer infrastructures but are not associated in other courses in this subject area.

## Course: Special Topics of Complexity Management [KompMansp]

**Coordinators:** D. Seese

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

see German version

### Conditions

see German version

### Learning Outcomes

see German version

### Content

see German version

### Literature

#### Elective literature:

Will be announced in the lecture.

### Remarks

see German version

## Course: Special Topics of Software- and Systemsengineering [SSEsp]

**Coordinators:** A. Oberweis, D. Seese

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

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

### Conditions

None.

### Learning Outcomes

Students are able to handle methods and instruments in a subarea of "Software and Systems Engineering" and to show the capability to be innovative with regard to applied methods.

The course will impart knowledge of basics and methods in the context of their application in practice. Based on the understanding of the imparted concepts and methods students will be able to choose the appropriate methods and apply them in the right way for problems they will face in their professional life.

Students will be enabled to find arguments for solution approaches and to argue for them.

### Content

This course is a placeholder for special courses that are offered in an irregular sequence and cover selected topics in the field of software and systems engineering.

### Media

Slides, access to internet resources

### Literature

#### Elective 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 software and systems engineering, but cannot assigned to another course of this topic.

## Course: Special Topics of Knowledge Management [25860sem]

**Coordinators:** R. Studer

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

Assesment is provided by a written exam of 60 minutes or an oral exam during the first few weeks after the lecturing period (acc. to §4(2), 1 or 2 SPO). The exam is offered each semester and may be repeated at the regular examination day.

### Conditions

The lecture *Angewandte Informatik I - Modellierung* [2511030] is a prerequisite.

### Learning Outcomes

The students acquire the skills, methods and tools in one specialized topic of “knowledge management” to demonstrate their mastery and innovativeness.

The lecture aims at providing principles and methods in the context of the practical application of KM. On the basis of a fundamental understanding of concepts, methods, and tools, students will be able to work on advanced problems. The students will be able to find and argue for solutions of KM problems.

### Content

The lecture deals with special topics in the area of knowledge management (incl. Knowledge Discovery and Semantic Web). The lecture deepens one of the following topics:

- Dynamic and Interoperable Systems in Knowledge Management
- Personal and Process-oriented Knowledge Management
- Formal Concept Analysis
- Semantic Search and Text Mining
- Combination of Social Software and Semantic Web

### Literature

#### Elective literature:

Depends on the actual content.

**Course: Special Topics in Optimization I [25128]****Coordinators:** O. Stein**Part of the modules:** Mathematical Programming (p. 66)[WI4OR6]

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

**Learning Control / Examinations**

The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation.

The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

The examination can also be combined with the examination of *Special Topics in Optimization II* [25126]. In this case, the duration of the written examination takes 120 minutes.

In a combined examination of *Special Topics in Optimization I* [25128] and *Special Topics in Optimization II* [25126], upon attaining more than 60% of the exercise points, the grade of the passed examination is improved by a third of a grading step.

**Conditions**

None.

**Learning Outcomes**

The student knows and understands fundamentals of a special topic in continuous optimization.

**Content****Remarks**

The lecture is offered irregularly. The curriculum of the next three years is available online ([www.ior.kit.edu](http://www.ior.kit.edu)).

## Course: Special Topics in Optimization II [25126]

**Coordinators:** O. Stein

**Part of the modules:** Mathematical Programming (p. 66)[WI4OR6]

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

### Learning Control / Examinations

The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation.

The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

The examination can also be combined with the examination of *Special Topics in Optimization I* [25128]. In this case, the duration of the written examination takes 120 minutes.

In a combined examination of *Special Topics in Optimization I* [25128] and *Special Topics in Optimization II* [25126], upon attaining more than 60% of the exercise points, the grade of the passed examination is improved by a third of a grading step.

### Conditions

None.

### Learning Outcomes

The student knows and understands fundamentals of a special topic in continuous optimization.

### Content

### Remarks

The lecture is offered irregularly. The curriculum of the next three years is available online ([www.ior.kit.edu](http://www.ior.kit.edu)).

## Course: Special Topics in Management: Management and IT [2577907]

**Coordinators:** H. Lindstädt

**Part of the modules:** Strategic Corporate Management and Organization (p. 28)[WI4BWL01]

ECTS Credits	Hours per week	Term	Instruction language
2	1/0	Winter / Summer Term	de

### Learning Control / Examinations

The assessment consists of a written exam (30 min) at the beginning of the recess period (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

The course discusses management questions and concepts that are clearly motivating from a current and practical perspective. Here the integration of IT and process issues into corporate management from the management's perspective is one of the subjects of particular interest. The event takes place in close cooperation with leading, practical managers.

### Content

(Excerpt):

- A summary of current management concepts and questions.

### Media

Slides.

### Literature

The relevant excerpts and additional sources are made known during the course.



## Course: Special Sociology [spezSoz]

**Coordinators:** G. Nollmann, Pfadenhauer, Pfaff, Haupt, Grenz, Eisewicht, Kunz

**Part of the modules:** Sociology (p. 134)[WI4SOZ1]

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

### Learning Control / Examinations

The assessment consists of a graded term paper (according to Section 4 (2), 3 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 to sociological theory, according to 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 discussed.

### Media

Will be announced in the lecture.

### Literature

Will be announced in the lecture.

### Elective literature:

Will be announced in the lecture.

**Course: Game Theory I [2520525]****Coordinators:** N.N.**Part of the modules:** Applied Strategic Decisions (p. 46)[WI4VWL2], Social Choice Theory (p. 49)[WI4VWL9]

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

**Learning Control / Examinations**

The assessment consists of a written exam (80 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.  
See corresponding module information.

**Learning Outcomes**

This course conveys established knowledge in theory of strategic decision making. The students shall be able to analyze strategic problems systematically and to give advice for behavior in concrete economic situations.

**Content**

Main topic is non-cooperative game theory. Models, solution concepts and applications are discussed for simultaneous as well as sequential games. Different equilibrium concepts are introduced and a short introduction to cooperative game theory is given.

**Media**

Folien, Übungsblätter.

**Literature**

Gibbons, A primer in Game Theory, Harvester-Wheatsheaf, 1992  
Holler/Illing, Eine Einführung in die Spieltheorie, 5. Auflage, Springer Verlag, 2003  
Gardner, Games for Business and Economics, 2. Auflage, Wiley, 2003  
Berninghaus/Ehrhart/Güth, Strategische Spiele, 2. Auflage, Springer Verlag 2006

**Elective literature:**

- Binmore, Fun and Games, DC Heath, Lexington, MA, 1991

## Course: Facility Location and Strategic Supply Chain Management [2550486]

**Coordinators:** S. Nickel

**Part of the modules:** Operations Research in Supply Chain Management and Health Care Management (p. 64)[WI4OR5]

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

### Learning Control / Examinations

The assessment consists of a written exam (120 min) according to Section 4 (2), 1 of the examination regulation.

The exam takes place in every semester.

Prerequisite for admission to examination is the successful completion of the online assessments.

### Conditions

Basic knowledge as conveyed in the module *Introduction to Operations Research* [WW1OR] is assumed.

### Learning Outcomes

The lecture covers basic quantitative methods in location planning in the context of strategic Supply Chain Planning. Besides the discussion of several criteria for the evaluation of the locations of facilities, the students are acquainted with classical location planning models (planar models, network models and discrete models) and advanced location planning models designed for Supply Chain Management (single-period and multi-period models). The exercises accompanying the lecture offer the possibility to apply the considered models to practical problems.

### Content

Since the classical work "Theory of the Location of Industries" of Weber from 1909, the determination of an optimal location of a new facility with respect to existing customers is strongly connected to strategical logistics planning. Strategic decisions concerning the location of facilities as production plants, distribution centers or warehouses are of high importance for the rentability of supply chains. Thoroughly carried out, location planning allows an efficient flow of materials and leads to lower costs and increased customer service.

Subject of the course is an introduction to the most important terms and definitions in location planning as well as the presentation of basic quantitative location planning models. Furthermore, specialized location planning models for Supply Chain Management will be addressed as they are part in many commercial SCM tools for strategic planning tasks.

### Literature

#### Elective literature:

- Daskin: Network and Discrete Location: Models, Algorithms, and Applications, Wiley, 1995
- Domschke, Drexl: Logistik: Standorte, 4. Auflage, Oldenbourg, 1996
- Francis, McGinnis, White: Facility Layout and Location: An Analytical Approach, 2nd Edition, Prentice Hall, 1992
- Love, Morris, Wesolowsky: Facilities Location: Models and Methods, North Holland, 1988
- Thonemann: Operations Management - Konzepte, Methoden und Anwendungen, Pearson Studium, 2005

### Remarks

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

**Course: Tax Law I [24168]**

**Coordinators:** D. Dietrich  
**Part of the modules:** Private Business Law (p. 132)[WI4JURA5]

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

**Learning Control / Examinations**

The assessment consists of a written exam (approx. 45 minutes) according to section 4 subsection 2 no. 1 study and examination regulations.

**Conditions**

None.

**Learning Outcomes**

The target of the lecture is an introduction to national business tax law. The legal norms, spread on several individual tax laws, which are decisive for the taxation of the companies and their owners, will be treated. The focus is on basic fiscal knowledge realizable in practice as a component of modern business economics.

**Content**

Except for a basic knowledge of the existing German company types and the annual financial statements (balance sheet, statement of earnings), no fiscal previous knowledge is required. The lecture intends to give a current global overview about the most important elements of law. The focus is on trade or business companies in the most common forms such like sole traders, partnerships and corporations.

**Media**

transparancies

**Literature**

- Grashoff Steuerrecht, Verlag C. H. Beck, last edition
- Tipke/Lang Steuerrecht, Verlag C. H. Beck, last edition

**Course: Tax Law II [24646]**

**Coordinators:** D. Dietrich  
**Part of the modules:** Private Business Law (p. 132)[WI4JURA5]

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

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes**

It is the target of the lecture to provide extended knowledge in business administration related theory of taxation in the field of economics and law, based on the general lecture "introduction to corporate tax law". The students obtain the basis for an economic examination of the fiscal prescriptions and are able to assess the impact on business decisions. The emphasis is on such tax law regulations which allow possibilities for action and decision to the taxpayer.

**Content**

The lecture requires basic knowledge of commercial law and company law as well as of earnings tax law. Basic and current questions of German corporate taxation are systematically prepared in topic blocs; foils, leaflets and supplementary references are distributed in the individual sessions. There is room for discussion. A recent text collection of the tax laws will be necessary.

**Media**

transparancies

**Literature**

- Grashoff, Steuerrecht, Verlag C.H. Beck, latest edition.
- Spangemacher, Gewerbesteuer, Band 5, Grüne Reihe, Erich Fleischer Verlag
- Falterbaum/Bolk/Reiß/Eberhart, Buchführung und Bilanz, Band 10, Grüne Reihe, Erich Fleischer Verlag
- Tipke, K./Lang, J., Steuerrecht, Köln, in der neuesten Auflage.
- Jäger/Lang Körperschaftsteuer, Band 6, Grüne Reihe, Erich Fleischer Verlag
- Lippross Umsatzsteuer, Band 11, Grüne Reihe, Erich Fleischer Verlag
- Plückebaum/Wendt/ Niemeier/Schlierenkämper Einkommensteuer, Band 3, Grüne Reihe, Erich Fleischer Verlag

**Course: Instrumentation and Control Technologies for Production Systems [2150683]****Coordinators:** Gönzheimer**Part of the modules:** Specialization in Production Engineering (p. 72)[WI4INGMB22]

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

**Learning Control / Examinations**

The assessment consists of an oral exam (20 min) taking place during the recess period (according to Section 4(2), 1 or 2) of the examination regulation).

The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

**Conditions**

None.

**Learning Outcomes****Content**

**Course: Stochastic and Econometric Models in Credit Risk Management [2520337]****Coordinators:** Y. Kim**Part of the modules:** Statistical Methods in Risk Management (p. 69)[W14STAT2]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

The deregulation of European markets and the advent of monetary union has resulted in greater liquidity and more competition, creating a truly homogeneous European credit market. Second, given the low level of nominal interest rates, investors are willing to take on more credit risk to boost returns. Third, the regulatory authorities are set to accept the use of internal models for risk management. This will enable banks to better identify and measure credit risk and therefore manage it more effectively.

The course is intended as a mathematically rigorous introduction to the stochastic and econometric models used in credit risk modeling. We will start with a review on term-structure models, and then continue with pricing credit risk and credit risk derivatives using

- firm's value models,
- intensity models,
- pricing credit derivatives.

**Literature**

David Lando, Credit Risk Modeling: Theory and Applications, Princeton Series in Finance, 2004

Phillipp J. Schönbucher, Credit Derivatives Pricing Models: Model, Pricing and Implementation, Wiley-Finance, 2003

Darrell Duffie, Kenneth J. Singleton, Credit Risk: Pricing, Measurement and Management, Princeton Series in Finance, Princeton University Press, 2003

**Remarks**

The course Stochastic and Econometric Models in Credit Risk Management [2520337] will not be offered any more from summer term 2013 on. The examination will be offered latest until summer term 2012.

**Course: Markov Decision Models I [2550679]****Coordinators:** K. Waldmann**Part of the modules:** Stochastic Modelling and Optimization (p. 67)[WI4OR7]

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

**Learning Control / Examinations**

The assessment consists of an 1h written exam following Section 4(2), 1 of the examination regulation. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.3 ( according to Section 4(2), 3 of the examination regulation).

**Conditions**

None.

**Learning Outcomes**

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

**Content**

Markov Chains, Poisson Processes, Markov Chains in Continuous Time, Queuing Systems

**Media**

Blackboard, Slides, Flash Animations, Simulation Software

**Literature**

Waldmann, K.H. , Stocker, U.M. (2004): Stochastische Modelle - eine anwendungsorientierte Einführung; Springer

**Elective literature:**

Norris, J.R. (1997): Markov Chains; Cambridge University Press

Bremaud, P. (1999): Markov Chains, Gibbs Fields, Monte Carlo Simulation, and Queues; Springer



**Course: Markov Decision Models II [2550682]****Coordinators:** K. Waldmann**Part of the modules:** Stochastic Modelling and Optimization (p. 67)[WI4OR7]

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

**Learning Control / Examinations**

The assessment consists of an 1h written exam following §4(2), 1 SPO. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.3.

**Conditions**

None.

**Learning Outcomes**

The lecture provides students with knowledge on Markov decision processes for analysis to control and optimize stochastic dynamic systems. They are able to apply the theory acquired and to adjust the models to actual problems. They develop the optimality criterion and can solve the resulting optimal value function efficiently to gain optimal policies and the optimal value.

**Content**

Markov decision models: Foundations, optimality criteria, solution of the optimality equation, optimality of simply structured decision rules, applications.

**Media**

Blackboard, Slides, Flash Animations, Simulation Software

**Literature**

Lecture Notes

**Elective literature:**

Waldmann, K.H. , Stocker, U.M. (2004): Stochastische Modelle - eine anwendungsorientierte Einführung; Springer

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: Material Flux Analyses - River Basin Management [19245]

**Coordinators:** S. Fuchs

**Part of the modules:** Environmental Management (p. 111)[WI4INGBGU12]

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

### Learning Control / Examinations

See module description.

### Conditions

Prior attendance of the course *Urban Water Resource Management and Ecological Engineering* [19057/19058] is recommended.

### Learning Outcomes

#### Content

- Introduction
- Tools for material flow/ mass balance
- Measurement and analyzation of material flow in water management
- Material flow in urban areas
- Material flow in agricultural areas
- Nutrient and heavy metal budget in Germany
- Water quality
- Material flow in industry
- Water cycle
- Nitrogen cycle
- Phosphorus cycle
- Pesticide cycle

### Literature

#### Elective literature:

Lehn, H., Steiner, M., Mohr, H.: Wasser – die elementare Ressource; Leitlinien einer nachhaltigen Nutzung, Springer Verlag, Berlin, (1999)

## Course: Material Flow Analysis and Life Cycle Assessment [2581995]

**Coordinators:** L. Schebek  
**Part of the modules:** Industrial Production II (p. 38)[WI4BWLIIIP2]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Winter term	de

### Learning Control / Examinations

The examination will be in form of an oral or written exam acc. to §4(2), 1 ER. Exams are offered in every semester and can be re-examined at every ordinary examination date.

### Conditions

None.

### Learning Outcomes

- Students shall be aware of the important role of material flow systems for the economy and ecology.
- Students shall be proficient in understanding the basics and methodology of analytical tools for material flow analysis and Life Cycle Assessment.
- Students shall be able to apply Life Cycle Assessment in case studies.

### Content

Materials – in the sense of raw materials taken from nature – represent the physical basis of the economy and the human society in general. At the same time, global environmental problems, e. g., the greenhouse effect, as well as economic problems, e.g., the availability and the price development of raw materials, are directly linked to the increasing use of specific materials like fossil carbon resources or metals. Hence, for the development of solution strategies, the understanding of material flow systems of the techno-sphere, i. e. the environment made by humans, is essential. The lecture is an introduction into basic system theory and modelling techniques of material flow analysis. On this basis, the methodology of the Life Cycle Assessment (LCA) is then presented, which comprises material flows and their environmental effects throughout the entire life cycle of production, use and disposal of products. For decision-makers in economy and policy, LCA serves as an instrument of analysis in order to compare the different possibilities of the design of products, technologies and services. In this lecture, the structure and particular modules of the Life Cycle Assessment are presented in detail. Furthermore, the applications of the Life Cycle Assessment in the context of decision support are explained, in particular within the context of development of innovative technologies. Recent developments of the Life Cycle Costing and the Social LCA will also be considered.

### Media

Media will be provided on learning platform.

### Literature

will be announced in the course

**Course: Strategic Aspects of Energy Economy [2581958]****Coordinators:** A. Ardone**Part of the modules:** Energy Economics and Technology (p. 41)[WI4BWLIP5]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Winter term	

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes****Content****Literature**

Will be announced in the lecture.

## Course: Strategic and Innovative Decision Making in Marketing [2571165]

**Coordinators:** B. Neibecker

**Part of the modules:** Marketing Management (p. 42)[WI4BWLMAR5], (p. 44)[WI4BWLMAR7]

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

### Learning Control / Examinations

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

### Conditions

See corresponding module information.

### Learning Outcomes

Students have learned the following outcomes and competences:

- To specify the key terms in strategic management and innovation research, based on methodological and behavioral approaches
- To apply statistical tools to analyze and interpret strategic problems in marketing
- To identify the main research trends
- To analyze and interpret high level academic articles
- To learn interactive skills to work in teams and to follow a goal-oriented approach
- To gain understanding of methodological research to develop concrete plans for marketing decision-making

### Content

The course places emphasis on the role of marketing in strategic planning. The planning and implementation stages are discussed using a case study in business portfolio analysis, talking about experience effects, approaches in defining strategic business units. A critical view on market orientation as a source of sustainable competitive advantage is given. Further topics are innovation and diffusion models, behavioral approaches to innovative decision processes and a discussion on Porter's single diamond theory and globalization.

### Literature

- Backhaus, K. und M. Voeth: Industriegütermarketing. München: Vahlen 2010.
- Cestre, G. und R. Y. Darmon: Assessing consumer preferences in the context of new product diffusion. In: International Journal of Research in Marketing 15, 1998, 123-135.
- Dunning, J. H.: Internationalizing Porter's Diamond. In: mir Management International Review, Special Issue 1993/2, 7-15.
- Gatignon, H. und T. S. Robertson: Innovative Decision Processes. In: Robertson T. S. und H. H. Kassarian (Hrsg.), Handbook of Consumer Behavior, Englewood Cliffs: Prentice-Hall 1991.
- Homburg, C. und H. Krohmer: Marketingmanagement. Wiesbaden: Gabler 2009.
- Kumar, V., E. Jones, R. Venkatesan und R. P. Leone: Is Market Orientation a Source of Sustainable Competitive Advantage or Simply the Cost of Competing? In: Journal of Marketing 75, 2011, 16-30.
- Lilien, G. L., P. Kotler und K. S. Moorthy: Marketing Models. Englewood Cliffs: Prentice Hall 1992.
- Porter, M. E.: Der Wettbewerb auf globalen Märkten. In: Porter, M. E. (Hrsg.), Globaler Wettbewerb, Gabler 1989, 17-63.
- Porter, M. E.: The Competitive Advantage of Nations. New York: Free Press 1990 (zur Ergänzung).
- Prahalad, C. K.: Weak Signals versus Strong Paradigms. In: Journal of Marketing Research 32, 1995, III-VIII..
- Rugman, A. M. und D'Cruz J. R.: The „Double Diamond“ Model of International Competitiveness: The Canadian Experience. In: mir Management International Review, Special Issue 1993/2, 17-39.
- Walker, R.: Analysing the business portfolio in Black & Decker Europe. In: Taylor, B. und J. Harrison (Hrsg.), The Manager's Casebook of Business Strategy, Butterworth-Heinemann: Oxford 1991, 19-36.

## Course: Strategic Management of Information Technology [2511602]

**Coordinators:** T. Wolf

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

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

### Conditions

None.

### Learning Outcomes

Students know the outer frame of IT in an enterprise and know which functions IT has within an enterprise. They understand the organization and the content of these functions.

### Content

The following topics will be covered: strategic planning of ICT, architecture of ICT, overall planning of ICT, outsourcing, operation and controlling of ICT.

### Media

Slides, internet resources

### Literature

- Nolan, R., Croson, D.: Creative Destruction: A Six-Stage Process for Transforming the Organization. Harvard Business School Press, Boston Mass. 1995
- Heinrich, L. J., Burgholzer, P.: Informationsmanagement, Planung, Überwachung, Steuerung d. Inform.-Infrastruktur. Oldenbourg, München 1990
- Nolan, R.: Managing the crises in data processing. Harvard Business Review, Vol. 57, Nr. 2 1979
- Österle, H. et al.: Unternehmensführung und Informationssystem. Teubner, Stuttgart 1992
- Thome, R.: Wirtschaftliche Informationsverarbeitung. Verlag Franz Vahlen, München 1990

**Course: Structural and Functional Ceramics [2126775]****Coordinators:** M. Hoffmann**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

**Learning Control / Examinations**

The assessment consists of an oral exam (20-30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

**Conditions**

Basic knowledge of experimental physics and chemistry is recommended.

It is recommended to attend the course *Introduction in Ceramics [21755]*.

**Learning Outcomes**

Based on concrete examples the importance of microstructural constitution on mechanical, thermal, chemical and electrical properties is shown.

**Content**

The lecture gives an overview on structure and properties of technical relevant structural and functional ceramic materials and parts. The following groups of materials are presented: Silicon Nitride, Silicon Carbide, Alumina, Zirconia, Ferroelectric ceramics.

**Literature****Elective literature:**

H. Salmang, H. Scholze, „Keramik“, Springer-Verlag;

Kingery, Bowen, Uhlmann, „Introduction To Ceramics“, Wiley-Verlag

## Course: Superhard Thin Film Materials [2177618]

**Coordinators:** Ulrich

**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an oral exam (30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

### Conditions

None.

### Recommendations

Basic knowledge of physics, chemistry and material science is assumed.

The module *Emphasis Material Science* [WI3INGMB9] should be completed successfully beforehand.

### Learning Outcomes

The student

- has a specific knowledge of different parts of Material Science
- is able to apply this knowledge in practice

### Content

Superhard materials are solids with hardness larger than 4000 HV0,05.

In this lecture, their modelling, production, characterization and application as thin film materials will be discussed.

First, the necessary basics will be shown. Thereby, the focus will be on plasma, which is the central element for all coating methods, allowing the synthesis of superhard materials (definition, characteristics, plasma processes, plasma wall interaction, in-situ-process control, coating modification). Another focus will be on computer simulation that can be used to modulate and depict many processes.

In the second part of the lecture selected super-hard materials will be presented: amorphous hydrogenated carbon, diamond-like carbon, diamond, cubic boron nitride, materials of the system transition metal-B-C-N-Si as well as superhard multilayer.

Microstructure, mechanical, electronic and optical properties, a customized coating method, characterisation methods (quality control), mechanisms for the synthesis of materials will all be examined as well as their applications and market potential.

### Literature

#### Elective literature:

- G. Kienel: Vakuumbeschichtung 1 bis 5, VDI-Verlag 1995
- R. A. Haefer: Oberflächen- und Dünnschichttechnologie; Teil I und II, Springer-Verlag 1991



## Course: Supply Chain Management [2117062]

**Coordinators:** K. Alicke

**Part of the modules:** Logistics in Value Chain Networks (p. 87)[WI4INGMB28]

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

### Learning Control / Examinations

The assessment consists of an oral exam according to §4 (2), 2 of the examination regulation.

### Conditions

None.

### Learning Outcomes

The course provides the theoretical and practical basics to use approaches of Supply Chain Management within the operational practice.

Exercises show the practical side of the lessons.

### Content

- Bullwhip-Effect, Demand Planning & Forecasting
- Conventional planning processes (MRP + MRP II)
- Stock keeping strategy
- Data acquisition and analysis
- Design for logistics (Postponement, Mass Customization, etc.)
- Logistic partnerships (VMI, etc.)
- Distribution structures (central vs. distributed, Hub&Spoke)
- SCM-metrics (performance measurement) e-business
- Special sectors as well as guest lectures

## Course: Supply Chain Management with Advanced Planning Systems [2581961]

**Coordinators:** M. Göbelt, C. Sürle  
**Part of the modules:** Industrial Production III (p. 39)[WI4BWLIP6]

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

### Learning Control / Examinations

The examination will be in form of an oral or written exam acc. to §4(2), 1 ER. Exams are offered in every semester and can be re-examined at every ordinary examination date.

### Conditions

see module description

### Learning Outcomes

This lecture deals with supply chain management from a practitioner's perspective with a special emphasis on the software solution SAP SCM and the planning domain. First, the term supply chain management is defined and its scope is determined. Methods to analyze supply chains as well as indicators to measure supply chains are derived. Second, the structure of an APS (advanced planning system) is discussed in a generic way. Later in the lecture, the software solution SAP SCM is mapped to this generic structure. The individual planning tasks and software modules (demand planning, supply network planning, production planning / detailed scheduling, transportation planning / vehicle scheduling, global available-to-promise) are presented by discussing the relevant business processes, providing academic background, describing planning processes for a fictive company and showing the user interface and user-related processes in the software solution.

The lecture is supported by a self-explanatory tutorial, in which students can explore the software solution for the fictive company offline on their own.

### Content

#### 1. Introduction to Supply Chain Management

- 1.1. Supply Chain Management Fundamentals
- 1.2. Supply Chain Management Analytics

#### 2. Structure of Advanced Planning Systems

#### 3. SAP SCM

- 3.1. Introduction / SCM Solution Map
- 3.2. Demand Planning
- 3.3. Supply Network Planning
- 3.4. Production Planning and Detailed Scheduling
- 3.5. Deployment
- 3.6. Transportation Planning and Vehicle Scheduling
- 3.7. [Optional] Global Available to Promise

#### 4. SAP SCM in Practice

- 4.1. Success Stories
- 4.2. SAP Implementation Methodology

## Course: Systematic Product Development in Sensor Technology [23209]

**Coordinators:** Ivers-Tiffée, Riegel

**Part of the modules:** Sensor Technology I (p. 115)[WI4INGETIT3], Sensor Technology II (p. 116)[WI4INGETIT5]

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

### Learning Control / Examinations

The assessment consists of an oral exam (20 min) according to Section 4(2), 2 of the examination regulation.

The examination takes place in every winter semester. Re-examinations are offered at every ordinary examination date.

### Conditions

It is recommended to attend the courses *Material Science II* [21782] and *Electrical Engineering II* [23224] beforehand.

### Learning Outcomes

#### Content

#### Literature

##### Elective literature:

Schaumburg, H.: Sensoren. Stuttgart, Teubner 1992

Schaumburg, H.: Sensoranwendungen. Stuttgart, Teubner 1995

## Course: Systematic Selection of Materials [2174576]

**Coordinators:** Wanner

**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an oral exam (20-30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

### Conditions

The course *Material Science I* [21760] has to be completed beforehand.

Basic knowledge of natural science and knowledge of the content *Material Science II* [21782] is recommended.

### Learning Outcomes

The students are able to select the best material for a given application. They are proficient in selecting materials on base of performance indices and materials selection charts. They can identify conflicting objectives and find sound compromises. They are aware of the potential and the limits of hybrid material concepts (composites, bimaternal, foams) and can determine whether following such a concept yields a useful benefit.

### Content

Important aspects and criteria of materials selection are examined and guidelines for a systematic approach to materials selection are developed. The following topics are covered: the status of materials selection in mechanical design and product development; the most important classes of materials and their property profiles;

### Literature

#### Elective literature:

- Materials Selection in Mechanical Design: Das Original mit Übersetzungshilfen, Easy-Reading-Ausgabe, Ashby, M. F.; Wanner, A. (Hrsg.); Fleck, C. (Hrsg.), Spektrum Akademischer Verlag, ISBN: 978-3-8274-1762-6, 2006

## Course: System Dynamics and Control Engineering [23155]

**Coordinators:** M. Kluwe  
**Part of the modules:** Control Engineering I (p. 113)[WI4INGETIT1]

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

### Learning Control / Examinations

The assessment consists of a written exam (120 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.

### Recommendations

Knowledge of integral transformations is assumed. There it is recommended to attend the course *Complex Analysis and Integral Transformations* beforehand.

### Learning Outcomes

The students

- get familiar with the basic concepts of control theory,
- learn and understand the elements, the structure and the behavior of dynamic systems,
- have insight in the problems of control and intuition about methods available to solve those problems as well in frequency domain as in time domain

### Content

**Introduction: Overview** and definitions, control and feedback control, construction of control systems

**Classification und description of linear control circuits: Introduction and basics**, Signal flow diagram, basic elements of time continuous control loops, standard control loop and conversion of signal flow diagrams, structure of digital control loops, description of digital control loops, simulation of time continuous control loops

**Analysis of linear time continuous control loops: steady-state behaviour and characteristic quantities**, frequency response and Nyquist plot, Bode diagram, basic stability principles, algebraic stability criterias, graphical stability criterias

**Analysis of linear time discrete control loops: steady-state behaviour**, frequency response, Nyquist plot and Bode diagram, Bode diagram, basic stability principles, algebraic stability criterias, graphical stability criterias

**Synthesis of linear time continuous control loops: control loop requirements**, direct methods, Design based on the Bode Diagram, design based on the root locus, heuristic design concepts, meshed control loops

**Synthesis of linear time discrete control loops: Fast Sampling Design**, direct methods, Design based on the Bode Diagram and the root locus

**The job profile of an automatic control engineer**

### Media

Online material is available on: [www.irs.kit.edu](http://www.irs.kit.edu) and can be downloaded using a password.

### Literature

- O. Föllinger unter Mitwirkung von F. Dörrscheidt und M. Klittich:  
Regelungstechnik, Einführung in die Methoden und ihre Anwendung  
10. Auflage, Hüthig-Verlag, 2008
- J. Lunze:  
Regelungstechnik I  
7. Auflage, Springer-Verlag, 2008
- R. Dorf - R. Bishop:  
Modern Control Systems  
11th edition, Addison-Wesley, 2007
- C. Phillips - R. Harbor:  
Feedback Control Systems  
4th edition, Prentice-Hall, 2000
- O. Föllinger:  
Lineare Abtastsysteme  
5. Auflage, R. Oldenbourg Verlag, 1993

- K. Ogata:  
Discrete-Time control systems  
Prentice Hall Verlag, 1987
- G.C. Goodwin:  
Control System Design  
Prentice Hall Verlag,

## Course: Tactical and Operational Supply Chain Management [2550488]

**Coordinators:** S. Nickel

**Part of the modules:** Operations Research in Supply Chain Management and Health Care Management (p. 64)[WI4OR5]

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

### Learning Control / Examinations

The assessment consists of a written exam (120 minutes) according to Section 4(2), 1 of the examination regulation.

The exam takes place in every the semester.

Prerequisite for admission to examination is the succesful completion of the online assessments.

### Conditions

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

### Learning Outcomes

The main goal of the lecture is the presentation of fundamental techniques from procurement and distribution logistics. A further aspect is set on methods from inventory management and lot sizing. Students acquire the ability to efficiently utilize quantitative models from transportation planning (long-distance and distribution planning), inventory management and lot sizing in production. The introduced methods will be discussed in more detail and illustrated with case-studies in the accompanying exercises

### Content

The planning of material transport is an essential element of Supply Chain Management. By linking transport connections across different facilities, the material source (production plant) is connected with the material sink (customer).

The general supply task can be formulated as follows (cf. Gudehus): For given material flows or shipments, choose the optimal (in terms of minimal costs) distribution and transportation chain from the set of possible logistics chains, which asserts the compliance of delivery times and further constraints. The main goal of the inventory management is the optimal determination of order quantities in terms of minimization of fixed and variable costs subject to resource constraints, supply availability and service level requirements. Similarly, the problem of lot sizing in production considers the determination of the optimal amount of products to be produced in a time slot.

The course includes an introduction to basic terms and definitions of Supply Chain Management and a presentation of fundamental quantitative planning models for distribution, vehicle routing, inventory management and lot sizing. Furthermore, case studies from practice will be discussed in detail.

### Literature

#### Elective literature:

- Domschke: Logistik: Transporte, 5. Auflage, Oldenbourg, 2005
- Domschke: Logistik: Rundreisen und Touren, 4. Auflage, Oldenbourg, 1997
- Ghiani, Laporte, Musmanno: Introduction to Logistics Systems Planning and Control, Wiley, 2004
- Gudehus: Logistik, 3. Auflage, Springer, 2005
- Simchi-Levi, Kaminsky, Simchi-Levi: Designing and Managing the Supply Chain, 3rd edition, McGraw-Hill, 2008
- Silver, Pyke, Peterson: Inventory management and production planning and scheduling, 3rd edition, Wiley, 1998

### Remarks

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

**Course: Technological Change in Energy Economics [2581000]****Coordinators:** M. Wietschel**Part of the modules:** Energy Economics and Technology (p. 41)[WI4BWLIIIP5]

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

**Learning Control / Examinations**

The assessment consists of a written exam.

**Conditions**

None.

**Learning Outcomes****Content**



**Course: Telecommunication and Internet Economics [2561232]****Coordinators:** K. Mitusch**Part of the modules:** Electronic Markets (p. 32)[WI4BWLISM2], Network Economics (p. 52)[WI4VWL4], Telecommunications Markets (p. 54)[WI4VWL10]

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

**Learning Control / Examinations**

Result of success is made by a 60 minutes written examination during the semester break (according to §4(2), 1 ERSC). Examination is offered every semester and can be retried at any regular examination date.

**Conditions**

None.

**Recommendations**

Basic knowledge and skills of microeconomics from undergraduate studies (bachelor's degree) are expected.

Particularly helpful but not necessary: Industrial Economics. Prior attendance of the lecture „Competition in Networks“ [26240] or “Industrial Organisation” is helpful in any case but not considered a formal precondition. The english taught course “Communications Economics” is complementary and recommendet for anyone interested in the sector.

**Learning Outcomes**

The students should get an idea of the complex competition processes in the telecommunication and internet sector. Besides, they should get to know the analytic instruments with which these competitive processes can be analyzed. The basic patterns of the current debates on economic and regulation policies should become clear to them. The lecture is suited for all students who will deal in their professional life with these sectors. As the software industry shows similar problems, the lecture is also suited for students interested in this sector.

**Content**

Among the network sectors the telecommunication and internet sector is the most dynamic one and the one with and highest variety of phenomena. Problems of natural monopoly still exist in some parts. But there is also competition, not only at the service level but also at the infrastructural level. Both levels are characterized by (vertical) quality differentiations and by high technology dynamics. What should the regulation of this sector look like? How should the mutual network access prices of two telecommunication providers be regulated and how can regulators set incentives for infrastructure investments?

The internet is a free market par excellence, because everybody can open internet businesses without high entry costs. Why then can a company like ebay dominate the market for internet-auction platforms so strongly? The causes of market concentration on the internet will be analyzed. So will be the economic implications of the Next Generations Networks.

**Literature**

J.-J. Laffont, J. Tirole (2000): Competition in Telecommunications, MIT Press.  
Further literature will be provided during the lecture

**Course: Telecommunications Law [24632]**

**Coordinators:** I. Spiecker genannt Döhmann  
**Part of the modules:** Public Business Law (p. 133)[WI4JURA6]

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

**Learning Control / Examinations**

The assessment consists of an written exam (following §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](http://www.kit.edu/zar))

**Learning Outcomes**

Telecommunications is the technical basis of the Information Engineering and Management. In which way for example UMTS is regulated, is of relevant importance for the supply of services in the world of the mobile contents services. The central defaults of the telecommunications regulation are in the telecommunications law (TKG). This was completely amended due to community-legal defaults 2004. The lecture procures for apprehending the basics of legal framework of the information society the essential knowledge in telecommunication law.

**Content**

The lecture offers an overview of the new TKG. The whole range of the regulation is treated: Of the material-legal instruments of the competition-creative economic regulation (market -, entrance -, payment regulation as well as special supervision of abuse) and the non-economic regulation (customer protection; Broadcasting; Assignment of frequencies, numbers and rights of way; secrecy of telecommunications; Data security and public security) up to the institutional arrangement of the regulation. To assist in the understanding the technical and economic bases are clarified as well as community and constitutional default sat at the beginning of the lecture.

**Media**

extensive script with cases; content structure, further information in the lectures

**Literature**

Since the law material is to be partly compiled in the discourse with the studying, a current version of the TKG is to be bring along to the lecture.

Further literature will be announced in the lecture.

**Elective literature:**

tba

**Course: Theoretical Sociology [thSoz]**

**Coordinators:** G. Nollmann, Pfadenhauer, Pfaff, Haupt, Grenz, Eisewicht

**Part of the modules:** Sociology (p. [134](#))[WI4SOZ1]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes**

The student

- gains specific knowledge of a particular research problem.

**Content**

Students are free to choose any course on specific questions on contemporary research offered by the Institute of Sociology. In class, the specific research question, recent data and current debates on the problem will be presented and discussed.

**Course: Transport Economics [2560230]****Coordinators:** G. Liedtke, E. Szimba**Part of the modules:** Transport infrastructure policy and regional development (p. 55)[WI4VWL11], Network Economics (p. 52)[WI4VWL4], Environmental Economics (p. 53)[WI4VWL5]

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

**Learning Control / Examinations**

The assessment is made by a 60 minutes written examination during the semester break (according to §4(2), 1 ERSC). Examination is offered every semester and can be retried at any regular examination date.

**Conditions**

None.

**Learning Outcomes**

The course provides students an overview of transport economics. The field deals with the role of transport infrastructure, regulation and pricing in transportation from an economic perspective. The course shall prepare for a career entry in the public sector, a regulation authority or a transport related consultancy. The course also addresses future employees of major construction companies and project corporations for transport infrastructure.

The course gives insights in the complex trade offs to be dealt with in regulatory and infrastructure measures and explains the relevant political considerations. It will be demonstrated, how to estimate the quantitative effects of transport policies using transport models.

**Content**

The course shall provide an overview of classical welfare economic aspects in reference to planning, assessment, and pricing of transport infrastructure. It will be demonstrated, using new microeconomic models, which impacts regulation and pricing in transport have on the economic actions of individuals and logisticians and which benefits and costs apply. The following topics will be discussed:

- Targets, areas and tools of transport policy,
- Project evaluation from the perspective of the public sector,
- Private sector costing and project evaluation,
- Transport system analysis,
- Macroscopic transport modelling,
- Microeconomic transport demand models, particularly logistics models,
- Case studies.

**Media**

didactic models in MS-Excel

**Literature**

Will be announced in the lecture.

(for literature to prepare the lecture - see additional literature)

**Elective literature:**

Aberle, G: Transportwirtschaft: einzelwirtschaftliche und gesamtwirtschaftliche Grundlagen München; Wien: Oldenbourg, 2003.

Blauwens, G., De Baere, P. and Van der Voorde, E.(2006): Transport Economics.

Frerich, J; Müller, G: Europäische Verkehrspolitik, Landverkehrspolitik München; Wien: Oldenbourg, 2004.

Dasgupta, A, Pearce, D (1972): Cost-Benefit Analysis, MacMillan, London.

Bossel, H (1994): Modellbildung und Simulation, Vieweg, Braunschweig.

Bundesverkehrswegeplanung (BVWP) (2003), Die gesamtwirtschaftliche Bewertungsmethodik, online unter <http://www.bmvbs.de/-,1495.8266/Bundesverkehrswegeplan-2003-Di.htm>BVU, ifo, ITP, and PLANCO (2001): Verkehrsprognose 2015 für die Bundesverkehrswegeplanung, online bei Bundesministerium für Verkehr-, Bau- und Wohnungswesen (<http://www.bmvbs.de>)

Europäische Kommission (2008): Guide to Cost Benefit Analysis of Investment Projects, online unter [http://ec.europa.eu/regional\\_policy/sou](http://ec.europa.eu/regional_policy/sou)

Ben-Akiva, M., Meerseman, H., and Van de Voorde, E. (2008): Recent developments in transport modelling: Lessons for the freight sector.

Manheim, M. (1979): Fundamentals of Transportation Systems Analysis.

Ortúzar, J. d. D. and Willumsen, L. (1990): Modelling Transport.

Gudehus, T. (2004): "Logistik, Grundlagen, Strategien, Anwendungen"

**Course: Exercises in Chemical Technology of Water [22602]**

**Coordinators:** H. Horn  
**Part of the modules:** Water Chemistry I (p. 121)[WI4INGCV6]

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

**Learning Control / Examinations**

See module description.

**Conditions**

The attendance of the course *Chemical Technology of Water* [22601] is a prerequisite to participate in the exercise.

**Learning Outcomes**

The contents of 22601 are deepened and calculations are given.

**Content**

Tutorials and exercise sheets concerning

1. Chemical-physical basics
2. Lime – carbon dioxide equilibrium
3. Adsorption
4. Ion exchange
5. Oxidation

**Literature****Elective literature:**

- DVGW: Wasseraufbereitung-Grundlagen und Verfahren. In: Lehr- und Handbuch Wasserversorgung Bd.6. Oldenbourg Industrieverlag, 2004.
- Frimmel, F. H.: Wasser und Gewässer. Ein Handbuch. Spektrum Verlag, 1999.
- Sigg, L., Stumm, W.: Aquatische Chemie. Eine Einführung in die Chemie wässriger Lösungen und natürlicher Gewässer. Verlag der Fachvereine Zürich, 1994.
- Stumm, W., Morgan, J. J.: Aquatic Chemistry. Chemical Equilibria and Rates in Natural Waters. 3rd ed. Wiley & Sons, 1996.

**Course: Exercises in Transportation Planning and Traffic Engineering Basics [19035]**

**Coordinators:** P. Vortisch, M. Kagerbauer, M. Kagerbauer  
**Part of the modules:** Transportation Systems (p. 109)[WI4INGBGU8]

ECTS Credits	Hours per week	Term	Instruction language
1,5	0/1	Summer term	de

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

**Content**

**Course: Metal Forming [2150681]****Coordinators:** Herlan**Part of the modules:** Specialization in Production Engineering (p. 72)[WI4INGMB22]

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

**Learning Control / Examinations**

The assessment consists of an oral exam (20 min) taking place during the recess period (according to Section 4(2), 1 or 2) of the examination regulation).

The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

**Conditions**

None.

**Learning Outcomes****Content**



**Course: Environmental and Ressource Policy [2560548]**

**Coordinators:** R. Walz  
**Part of the modules:** Environmental Economics (p. 53)[WI4VWL5]

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

**Learning Control / Examinations****Conditions**

It is recommended to already have knowledge in the area of industrial organization and economic policy. This knowledge may be acquired in the courses *Introduction to Industrial Organization* [2520371] and *Economic Policy* [2560280].

**Learning Outcomes****Content****Literature****Elective literature:**

Michaelis, P.: *Ökonomische Instrumente in der Umweltpolitik. Eine anwendungsorientierte Einführung*, Heidelberg  
 OECD: *Environmental Performance Review Germany*, Paris

**Remarks**

The credits have been reduced to 4.

**Course: Environmental Chemistry [0170110]****Coordinators:** J. Winter**Part of the modules:** Water Supply and Sanitation (p. 112)[WI4INGBGU13]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: Environment Communication [19212]****Coordinators:** Kämpf**Part of the modules:** Understanding and Prediction of Disasters I (p. 123)[WI4INGINTER1], Understanding and Prediction of Disasters II (p. 124)[WI4INGINTER2], Understanding and Prediction of Disasters III (p. 125)[WI4INGINTER3]

ECTS Credits	Hours per week	Term	Instruction language
3	2/1	Summer term	de

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Remarks**For further information, see [http://www.iwk.uni-karlsruhe.de/kurse\\_vertiefungsstudium.php](http://www.iwk.uni-karlsruhe.de/kurse_vertiefungsstudium.php)

**Course: Environmental Economics and Sustainability [2521547]**

**Coordinators:** R. Walz  
**Part of the modules:** Environmental Economics (p. 53)[WI4VWL5]

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

**Learning Control / Examinations****Conditions**

It is recommended to already have knowledge in the area of macro- and microeconomics. This knowledge may be acquired in the courses *Economics I: Microeconomics* [2600012] and *Economics II: Macroeconomics* [2600014].

**Learning Outcomes****Content****Literature****Elective literature:**

Hodge, I.: Environmental Economics, Houndsmills

Umweltbundesamt: Nachhaltige Entwicklung in Deutschland, Erich Schmidt Verlag, Berlin

**Course: Environmental Law [24140]****Coordinators:** I. Spiecker genannt Döhmann**Part of the modules:** Environmental Economics (p. 53)[WI4VWL5], Public Business Law (p. 133)[WI4JURA6]

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

**Learning Control / Examinations**

The assessment consists of an 1h written exam 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](http://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 certificates. On this basis, the course will center around immissions and waste management law. Additionally, water law, protection of soil law and nature protection law will be covered. Students shall be enabled to deal with easy cases in regard to environmental law.

**Content**

The lecture begins with an introduction into the special problems faced by environmental law. Different instruments, according to common goods theory, will be presented. In the main part of the lecture, immissions law, waste management law, water law, protection of soil law and nature protection law will be analyzed.

**Media**

extensive script with cases; content structure, further information in the lectures

**Literature**

Will be announced in the course.

**Elective literature:**

Will be announced in the course.

**Course: [0170605]****Coordinators:** J. Winter**Part of the modules:** Water Supply and Sanitation (p. 112)[WI4INGBGU13]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: Environmental Impact of Roads [19302]**

**Coordinators:** R. Roos  
**Part of the modules:** Highway Engineering (p. 104)[WI4INGBGU2]

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

**Learning Control / Examinations**

See module description.

**Conditions**

See corresponding module information.

**Learning Outcomes****Content**

## Course: Management and Strategy [2577900]

**Coordinators:** H. Lindstädt

**Part of the modules:** Strategic Corporate Management and Organization (p. 28)[WI4BWL01]

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

### Learning Control / Examinations

The assessment consists of a written exam (60 min) taking place at the beginning 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

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.

### Content

- Corporate management principles
- Strategic management principles
- Strategic analysis
- Competitive strategy: modelling and selection on a divisional level
- Strategies for oligopolies and networks: anticipation of dependencies
- Corporate strategy: modelling and evaluation on a corporate level
- Strategy implementation

### 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.



**Course: Insurance Management Game [ INSGAME]****Coordinators:** U. Werner**Part of the modules:** Insurance Management I (p. 24)[WI4BWLFBV6]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content**

**Course: Copyright [24121]**

**Coordinators:** T. Dreier  
**Part of the modules:** Intellectual Property Law (p. 131)[WI4JURA4]

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

**Learning Control / Examinations**

The assessment consists of a written exam according to section 4 subsection 2 no. 1 study and examination regulations.

**Conditions**

None.

**Learning Outcomes**

It is the aim of this course to provide students with knowledge in the area of copyright 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, 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.

**Content**

The course deals with the subject matter of copyright, the rights of authors, licensing, limitations and exceptions to copyright, term of protection, neighbouring rights, enforcement and collective administration of rights. The course does not merely focus on German copyright law, but likewise puts European and international copyright law into perspective. Students shall understand how the legal rules depend upon, and interact with, the economic background, legislative policy and information and communication technologies. Students shall learn about the rules of national, European and international copyright law and to apply these legal rules in practical cases.

**Media**

slides

**Literature**

Schulze, Gernot Meine Rechte als Urheber Verlag C.H.Beck, current edition

**Elective literature:**

Additional literature tba in class.

**Remarks**

It is possible that this course will be taught in the summer instead of the winter semester.

**Course: Valuation [2530212]****Coordinators:** M. Ruckes**Part of the modules:** Finance 1 (p. 21)[WI4BWLFBV1], Finance 3 (p. 23)[WI4BWLFBV11], Finance 2 (p. 22)[WI4BWLFBV2]

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

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes**

Students learn to assess and compare corporate investment projects from a financial point of view.

**Content**

Firms prosper when they create value for their shareholders and stakeholders. This is achieved by investing in projects that yield higher returns than their according cost of capital. Students are told the basic tools for firm and project valuation as well as ways to implement these tools in order to enhance a firm's value and improve its investment decisions. Among other things, the course will deal with the valuation of firms and individual projects using discounted cash flow and relative valuation approaches and the valuation of flexibility deploying real options.

**Literature****Elective literature:**

Titman/Martin (2007): Valuation – The Art and Science of Corporate Investment Decisions, Addison Wesley.

**Course: Combustion Engines A [2133101]**

**Coordinators:** Spicher  
**Part of the modules:** Combustion Engines I (p. 81)[W14INGMB18]

ECTS Credits	Hours per week	Term	Instruction language
9	4/2	Winter term	de

**Learning Control / Examinations**

The assessment consists of a written exam (120 min) according to §4 (2), 1 of the examination regulation. The grade of the exam is included in the overall grade of the module with a weighting factor of 6.

**Conditions**

It is recommended to have basic knowledge of thermodynamics.

**Learning Outcomes****Content**

**Course: Combustion Engines B [2134135]**

**Coordinators:** Spicher  
**Part of the modules:** Combustion Engines II (p. 82)[WI4INGMB19]

ECTS Credits	Hours per week	Term	Instruction language
5	2/1	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 grade of the exam is included in the overall grade of the module with a weighting factor of 5.

**Conditions**

The course *Combustion Engines A* [21101] has to be completed beforehand.  
Knowledge of thermodynamics is recommended.

**Learning Outcomes****Content**

## Course: Process Engineering in Water Quality Management [19054]

**Coordinators:** E. Hoffmann

**Part of the modules:** Water Supply and Sanitation (p. 112)[WI4INGBGU13]

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

### Learning Control / Examinations

See module description.

### Conditions

Prior attendance of the course *Urban Water Resources Management* [0170603].

Attendance of *Process Engineering in Water Quality Management* [19054]

### Learning Outcomes

#### Content

- Concept of "unit processes"
- Gas exchange
- Acid-base-reactions
- Oxidation- reduction- reactions
- Phase transition processes
- Adsorption/ ion exchange
- Separation processes
- Membrane processes

#### Literature

##### Elective literature:

- Imhoff, K. und K.R.: Taschenbuch der Stadtentwässerung, Oldenbourg, München (2006)
- Weber, W.J.Jr.: Physicochemical Processes for Water Quality Control, Wiley Interscience, New York (1972)
- Lehr- und Handbuch der Abwassertechnik, Bände 1-5 (1995 und folgende)
- Kittner, H., Starke, W., Wissel, D.: Wasserversorgung, VEB Verlag für Bauwesen (1988)
- Benfield, L., Judkins, J., Weand, B.: Process Chemistry for Water and Wastewater Treatment, Prentice Hall, Englewood Cliffs (1982)

## Course: Behavioral Approaches in Marketing [2572167]

**Coordinators:** B. Neibecker

**Part of the modules:** Marketing Management (p. 42)[WI4BWLMAR5], (p. 44)[WI4BWLMAR7]

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

### Learning Control / Examinations

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

### Conditions

(see description of the module)

### Learning Outcomes

Students have learned the following outcomes and competences:

- To specify the key terms in marketing and communication management
- To identify and define theoretical constructs in marketing communication, based on behavioral theory
- To identify the main research trends
- To analyze and interpret high level academic articles
- To learn interactive skills to work in teams and to follow a goal-oriented approach
- To gain understanding of methodological research to develop concrete plans for marketing decision-making

### Content

This course gives an introduction to consumer behavior and the influence of cognitive and emotional information processing on consumer decision making. The contribution of advertising response models is considered and faced with social and environmental aspects (e.g. cross-cultural influences) on consumer behavior, mass communication and internet advertising. In addition, a scientific case study on the effectiveness of TV-commercials is discussed. Central issues of the course:

Case Studies in brand management and advertising response.

Psychological factors (research design and test marketing / arousal / effectiveness of TV-commercials as case studies).

Emotions in marketing.

Information processing and retention in memory (schema theory / visual information processing).

Complex advertising response models (attitude towards the ad / attitude towards the brand / persuasion / context effects in learning / decision making / Means-end-theory and strategic advertising).

Social processes (culture / subculture / cross cultural influence / product design).

Neuromarketing.

### Literature

(Literature is in English and German, see German description)

**Course: Laws concerning Traffic and Roads [VLBGU]****Coordinators:** D. Hönig**Part of the modules:** Safety, Computing and Law in Highway Engineering (p. 105)[WI4INGBGU3]

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

**Learning Control / Examinations**

See module description.

**Conditions**

See corresponding module information.

**Learning Outcomes****Content**



**Course: Transport Planning Methods [19301w]****Coordinators:** P. Vortisch, M. Kagerbauer**Part of the modules:** Transportation Planning and Engineering (p. 110)[WI4INGBGU12]

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

**Learning Control / Examinations**

See module description.

**Conditions**

As a basis the Bachelor module *Fundamentals of Spatial and Infrastructural Development* [WW3INGBGU1] or the course *Basics in Transport Planning and Traffic Engineering* [19027] is recommended.

**Learning Outcomes****Content**

## Course: Project in Public Transportation I [19323]

**Coordinators:** E. Hohnacker

**Part of the modules:** Project in Public Transportation (p. 107)[WI4INGBGU5]

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

### Learning Control / Examinations

The conjoined assessment of the lectures *Project in Public Transportation I* [19323] an *Project in Public Transportation II* [19324] consists of a oral presentation and a written paper according §4(2), 3 of the examination regulation.

The mark consist of both parts of the assessment (66% of the mark of the presentation and 34% of the written paper).

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.

### Conditions

See module description.

The lecture is oligator in the module *Project in Public Transportation* [WI4INGBGU5].

### Learning Outcomes

#### Content

practise: urban traffic project: Planing and line-laying

## Course: Project in Public Transportation II [19324]

**Coordinators:** E. Hohnacker

**Part of the modules:** Project in Public Transportation (p. 107)[WI4INGBGU5]

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

### Learning Control / Examinations

The conjoined assessment of the lectures *Project in Public Transportation I* [19323] and *Project in Public Transportation II* [19324] consists of a oral presentation and a written paper according §4(2), 3 of the examination regulation.

The mark consist of both parts of the assessment (66% of the mark of the presentation and 34% of the written paper).

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.

### Conditions

See module description.

The lecture is obligator in the module *Project in Public Transportation* [WI4INGBGU5].

### Learning Outcomes

#### Content

practise: urban traffic project: economic evaluation

**Course: Transport System Planning [19062]****Coordinators:** P. Vortisch**Part of the modules:** Transportation Systems (p. 109)[WI4INGBGU8]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes****Content**

**Course: Traffic Engineering and Traffic Telematics [19303w]****Coordinators:** P. Vortisch, B. Chlond**Part of the modules:** Transportation Planning and Engineering (p. 110)[WI4INGBGU12]

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

**Learning Control / Examinations**

See module description.

**Conditions**

As a basis the Bachelor module *Fundamentals of Spatial and Infrastructural Development* [WW3INGBGU1] or the course *Basics in Transport Planning and Traffic Engineering* [19027] is recommended.

**Learning Outcomes****Content**

**Course: Transportation Planning and Traffic Engineering Basics [19027]**

**Coordinators:** P. Vortisch, M. Kagerbauer, M. Kagerbauer  
**Part of the modules:** Transportation Systems (p. 109)[WI4INGBGU8]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes****Content**

## Course: Failure of Structural Materials: Fatigue and Creep [21715]

**Coordinators:** Gruber

**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an oral exa (30 min) according to Section 4(2), 2 of the examination regulation.

### Conditions

None.

### Learning Outcomes

- Mechanical Understanding of Load vs Material Strength
- Empirical Material Behavior
- Physical Understanding of Failure Phenomena
- Statistical Description of Failure
- Material Selection and Understanding Alloying Effects

### Content

#### 1 Fatigue

- 1.1 Introduction
- 1.2 Statistical Aspects
- 1.3 Lifetime
- 1.4 Fatigue Mechanisms
- 1.5 Material Selection
- 1.6 Thermomechanical Loading
- 1.7 Notches and Shape Optimization
- 1.8 Case Study: ICE-Desaster

#### 2 Creep

- 2.1 Introduction
- 2.2 High Temperature Plasticity
- 2.3 Phänomenological Description of Creep
- 2.4 Creep Mechanisms
- 2.5 Alloying Effects

### Literature

#### Elective literature:

1. Engineering Materials, M. Ashby and D.R. Jones (2nd Edition, Butterworth-Heinemann, Oxford, 1998); sehr lesenswert, relativ einfach aber dennoch umfassend, verständlich
2. Mechanical Behavior of Materials, Thomas H. Courtney (2nd Edition, McGraw Hill, Singapur); Klassiker zu den mechanischen Eigenschaften der Werkstoffe, umfangreich, gut
3. Bruchvorgänge in metallischen Werkstoffen, D. Aurich (Werkstofftechnische Verlagsgesellschaft Karlsruhe), relativ einfach aber dennoch umfassender Überblick für metallische Werkstoffe
4. Fatigue of Materials, Subra Suresh (2nd Edition, Cambridge University Press); Standardwerk über Ermüdung, alle Materialklassen, umfangreich, für Einsteiger und Fortgeschrittene

## Course: Failure of Structural Materials: Deformation and Fracture [21711]

**Coordinators:** Weygand

**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

ECTS Credits	Hours per week	Term	Instruction language
4	2	Winter 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

None.

### Learning Outcomes

- Mechanical Understanding of Load vs Material Strength
- Empirical Material Behavior
- Physical Understanding of Failure Phenomena

### Content

1. Introduction
2. linear elasticity
3. classification of stresses
4. Failure due to plasticity
  - \* tensile test
  - \* dislocations
  - \* hardening mechanisms
  - \* guidelines for dimensioning
5. composite materials
6. fracture mechanics
  - 6.1 hypotheses for failure
  - 6.2 linear elastic fracture mechanics
  - 6.3 crack resistance
  - 6.4 experimental measurement of fracture toughness
  - 6.5 defect measurement
  - 6.6 crack propagation
  - 6.7 application of fracture mechanics
  - 6.8 atomistics of fracture

### Literature

#### Elective literature:

1. Engineering Materials, M. Ashby and D.R. Jones (2nd Edition, Butterworth-Heinemann, Oxford, 1998); sehr lesenswert, relativ einfach aber dennoch umfassend, verständlich
2. Mechanical Behavior of Materials, Thomas H. Courtney (2nd Edition, McGraw Hill, Singapur); Klassiker zu den mechanischen Eigenschaften der Werkstoffe, umfangreich, gut
3. Bruchvorgänge in metallischen Werkstoffen, D. Aurich (Werkstofftechnische Verlagsgesellschaft Karlsruhe), relativ einfach aber dennoch umfassender Überblick für metallische Werkstoffe



**Course: Civil Law for Advanced [24650]**

**Coordinators:** P. Sester  
**Part of the modules:** Private Business Law (p. 132)[WI4JURA5]

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

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

The course intends to build up extensive knowledge in german corporate law, trade law and civil law especially in contract law. It is designed for students who have already passed the courses *Civil Law for Beginners* [24012], *Advanced Civil Law* [24504], and *Commercial and Corporate Law* [24011/24509]. At the end students should be able to think through complex legal and economic questions.

**Content**

The course will focus on corporate law, trade law and civil law, especially contract law. We will discuss legal problems on the basis of selected examples in a application orientated way.

**Literature**

Klunzinger, Eugen: *Übungen im Privatrecht*, Verlag Vahlen, ISBN 3-8006-3291-8, in der neuesten Auflage

**Course: Law of Contracts [24671]**

**Coordinators:** P. Sester  
**Part of the modules:** Private Business Law (p. 132)[WI4JURA5]

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

**Learning Control / Examinations**

**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 public limited company (Aktiengesellschaft). In addition it will also focus on international relations.

**Literature**

Tba at the beginning of the course.

## Course: Computer Contract Law [VGE]

**Coordinators:** M. Bartsch  
**Part of the modules:** Intellectual Property Law (p. 131)[WI4JURA4]

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

### Learning Control / Examinations

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

### Conditions

None.

### Learning Outcomes

It is the aim of this course to provide students with knowledge in the area of contract formation and formulation in practice that builds upon the knowledge the students have already acquired concerning the legal protection of computer programs. Students shall understand how the legal rules depend upon, and interact with, the economic background and the technical features of the subject. The contract drafts shall be prepared by the students and will be corporately completed during the lecture. It is the aim of the course that students will be able to formulate contracts by themselves.

### Content

The course deals with contracts from the following areas:

- Contracts of programming, licencing and maintaining software
- Contracts in the field of IT employment law
- IT projects and IT Outsourcing
- Internet Contracts

From these areas single contracts will be chosen and discussed (e.g. software maintenance, employment contract with a software engineer). Concerning the respective contract the technical features, the economic background and the subsumption in the national law of obligation (BGB-Schuldrecht) will be discussed. As a result different contractual clauses will be developed by the students. Afterwards typical contracts and conditions will be analysed with regard to their legitimacy as standard business terms (AGB). It is the aim to show the effects of the german law of standard business terms (AGB-Recht) and to point out that contracts are a means of drafting business concepts and market appearance.

### Media

transparencies

### 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

### Remarks

The course is lectured in the winterterm 2011/12.

Until winter term 2010/11 the course was entitled "Vertragsgestaltung im EDV-Bereich".

**Course: Sales Management and Retailing [2572156]**

**Coordinators:** M. Klarmann  
**Part of the modules:** Sales Management (p. 43)[WI4BWLMAR6]

ECTS Credits	Hours per week	Term	Instruction language
3		Winter term	

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

**Content**

## Course: Gear Cutting Technology [2149655]

**Coordinators:** Felten

**Part of the modules:** Specialization in Production Engineering (p. 72)[WI4INGMB22]

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

### Learning Control / Examinations

The assessment consists of an oral exam (30 min) taking place during the recess period (according to Section 4(2), 1 or 2) of the examination regulation).

The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

### Conditions

None.

### Learning Outcomes

The student

- has the knowledge about the presented content,
- understands the within the lecture taught theory of gears and gear cutting as well as the taught basics and characteristics of the covered gear cutting processes,
- is able to transfer the within the lecture learned knowledge about the basics of the gearing geometry and the manufacturing of gears on new problematic issues and
- is able to analyze and to evaluate the applicability of the taught processes and techniques for various problems.

### Content

This lecture is focused on the demands of the modern manufacturing process of gears on the basis of the gearing geometry and the theory of gears and transmission types. For this purpose the processes for manufacturing various gearing types are covered, which are state of the technology in current operational practice. The subdivision of the processes is made in soft and hard machining, in each case in cutting and non-cutting methods. For the comprehensive understanding of the taught processes initially the description of the kinematics, the machine technology, the tools, the fields of application and the speciality as well as the current trends are made. Subsequent for the evaluation and classification in the fields of application and the capability of the processes finally the sequence of manufacturing of gears in mass production and the manufacturing errors are covered in the lecture.

The content of the lecture will be rounded off by demonstrative example parts and the possibility of the visit of real manufacturing environments within two short excursions to gear manufacturing companies.

Inhaltliche Schwerpunkte der Vorlesung:

1. History of gears
2. Basics of gearing geometry
3. Overview of processes for soft machining of gears (subdivided in cutting and non-cutting, description of particular kinematics, machine tools, tools and trends)
4. Overview of processes for hard machining of gears (subdivided in geometrically defined and geometrically undefined cutting edge, description of the particular kinematics, machine tools, tools and trends)
5. Processes for bevel gear manufacturing
6. Manufacturing errors of gears
7. Sequence of manufacturing in mass production

## Course: Virtual Engineering for Mechatronic Products [2121370]

**Coordinators:** J. Ovtcharova, S. Rude

**Part of the modules:** Virtual Engineering B (p. 90)[WW4INGMB30], Virtual Engineering A (p. 89)[WW4INGMB29]

ECTS Credits	Hours per week	Term	Instruction language
4	3/0	Winter term	de

### Learning Control / Examinations

The assessment is carried out as a general oral exam (20 min.) (according to Section 4(2), 2 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 oral examination.

### Conditions

None.

### Recommendations

Knowledge of CAx is assumed. Therefore it is recommended to attend the course Virtual Engineering I [2121352] beforehand.

### Learning Outcomes

Students should be able to apply the procedure of integrating mechatronic components in products.

Students should understand special requirements of functional networked systems.

Practical relevance of the methods are communicated with examples from automotive industry.

### Content

The integration of mechatronic components in products alters geometry-oriented construction activities to function-oriented activities. In this context, the application of IT systems needs to be realigned. The lecture deals with the following issues:

- challenges in the construction process concerning the integration of mechatronic components in products;
- support of task clarification through requirements management;
- problem-solving on based on functional networked systems;
- implementation of solutions on the basis of electronics (sensors, actuators, networked control devices);
- manage distributed software systems through software engineering;
- challenges in tests and validation concerning required system quality.

### Media

Lecture notes

### Remarks

Block course, duration one week

**Course: Virtual Engineering I [2121352]**

**Coordinators:** J. Ovtcharova  
**Part of the modules:** Virtual Engineering A (p. 89)[WW4INGMB29]

ECTS Credits	Hours per week	Term	Instruction language
6	2/3	Winter term	de

**Learning Control / Examinations**

The assessment is carried out as a general oral exam (30 min.) (according to Section 4(2), 2 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 oral examination.

**Conditions**

The course Virtual Engineering I [2123352] is compulsory and must be examined in the module Virtual Engineering A [WW4IngMB29].

**Learning Outcomes**

Students are introduced to Product Lifecycle Management to understand its application in the scope of Virtual Engineering. They should be able to apply CAD/PLM systems in different phases of the product development process. Furthermore, students should have an extensive knowledge of data models, specific modules and functions of CAD systems. They should be conscious about the IT fundament of CAx systems as well as integration issues and possible approaches. Students are given an overview on various CAE analysis methods along with possible application, constraints and limitations. They learn about different functions of preprocessors, solvers and postprocessors in CAE systems, different approaches for integrating CAD/CAE systems including advantages and disadvantages of the methods. Students will learn how to integrate CAM modules or systems with CAD systems and are able to define and simulate production processes in CAM modules. Fundamental understanding of the Virtual Engineering philosophy and virtual factory are communicated. They should be able to identify the advantages of Virtual Engineering compared to conventional approaches.

**Content**

The lecture communicates IT aspects required for understanding virtual product development processes. For this purpose, the focus is set on systems used in industry supporting the process chain of Virtual Engineering:

- Product Lifecycle Management is an approach for managing product related data across the entire lifecycle of the product, beginning with the concept phase until disassembling and recycling.
- CAx-systems for virtual product development allow modeling digital products regarding design, construction, manufacturing and maintenance.
- Validation systems enable the analysis of products regarding statics, dynamics, safety and manufacturing feasibility.

The objective of the lecture is to clarify the relationship between construction and validation operations by applying virtual prototypes and VR/AR/MR visualization techniques in combination with PDM/PLM-systems. This is taught by introducing each particular system in applied exercises.

**Media**

Lecture notes

## Course: Virtual Engineering II [2122378]

### Coordinators:

**Part of the modules:** Virtual Engineering B (p. 90)[WW4INGMB30]

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

### Learning Control / Examinations

The assessment is carried out as a general oral exam (20 min.) (according to Section 4(2), 2 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 oral examination.

### Conditions

The course Virtual Engineering II [2122378] is compulsory and must be examined in the module Virtual Engineering B [WW4IngMB30].

### Recommendations

Knowledge of CAx is assumed. Therefore it is recommended to attend the course Virtual Engineering I [2121352] beforehand.

### Learning Outcomes

Students are introduced to Virtual Reality, how to achieve stereoscopic visualization and which technologies can be used to create this effect.

They are able to model a scene in VR and store VR data structures. Students should understand the functionality of VR pipelines for visualizing scene. They should be familiar with several interaction systems and devices in a VR environment and should be able to assess the advantages and disadvantages of interaction and tracking devices.

Furthermore, they should know which validation tests could be carried out in product development processes with using virtual mock-up (VMU). The difference between VMU, physical mock-up (PMU) and virtual prototypes (VP) is introduced.

The vision of an integrated virtual product development is communicated to understand the challenges to achieve this vision.

### Content

The lecture presents the IT aspects required for understanding virtual product development processes:

- Corresponding models can be visualized in Virtual Reality Systems, from individual parts to complete assemblies.
- Virtual Prototypes combine CAD-data and information about properties of components and assemblies for immersive visualization, functionality tests and functional validation in VR/AR/MR environments.
- Integrated Virtual Product Development explains product development processes from the point of view of Virtual Engineering.

The objective of this lecture is to clarify the relationship between construction and validation operations by using virtual prototypes and VR/AR/MR visualization techniques in combination with PDM/PLM-systems. This will be achieved by introducing each particular IT-system with practical-oriented exercises.

### Media

Lecture notes



**Course: Virtual Reality Practical Course [2123375]****Coordinators:** J. Ovtcharova**Part of the modules:** Virtual Engineering B (p. 90)[WW4INGMB30], Virtual Engineering A (p. 89)[WW4INGMB29]

ECTS Credits	Hours per week	Term	Instruction language
4	3	Summer term	de

**Learning Control / Examinations**

The assessment is carried out as assessment of another type (according to Section 4(2), 3 of the examination regulation) and is made up of a Presentation of the project work (40%), the individual project participation (30%), a written test (20%) and soft skills (10%).

**Conditions**

Limited number of participants, for selection procedure and registration see course homepage.

**Learning Outcomes**

The students are able to operate and use virtual reality hardware and software. They can:

- design complex tasks as team members
- solve subtasks in specific work packages keeping the interfaces in mind
- combining all parts to the final product.

**Content**

The lab course consists of:

1. Introduction and basics in virtual reality (hardware, software, application)
2. Introduction in 3DVIA Virtools tool kit as an application development system
3. Implementation and practice by developing a driving simulator in small groups.

**Course: Lecture „Entrepreneurship“ [2545001]**

**Coordinators:** O. Terzidis, A. Presse  
**Part of the modules:** EnTechnon (p. 45)[WI4BWLENT1]

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

**Learning Control / Examinations**

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

**Conditions**

None.

**Learning Outcomes****Content**

**Course: Theory of Economic Growth [2520543]****Coordinators:** M. Hillebrand**Part of the modules:** Macroeconomic Theory (p. 48)[W14VWL8], Innovation and growth (p. 57)[WW4VWLIWW1]

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

**Learning Control / Examinations**

According to the attendance the assessment consists of a written or an oral exam at the beginning of the recess period (according to Section 4 (2), 1 or 2 of the examination regulation).

The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

**Conditions**

None.

**Recommendations**

Basic knowledge in micro- and macroeconomics, as conveyed in the courses *Economics I: Microeconomics* [2600012] and *Economics II: Macroeconomics* [2600014], is assumed.

According the focus of the course quantitativ-mathematical modelling should be in participant's interest.

**Learning Outcomes****Content**

**Course: Heat Economy [2581001]****Coordinators:** W. Fichtner**Part of the modules:** Energy Economics and Technology (p. 41)[WI4BWLIP5]

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

**Learning Control / Examinations**

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

**Conditions**

None.

**Learning Outcomes****Content****Media**

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

## Course: Elective Foreign Languages [SQ HoC3]

**Coordinators:** House of Competence  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
2-4	2-4	Winter / Summer Term	

### Learning Control / Examinations

#### Conditions

Depending on the choice of the language and the level prior knowledge is assumed.  
 Basic level english language courses can only be attended if english language skills were not acquired in school before.

### Learning Outcomes

#### Content

**Course: Elective “Workshops for Competence and Creativity” [SQ HoC2]**

**Coordinators:** House of Competence  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

**Content**

**Course: Elective “Culture - Policy - Science - Technology” [SQ HoC1]**

**Coordinators:** House of Competence  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes****Content****Literature**

Will be announced in the respective course.

**Course: Elective “Personal Fitness & Emotional Competence” [SQ HoC4]**

**Coordinators:** House of Competence  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
2-3	k.A.	Winter / Summer Term	de

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Literature**

Will be announced in the respective course.



**Course: Elective “Tutor Programmes” [SQ HoC5]**

**Coordinators:** House of Competence  
**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations****Conditions**

The participation in this program requires that the student has been or will be a tutor for at least two semesters.  
The application for this program takes place via the dean's office and in consultation with the corresponding chair.

**Learning Outcomes****Content**

**Course: Legislation of Water, Soil and Waste [19260]****Coordinators:** E. Wolf**Part of the modules:** Environmental Management (p. 111)[WI4INGBGU12]

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

**Learning Control / Examinations**

See module description.

**Conditions**

None.

**Learning Outcomes****Content**

Introduction

- sources of law
- legal terms
- EU, federal state

Water Rights

- water resources act (WHG) -> framework for Baden-Württemberg
- EU requirements

Water Act

- objectives
- principles and instruments
- water management
- water, sanitation, engineering
- environmental management

Waste Legislation

- summary of development
- from waste to recycling
- recycling and waste management act

Federal Soil Protection Act

- goals
- legal concept
- risk assessment
- remediation (investigation, planning, measures)

**Literature**

Legal texts (WHG, Krw-/AbfG, BBodSchG)

**Elective literature:**

Erbguth, Wilfried, Umweltrecht

Klöpper, Michael, Umweltrecht

**Course: [19207]****Coordinators:** B. Lehmann**Part of the modules:** Understanding and Prediction of Disasters I (p. 123)[WI4INGINTER1], Understanding and Prediction of Disasters II (p. 124)[WI4INGINTER2], Understanding and Prediction of Disasters III (p. 125)[WI4INGINTER3]

ECTS Credits	Hours per week	Term	Instruction language
4.5	2/0	Summer term	de

**Learning Control / Examinations****Conditions**

None.

**Learning Outcomes****Content****Remarks**For further information, see [http://www.iwk.uni-karlsruhe.de/kurse\\_vertiefungsstudium.php](http://www.iwk.uni-karlsruhe.de/kurse_vertiefungsstudium.php)

**Course: Laboratory Work "Water" [22664]**

**Coordinators:** H. Horn, G. Abbt-Braun  
**Part of the modules:** Water Chemistry I (p. 121)[WI4INGCV6]

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

**Learning Control / Examinations**

The assessment consists of course-related experiments (according to §4(2), 3 of the examination regulation) and an final oral exam (according to §4(2), 2 of the examination regulation).

The grade of this course is made up of 50 % each from the two parts of the assessment.

The successful completion of the *Laboratory Work "Water"* [22664] ist prerequisites for admission to the module examination.

**Conditions**

None.

**Learning Outcomes**

The practical course gives theoretical and practical basics for water examination and water treatment. Knowledge from 22601, 22602 is deepened.

**Content**

Technical and water chemical experiments, out of

1. Lime solution experiment
2. Flocculation
3. Adsorption
4. Oxidation
5. Atom absorption spectrometry
6. Ion chromatography
7. HPLC
8. Sum parameters

**Literature****Elective literature:**

- Frimmel, F. H.: Wasser und Gewässer. Ein Handbuch. Spektrum Verlag, 1999.
- Frimmel, F. H., Abbt-Braun, G.: Wasser-technologisches und wasserchemisches Praktikum. Band 44. Schriftenreihe des Lehrstuhls für Wasserchemie und der DVGW-Forschungsstelle am Engler-Bunte-Institut der Universität Karlsruhe (TH), 2006.
- Sigg, L., Stumm, W.: Aquatische Chemie. Eine Einführung in die Chemie wässriger Lösungen und natürlicher Gewässer. Verlag der Fachvereine Zürich, 1994.

**Remarks**

The successful completion of the *Laboratory Work "Water"* [22664] is prerequisites for admission to the module examination.

**Course: Web Service Engineering [2511502]****Coordinators:** C. Zirpins**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

**Learning Control / Examinations**

The assessment consists of an oral exam (20 min) (following §4(2), 2 SPO).

**Conditions**

None.

**Recommendations**

The course might be combined with the lecture "Service Oriented Computing 1".

**Learning Outcomes**

Students will acquire a deep and systematic understanding of service-oriented software systems and their embedding in organizations. Equipped with practical and research-based knowledge, they will be enabled to engineer state-of-art service-oriented applications with Web technologies and gain a broad understanding of tools and methodologies for their own work.

**Content**

The lecture "Web Service Engineering" covers technical and organizational aspects with respect to the development of modern service-oriented software as socio-technical systems in enterprises and Web environments. It introduces background, state-of-technology and emerging trends of methods, tools and processes for application development with Web services. The topics of the lecture include e.g.:

- Web service foundations and base technologies
- Service-oriented software and enterprise architectures (SOA)
- SOA life cycle and development processes
- Analysis and requirements engineering for SOA
- Service-oriented design and modeling
- Construction and testing of Web service applications
- Web service development tools
- Trends: e.g. development with service mashups / cloud services

**Media**

Slides in PDF-format will be provided via the course webpages.

**Literature**

Compulsory literature will be announced in the course.

**Remarks**

The course "Web Service Engineering" will not be offered any more from summer term 2012 on. The examination will be offered latest until summer term 2013 (repeaters only).

## Course: Materials of Lightweight Construction [2174574]

**Coordinators:** Weidenmann

**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

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

### Learning Control / Examinations

The assessment consists of an oral exam (20-30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

### Conditions

Successful completion of the course *Material Science I* [2125760].

Basic knowledge of natural science and knowledge of the content *Material Science II* [2126782] is recommended.

### Learning Outcomes

The students know different lightweight materials, their composition, properties and fields of application and can apply this knowledge effectively and precisely.

They master the hardening mechanisms of lightweight materials and can transfer this knowledge to applied problems.

The students have a basic understanding of basic mechanical models of composites - mainly polymer matrix composites - and can depict differences in the mechanical properties depending on composition and structure.

### Content

- Introduction
- Constructive, production-oriented and material aspects of lightweight construction
- Aluminium-based alloys
- Aluminium wrought alloys
- Aluminium cast alloys
- Magnesium-based alloys
- Magnesium wrought alloys
- Magnesium cast alloys
- Titanium-based alloys
- Titanium wrought alloys
- Titanium cast alloys
- High-strength steels
- High-strength structural steels
- Heat-treatable and hardenable steels
- Composites - mainly PMC
- Matrices
- Reinforcements

### Media

lecture notes are handed out during the lecture

### Literature

#### Elective literature:

- Anwendungstechnologie Aluminium: Ostermann, F., Springer-Verlag, ISBN: 978-3-540-23882-9, 2007
- Magnesium Technology: Friedrich, H.; Mordike, B. L., Springer-Verlag, ISBN: 978-3-540-20599-9, 2005
- Titanium: Lütjering, G.; Williams, J. C., Springer-Verlag, ISBN: 978-3-540-71397-5, 2007
- Handbuch der Verbundwerkstoffe: Neitzel, M.; Mitschang, P., Hanser Fachbuchverlag, ISBN: 978-3-446-22041-6, 2004
- Werkstoffe 2: Metalle, Keramiken und Gläser, Kunststoffe und Verbundwerkstoffe, Ashby, M. F.; Jones, D. R. H.; Heinzelmann, M. (Hrsg.), Spektrum Akademischer Verlag, ISBN: 978-3-8274-1709-1, 2007

**Course: Material Science and Engineering III [2173553]****Coordinators:** Wanner**Part of the modules:** Specific Topics in Material Science (p. 91)[WI4INGMB33]

ECTS Credits	Hours per week	Term	Instruction language
6	4/1	Winter term	de

**Learning Control / Examinations**

The assessment consists of an oral exam (30-40 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

**Conditions**

The course *Material Science I* [2125760] is a prerequisite.

It is recommended to have basic knowledge of natural science and knowledge of the content of the course *Material Science II* [2126782].

**Learning Outcomes**

The students are familiar with the thermodynamic foundations of phase transformations, the kinetics of phase transformations in the solid states (nucleation and growth phenomena), the mechanisms of microstructure formation and microstructure-property relationships. They can assess the effects of heat treatments and of alloying on the microstructure and the properties of iron-based materials (steels in particular). They can select steels for structural applications in mechanical engineering and subject them to appropriate heat treatments.

**Content**

Properties of pure iron; thermodynamic foundations of single-component and of binary systems; nucleation and growth; diffusion processes in crystalline iron; the phase diagram Fe-Fe<sub>3</sub>C; effects of alloying on Fe-C-alloys; nonequilibrium microstructures; multicomponent iron-based alloys; heat treatment technology; hardenability and hardenability tests.

**Media**

Lecture notes and working material will be released within the lecture.

**Literature****Elective literature:**

1. VDEh: Werkstoffkunde Stahl, Bd. 1: Grundlagen, Springer-Verlag, 1984
2. Honeycombe, R., Bhadeshia, H.: Steels - Microstructure and Properties, Edward Arnold, 1995
3. Macherauch: Praktikum in Werkstoffkunde, 10. Aufl., 1992

## Course: Machine Tools an Industrial Handling [2149902]

**Coordinators:** J. Fleischer

**Part of the modules:** Machine Tools an Industrial Handling (p. 76)[WI4INGMB32]

ECTS Credits	Hours per week	Term	Instruction language
9	4/2	Winter term	de

### Learning Control / Examinations

The assessment is carried out as written exam of 120 min (according to Section 4(2),1 of the examination regulation) of the course of this module.

### Conditions

None.

### Learning Outcomes

The student

- has knowledge about the application of machine tools.
- comprehends the assembly and the operation purpose of the major components of a machine tool.
- is able to apply methods of selection and assessment of production machines to new tasks.
- is able to assess the dimensioning of a machine tool.

### Content

The lecture 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 tothing.

### Literature

Script of the lecture



**Course: Competition in Networks [26240]**

**Coordinators:** K. Mitusch  
**Part of the modules:** Network Economics (p. 52)[WI4VWL4]

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

**Learning Control / Examinations**

Result of success is made by a 60 minutes written examination during the semester break (according to §4(2), 1 ERSC). Examination is offered every semester and can be retried at any regular examination date.

**Conditions**

None.

**Recommendations**

Basics of microeconomics obtained within the undergraduate programme (B.Sc) of economics are required. Useful, but not necessary, are basic knowledge of industrial economics, principal agent theory, and contract theory.

**Learning Outcomes**

The lecture provides the students with the basic economic understanding of network industries like telecom, utilities, IT and transport sectors.

Students are prepared for a possible job in the network industries. The student should get a vivid idea of the special characteristics of network industries concerning planning, competition, competitive distortion and state intervention. He should 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 industrial policy. All these issues are brought up, analyzed formally (in part) and illustrated by several examples in the lecture.

**Literature**

Will be announced in the lecture.

**Remarks**

From WS 2010/2011 on, the lecture gets 4,5 instead of 5 credit points.

**Course: Tendering, Planning and Financing in Public Transport [19313]****Coordinators:** W. Weißkopf**Part of the modules:** Transportation Systems (p. 109)[WI4INGBGU8], Project in Public Transportation (p. 107)[WI4INGBGU5]

ECTS Credits	Hours per week	Term	Instruction language
2	2	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**

See module description.

**Learning Outcomes****Content**

**Course: Windpower [23381]****Coordinators:** Lewald**Part of the modules:** Generation and transmission of renewable power (p. 118)[WI4INGETIT7]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	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 basic fundamentals for the use of wind power.

Wind Power fundamental lecture. Focus of the lecture is basic knowledge for the use of wind power for electricity, complemented by historical development, basic knowledge on wind systems and alternative renewable energies.

**Content**

The lecture contacts due to the broadly basic knowledge to all listeners of all terms.

On the basis of an overview of alternative, renewable energy technologies as well as general energy data, the entrance is transacted into the wind energy by means of an overview of the historical development of the wind force.

Since the wind supplies the driving power as indirect solar energy, the global and the local wind systems as well as their measurement and energy content are dedicated to its own chapter.

Whereupon constructing the aerodynamic bases and connections of wind-power plants and/or their profiles are described. The electrical system of the wind-power plants forms a further emphasis. Beginn of fundamental generator technology over control and controlling of the energy transfer.

After the emphasis aerodynamics and electrical system the further components of wind-power plants and their characteristics in the connection are described.

Finally the current economic, ecological and legislations boundary conditions for operating wind-power plants are examined.

In addition to wind-power plants for electricity production, the lecture is also shortly aiming at alternative use possibilities such as pumping systems.

Finally an overview of current developments like super-grids and visions of the future of the wind power utilization will be given.

**Media**

A scriptum that has to be overhaul is available on <http://www.ieh.uni-karlsruhe.de/windkraftanlagen.php>

Further book titles or relevant websites will be announced in the lecture.

**Course: Economic Policy [2560280]**

**Coordinators:** A. Schaffer  
**Part of the modules:** Economic Policy (p. 50)[WI4VWL6]

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

**Learning Control / Examinations**

**Conditions**  
None.

**Learning Outcomes**

**Content**

**Course: Seminar Economic Theory [SemWIOR2]****Coordinators:** C. Puppe**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

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

**Learning Control / Examinations****Conditions**

See corresponding module information.

At least one of the courses *Game Theory I* [2520525] and *Welfare Economics* [2520517] should have been attended beforehand.**Learning Outcomes****Content****Literature**

Will be announced at the end of the recess period.

## Course: Knowledge Management [2511300]

**Coordinators:** R. Studer

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

Making students sensitive to the problems of corporate knowledge management, knowledge about the central dimensions of influence as well as of relevant technologies for supporting knowledge management.

### Content

In modern companies, knowledge is increasingly important for fulfilling 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

### 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 [2520517]****Coordinators:** C. Puppe**Part of the modules:** Allocation and Equilibrium (p. 47)[WI4VWL7], Social Choice Theory (p. 49)[WI4VWL9]

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

**Learning Control / Examinations**

The assessment consists of a written exam at the end of the semester (according to Section 4 (2), 1 or 2 of the examination regulation).

**Conditions**

None.

**Learning Outcomes****Content****Literature****Elective literature:**

- J. Rawls: *A Theory of Justice*. Harvard University Press (1971)
- J. Roemer: *Theories of Distributive Justice*. Harvard University Press (1996)

## Course: Workflow-Management [2511204]

**Coordinators:** A. Oberweis

**Part of the modules:** Informatics (p. 58)[WI4INFO1], Emphasis in Informatics (p. 60)[WI4INFO2], Electives in Informatic (p. 62)[WI4INFO3]

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

### Learning Control / Examinations

The assessment of this course is a written examination (60 min) according to §4(2), 1 of the examination regulation in the first week after lecture period.

### Conditions

Knowledge of course *Applied Informatics I - Modelling* [2511030] is expected.

### Learning Outcomes

Students are familiar with the concepts and principles of workflow management concepts and systems and their applications. Based on theoretical foundations they can model business process models. Furthermore they have an overview of further problems of workflow management systems in commercial use.

### Content

A workflow is that part of a business process which is automatically executed by a computerized system. Workflow management includes the design, modelling, analysis, execution and management of workflows. Workflow management systems are standard software systems for the efficient control of processes in enterprises and organizations. Knowledge in the field of workflow management systems is especially important during the design of systems for process support.

The course covers the most important concepts of workflow management. Modelling and design techniques are presented and an overview about current workflow management systems is given. Standards, which have been proposed by the workflow management coalition (WfMC), are discussed. Petri nets are proposed as a formal modelling and analysis tool for business processes. Architecture and functionality of workflow management systems are discussed. The course is a combination of theoretical foundations of workflow management concepts and of practical application knowledge.

### Media

Slides, Access to internet resources.

### Literature

- M. Dumas, W. van der Aalst, A. H. ter Hofstede (Hrsg.): *Process Aware Information Systems*. Wiley-Interscience, 2005
- J.F. Chang: *Business Process Management*. Auerbach Publications, 2006

### Elective literature:

- W. van der Aalst, H. van Kees: *Workflow Management: Models, Methods and Systems*, Cambridge 2002: The MIT Press
- G. Vossen, J. Becker (Hrsg.): *Geschäftsprozessmodellierung und Workflow-Management. Modelle, Methoden, Werkzeuge*; Int. Thomson Pub. Company, 1996.
- A. Oberweis: *Modellierung und Ausführung von Workflows mit Petri-Netzen*. Teubner-Reihe Wirtschaftsinformatik, B.G. Teubner Verlag, 1996.
- G. Alonso, F. Casati, H. Kuno, V. Machiraju: *Web Services*, 2004, Springer Verlag, Heidelberg 1997
- S. Jablonski, C. Bussler: *Workflow-Management, Modeling Concepts, Architecture and Implementation*, Int. Thomson Computing Press, 1996.



**Course: „Good Governance“ at German Corporations [2577919]****Coordinators:** T. Reitmeyer**Part of the modules:** Seminar Module (p. 135)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
6	4	Winter / Summer Term	de

**Learning Control / Examinations**

Term paper (50%) and written conclusion (50%).

**Conditions**

None.

**Learning Outcomes****Content****Remarks**

The seminar expands over 2 semesters.

## Course: Microoptics and Lithography [2142884]

**Coordinators:** T. Mappes  
**Part of the modules:** Microoptics (p. 96)[WI4INGMBIMT3]

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

### Learning Control / Examinations

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

### Conditions

The course is compulsory in the module Microoptics and must be examined.

### Learning Outcomes

The course gives an introduction into the basics of microsystems technology, to fabrication processes for micro optical components and microoptical systems, and in particular to lithographic pattern transfer. Finally entire microsystems are presented and their applications are discussed.

The student will gain basic knowledge about the applications of microoptical elements and systems. He may analyse and compare cutting edge process technology for fabricating micro- and nano-devices with lithography (UV light, X-rays, electrons, or ion beams) and the respected resists used. He may thus select fabrication technologies, in particular lithographical patterning, appropriate in technical and economic regards for the product to be created.

### Content

#### 1 Introduction

Concepts in micro and nano fabrication and applications in optics and photonics

#### 2 Technologies, Resist

#### 3 E-Beam Lithography

#### 4 Optical Lithography

4.1 mask based lithography

4.2 interference lithography

#### 5 NGL Lithography

5.1 Immersion Lithography

5.2 2-photon Lithography

5.3 EUV Lithography

#### 6 X-ray Lithography and LIGA

#### 7 Selected Examples of Microoptical Systems and Devices

7.1 optical Lab-on-a-chip

7.2 micro optical benches

7.3 plasmonic sensors

### Media

Lecture script as \*.pdf.

### Literature

- W. Menz, J. Mohr, O. Paul: **Microsystem Technology**. Wiley-VCH, 1st ed. Weinheim, 2000. ISBN: 3527296344
- S. Sinzinger, J. Jahns: **Microoptics**. Wiley-VCH, 2nd ed. Weinheim, 2003. ISBN: 9783527403554
- M.J. Madou: **Fundamentals of Microfabrication**. Taylor & Francis Ltd., 2nd ed., Boca Raton 2002. ISBN: 9780849308260

## **Prüfungs- und Studienordnung der Universität Karlsruhe (TH) für den Masterstudiengang Wirtschaftsingenieurwesen**

Aufgrund von § 34 Absatz 1 Satz 1 des Landeshochschulgesetzes (LHG) vom 1. Januar 2005 hat der Senat der Universität Karlsruhe (TH) am 26.02.2007 die folgende Studien- und Prüfungsordnung für den Masterstudiengang Wirtschaftsingenieurwesen beschlossen.

Der Rektor hat seine Zustimmung am 06.03.2007 erteilt.

Aus Gründen der Lesbarkeit ist in dieser Satzung nur die männliche Sprachform gewählt worden. Alle personenbezogenen Aussagen gelten jedoch stets für Frauen und Männer gleichermaßen.

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## I. Allgemeine Bestimmungen

### § 1 Geltungsbereich, Ziele

- (1) Diese Masterprüfungsordnung regelt Studienablauf, Prüfungen und den Abschluss des Studiums im Masterstudiengang Wirtschaftsingenieurwesen an der Universität Karlsruhe (TH).
- (2) Im Masterstudium sollen die im Bachelorstudium erworbenen wissenschaftlichen Qualifikationen weiter vertieft oder ergänzt werden. Der Studierende soll in der Lage sein, die wissenschaftlichen Erkenntnisse und Methoden selbstständig anzuwenden und ihre Bedeutung und Reichweite für die Lösung komplexer wissenschaftlicher und gesellschaftlicher Problemstellungen zu bewerten.

### § 2 Akademischer Grad

Aufgrund der bestandenen Masterprüfung wird der akademische Grad „Master of Science“ (abgekürzt: „M.Sc.“) für den Masterstudiengang Wirtschaftsingenieurwesen verliehen.

### § 3 Regelstudienzeit, Studienaufbau, Leistungspunkte

- (1) Die Regelstudienzeit beträgt vier Semester. Sie umfasst Prüfungen und die Masterarbeit.
- (2) Die im Studium zu absolvierenden Lehrinhalte sind auf Fächer verteilt. Die Fächer sind in Module gegliedert, die jeweils aus einer Lehrveranstaltung oder mehreren thematisch und zeitlich aufeinander bezogenen Lehrveranstaltungen bestehen. Studienplan oder Modulhandbuch beschreiben Art, Umfang und Zuordnung der Module zu einem Fach sowie die Möglichkeiten, Module untereinander zu kombinieren. Die Fächer und ihr Umfang werden in § 16 definiert.
- (3) Der für das Absolvieren von Lehrveranstaltungen und Modulen vorgesehene Arbeitsaufwand wird in Leistungspunkten (Credits) ausgewiesen. Die Maßstäbe für die Zuordnung von Leistungspunkten entsprechen dem ECTS (European Credit Transfer System). Ein Leistungspunkt entspricht einem Arbeitsaufwand von etwa 30 Stunden.
- (4) Der Umfang der für den erfolgreichen Abschluss des Studiums erforderlichen Studienleistungen wird in Leistungspunkten gemessen und beträgt insgesamt 120 Leistungspunkte.
- (5) Die Leistungspunkte sind in der Regel gleichmäßig auf die Semester zu verteilen.
- (6) Lehrveranstaltungen/Prüfungen können auch in englischer Sprache angeboten/abgenommen werden.

### § 4 Aufbau der Prüfungen

(1) Die Masterprüfung besteht aus einer Masterarbeit, Fachprüfungen und einem Seminarmodul. Jede der Fachprüfungen besteht aus einer oder mehreren Modulprüfungen. Eine Modulprüfung kann in mehrere Modulteilprüfungen untergliedert sein. Eine Modul(teil)prüfung besteht aus mindestens einer Erfolgskontrolle nach Absatz 2 Nr. 1 und 2. Ausgenommen hiervon sind Seminarmodule.

(2) Erfolgskontrollen sind:

1. schriftliche Prüfungen,
2. mündliche Prüfungen,
3. Erfolgskontrollen anderer Art.

Erfolgskontrollen anderer Art sind z. B. Vorträge, Marktstudien, Projekte, Fallstudien, Experimente, schriftliche Arbeiten, Berichte, Seminararbeiten und Klausuren, sofern sie nicht als schriftliche oder mündliche Prüfung in der Modul- oder Lehrveranstaltungsbeschreibung im Modulhandbuch ausgewiesen sind.

(3) In den Fachprüfungen (nach § 16 Absatz 2 Nr. 1 bis 6) sind mindestens 50 vom Hundert einer Modulprüfung in Form von schriftlichen oder mündlichen Prüfungen (Absatz 2 Nr. 1 und 2) abzulegen, die restliche Prüfung erfolgt durch Erfolgskontrollen anderer Art (Absatz 2 Nr. 3).

### **§ 5 Anmeldung und Zulassung zu den Prüfungen**

(1) Die Zulassung zu den Prüfungen nach § 4 Absatz 2 Nr. 1 und 2 sowie zur Masterarbeit erfolgt im Studienbüro.

Um zu Prüfungen in einem Modul zugelassen zu werden, muss beim Studienbüro eine bindende Erklärung über die Wahl des betreffenden Moduls und dessen Zuordnung zu einem Fach, wenn diese Wahlmöglichkeit besteht, abgegeben werden.

(2) Die Zulassung darf nur abgelehnt werden, wenn der Studierende in einem mit Wirtschaftsingenieurwesen vergleichbaren oder einem verwandten Studiengang bereits eine Diplomvorprüfung, Diplomprüfung, Bachelor- oder Masterprüfung endgültig nicht bestanden hat, sich in einem Prüfungsverfahren befindet oder den Prüfungsanspruch in einem solchen Studiengang verloren hat.

In Zweifelsfällen entscheidet der Prüfungsausschuss.

### **§ 6 Durchführung von Prüfungen und Erfolgskontrollen**

(1) Erfolgskontrollen werden studienbegleitend, in der Regel im Verlauf der Vermittlung der Lehrinhalte der einzelnen Module oder zeitnah danach, durchgeführt.

(2) Die Art der Erfolgskontrollen (§ 4 Absatz 2 Nr. 1 bis 3) eines Moduls wird im Studienplan oder Modulhandbuch in Bezug auf die Lehrinhalte der betreffenden Lehrveranstaltungen und die Lehrziele des Moduls festgelegt. Die Art der Erfolgskontrollen, ihre Häufigkeit, Reihenfolge und Gewichtung, die Grundsätze zur Bildung der Modulteilprüfungsnoten und der Modulnote sowie Prüfer müssen mindestens sechs Wochen vor Semesterbeginn bekannt gegeben werden. Im Einvernehmen von Prüfer und Studierendem kann die Art der Erfolgskontrolle auch nachträglich geändert werden. Dabei ist jedoch § 4 Absatz 3 zu berücksichtigen.

(3) Bei unverhältnismäßig hohem Prüfungsaufwand kann eine schriftlich durchzuführende Prüfung auch mündlich oder eine mündlich durchzuführende Prüfung auch schriftlich abgenommen werden. Diese Änderung muss mindestens sechs Wochen vor der Prüfung bekannt gegeben werden.

Bei Einvernehmen zwischen Prüfer und Kandidat kann der Prüfungsausschuss in begründeten Ausnahmefällen auch kurzfristig die Änderung der Prüfungsform genehmigen.

Wird die Wiederholungsprüfung einer schriftlichen Prüfung in mündlicher Form abgelegt, entfällt die mündliche Nachprüfung nach § 8 Absatz 2.

(4) Macht ein Studierender glaubhaft, dass er wegen länger andauernder oder ständiger körperlicher Behinderung nicht in der Lage ist, die Erfolgskontrollen ganz oder teilweise in der vorgeschriebenen Form abzulegen, entscheidet der Prüfungsausschuss über eine alternative Form der Erfolgskontrollen.

(5) Bei Lehrveranstaltungen in englischer Sprache werden die entsprechenden Erfolgskontrollen in der Regel in englischer Sprache abgenommen.

(6) Schriftliche Prüfungen (§ 4 Absatz 2 Nr. 1) sind in der Regel von zwei Prüfern nach § 14 Absatz 2 oder § 14 Absatz 3 zu bewerten. Die Note ergibt sich aus dem arithmetischen Mittel der Einzelbewertungen. Entspricht das arithmetische Mittel keiner der in § 7 Absatz 2 Satz 2 definierten Notenstufen, so ist auf die nächstliegende Notenstufe zu runden. Bei gleichem Abstand ist auf die nächst bessere Notenstufe zu runden. Das Bewertungsverfahren soll sechs Wochen nicht überschreiten. Schriftliche Einzelprüfungen dauern in der Regel mindestens 60 und höchstens 240 Minuten.

(7) Mündliche Prüfungen (§ 4 Absatz 2 Nr. 2) sind von mehreren Prüfern (Kollegialprüfung) oder von einem Prüfer in Gegenwart eines Beisitzenden als Gruppen- oder Einzelprüfungen abzu-

nehmen und zu bewerten. Vor der Festsetzung der Note hört der Prüfer die anderen an der Kollegialprüfung mitwirkenden Prüfer an. Mündliche Prüfungen dauern in der Regel mindestens 15 Minuten und maximal 45 Minuten pro Studierenden.

(8) Die wesentlichen Gegenstände und Ergebnisse der mündlichen Prüfung in den einzelnen Fächern sind in einem Protokoll festzuhalten. Das Ergebnis der Prüfung ist dem Studierenden im Anschluss an die mündliche Prüfung bekannt zu geben.

(9) Studierende, die sich in einem späteren Prüfungszeitraum der gleichen Prüfung unterziehen wollen, werden entsprechend den räumlichen Verhältnissen als Zuhörer bei mündlichen Prüfungen zugelassen. Die Zulassung erstreckt sich nicht auf die Beratung und Bekanntgabe der Prüfungsergebnisse. Aus wichtigen Gründen oder auf Antrag des Studierenden ist die Zulassung zu versagen.

(10) Für Erfolgskontrollen anderer Art sind angemessene Bearbeitungsfristen einzuräumen und Abgabetermine festzulegen. Dabei ist durch die Art der Aufgabenstellung und durch entsprechende Dokumentation sicherzustellen, dass die erbrachte Studienleistung dem Studierenden zurechenbar ist.

(11) Schriftliche Arbeiten im Rahmen einer Erfolgskontrolle anderer Art haben dabei die folgende Erklärung zu tragen: „Ich versichere wahrheitsgemäß, die Arbeit selbstständig angefertigt, alle benutzten Hilfsmittel vollständig und genau angegeben und alles kenntlich gemacht zu haben, was aus Arbeiten anderer unverändert oder mit Abänderungen entnommen wurde.“ Trägt die Arbeit diese Erklärung nicht, wird diese Arbeit nicht angenommen.

(12) Bei mündlich durchgeführten Erfolgskontrollen anderer Art muss neben dem Prüfer ein Beisitzer anwesend sein, der zusätzlich zum Prüfer die Protokolle zeichnet.

### § 7 Bewertung von Prüfungen und Erfolgskontrollen

(1) Das Ergebnis einer Erfolgskontrolle wird von den jeweiligen Prüfern in Form einer Note festgesetzt.

(2) Im Masterzeugnis dürfen nur folgende Noten verwendet werden:

1	=	sehr gut (very good)	=	hervorragende Leistung
2	=	gut (good)	=	eine Leistung, die erheblich über den durchschnittlichen Anforderungen liegt
3	=	befriedigend (satisfactory)	=	eine Leistung, die durchschnittlichen Anforderungen entspricht
4	=	ausreichend (sufficient)	=	eine Leistung, die trotz ihrer Mängel noch den Anforderungen genügt
5	=	nicht ausreichend (failed)	=	eine Leistung, die wegen erheblicher Mängel nicht den Anforderungen genügt

Für die Masterarbeit und die Modulteilprüfungen sind zur differenzierten Bewertung nur folgende Noten zugelassen:

1	=	1.0, 1.3	=	sehr gut
2	=	1.7, 2.0, 2.3	=	gut
3	=	2.7, 3.0, 3.3	=	befriedigend
4	=	3.7, 4.0	=	ausreichend
5	=	4.7, 5.0	=	nicht ausreichend

Diese Noten müssen in den Protokollen und in den Anlagen (Transcript of Records und Diploma Supplement) verwendet werden.

(3) Für Erfolgskontrollen anderer Art kann die Benotung „bestanden“ (passed) oder „nicht bestanden“ (failed) vergeben werden.

(4) Bei der Bildung der gewichteten Durchschnitte der Fachnoten, Modulnoten und der Gesamtnote wird nur die erste Dezimalstelle hinter dem Komma berücksichtigt; alle weiteren Stellen werden ohne Rundung gestrichen.

(5) Jedes Modul, jede Lehrveranstaltung und jede Erfolgskontrolle darf jeweils nur einmal angerechnet werden.

(6) Erfolgskontrollen anderer Art dürfen in Modulteilprüfungen oder Modulprüfungen nur eingerechnet werden, wenn die Benotung nicht nach Absatz 3 erfolgt ist. Die zu dokumentierenden Erfolgskontrollen und die daran geknüpften Bedingungen werden im Studienplan oder Modulhandbuch festgelegt.

(7) Eine Modulteilprüfung ist bestanden, wenn die Note mindestens „ausreichend“ (4.0) ist.

(8) Eine Modulprüfung ist dann bestanden, wenn die Modulnote mindestens „ausreichend“ (4.0) ist. Die Modulprüfung und die Bildung der Modulnote werden im Studienplan oder Modulhandbuch geregelt. Die differenzierten Noten der betreffenden Erfolgskontrollen sind bei der Berechnung der Modulnoten als Ausgangsdaten zu verwenden. Enthält der Studienplan oder das Modulhandbuch keine Regelung darüber, wann eine Modulprüfung bestanden ist, so ist diese Modulprüfung dann bestanden, wenn alle dem Modul zugeordneten Modulteilprüfungen bestanden wurden.

(9) Eine Fachprüfung ist bestanden, wenn die für das Fach erforderliche Anzahl von Leistungspunkten über die im Studienplan oder Modulhandbuch definierten Modulprüfungen nachgewiesen wird.

Die Noten der Module eines Faches gehen in die Fachnote mit einem Gewicht proportional zu den ausgewiesenen Leistungspunkten der Module ein.

(10) Die Ergebnisse der Masterarbeit, der Modulprüfungen bzw. der Modulteilprüfungen, der Erfolgskontrollen anderer Art sowie die erworbenen Leistungspunkte werden durch das Studienbüro der Universität erfasst.

(11) Innerhalb der Regelstudienzeit, einschließlich der Urlaubssemester für das Studium an einer ausländischen Hochschule (Regelprüfungszeit), können in einem Fach auch mehr Leistungspunkte erworben werden als für das Bestehen der Fachprüfung erforderlich sind. In diesem Fall werden bei der Festlegung der Fachnote nur die Modulnoten berücksichtigt, die unter Abdeckung der erforderlichen Leistungspunkte die beste Fachnote ergeben.

Die in diesem Sinne für eine Fachprüfung nicht gewerteten Erfolgskontrollen und Leistungspunkte können im Rahmen der Zusatzfachprüfung nach § 12 nachträglich geltend gemacht werden.

(12) Die Gesamtnote der Masterprüfung, die Fachnoten und die Modulnoten lauten:

bis 1,5	=	sehr gut
1.6 bis 2.5	=	gut
2.6 bis 3.5	=	befriedigend
3.6 bis 4.0	=	ausreichend

(13) Zusätzlich zu den Noten nach Absatz 2 werden ECTS-Noten für Fachprüfungen, Modulprüfungen und für die Masterprüfung nach folgender Skala vergeben:

ECTS-Note	Quote	Definition
A	10	gehört zu den besten 10 % der Studierenden, die die Erfolgskontrolle bestanden haben
B	25	gehört zu den nächsten 25 % der Studierenden, die die Erfolgskontrolle bestanden haben
C	30	gehört zu den nächsten 30 % der Studierenden, die die Erfolgskontrolle bestanden haben
D	25	gehört zu den nächsten 25 % der Studierenden, die die Erfolgskontrolle bestanden haben
E	10	gehört zu den letzten 10 % der Studierenden, die die Erfolgskontrolle bestanden haben
FX		nicht bestanden (failed) – es sind Verbesserungen erforderlich, bevor die Leistungen anerkannt werden
F		nicht bestanden (failed) – es sind erhebliche Verbesserungen erforderlich

Die Quote ist als der Prozentsatz der erfolgreichen Studierenden definiert, die diese Note in der Regel erhalten. Dabei ist von einer mindestens fünfjährigen Datenbasis über mindestens 30 Studierende auszugehen. Für die Ermittlung der Notenverteilungen, die für die ECTS-Noten erforderlich sind, ist das Studienbüro der Universität zuständig.

### § 8 Erlöschen des Prüfungsanspruchs, Wiederholung von Prüfungen und Erfolgskontrollen

(1) Studierende können eine nicht bestandene schriftliche Prüfung (§ 4 Absatz 2 Nr. 1) einmal wiederholen. Wird eine schriftliche Wiederholungsprüfung mit „nicht ausreichend“ bewertet, so findet eine mündliche Nachprüfung im zeitlichen Zusammenhang mit dem Termin der nicht bestandenen Prüfung statt. In diesem Falle kann die Note dieser Prüfung nicht besser als 4.0 (ausreichend) sein.

(2) Studierende können eine nicht bestandene mündliche Prüfung (§ 4 Absatz 2 Nr. 2) einmal wiederholen.

(3) Wiederholungsprüfungen nach Absatz 1 und Absatz 2 müssen in Inhalt, Umfang und Form (mündlich oder schriftlich) der ersten entsprechen. Ausnahmen kann der Prüfungsausschuss auf Antrag zulassen. Fehlversuche an anderen Hochschulen sind anzurechnen.

(4) Die Wiederholung einer Erfolgskontrolle anderer Art (§ 4 Absatz 2 Nr. 3) wird im Modulhandbuch geregelt.

(5) Eine zweite Wiederholung derselben schriftlichen oder mündlichen Prüfung ist nur in Ausnahmefällen zulässig. Einen Antrag auf Zweitwiederholung hat der Studierende schriftlich beim Prüfungsausschuss zu stellen. Über den ersten Antrag auf Zweitwiederholung entscheidet der Prüfungsausschuss, wenn er den Antrag genehmigt. Wenn der Prüfungsausschuss diesen Antrag ablehnt, entscheidet der Rektor. Über weitere Anträge auf Zweitwiederholung entscheidet nach Stellungnahme des Prüfungsausschusses der Rektor. Absatz 1 Satz 2 und Satz 3 gilt entsprechend.

Bei nicht bestandener Erfolgskontrolle sind dem Kandidaten Umfang und Frist der Wiederholung in geeigneter Weise bekannt zu machen.

(6) Die Wiederholung einer bestandenen Erfolgskontrolle ist nicht zulässig.

(7) Eine Fachprüfung ist nicht bestanden, wenn mindestens ein Modul des Faches nicht bestanden ist.



(8) Die Masterarbeit kann bei einer Bewertung mit „nicht ausreichend“ einmal wiederholt werden. Eine zweite Wiederholung der Masterarbeit ist ausgeschlossen.

(9) Ist gemäß § 34 Absatz 2 Satz 3 LHG die Masterprüfung bis zum Beginn der Vorlesungszeit des achten Fachsemesters einschließlich etwaiger Wiederholungen nicht vollständig abgelegt, so erlischt der Prüfungsanspruch im Studiengang, es sei denn, dass der Studierende die Fristüberschreitung nicht zu vertreten hat. Die Entscheidung darüber trifft der Prüfungsausschuss.

(10) Der Prüfungsanspruch erlischt endgültig, wenn mindestens einer der folgenden Gründe vorliegt:

1. Der Prüfungsausschuss lehnt einen Antrag auf Fristverlängerung nach Absatz 9 ab.
2. Die Masterarbeit ist endgültig nicht bestanden.
3. Eine Erfolgskontrolle nach § 4 Absatz 2 Nr. 1 und 2 ist in einem Fach endgültig nicht bestanden.
4. Der Prüfungsausschuss hat dem Studierenden nach § 9 Absatz 5 den Prüfungsanspruch entzogen.

Eine Erfolgskontrolle ist dann endgültig nicht bestanden, wenn keine Wiederholungsmöglichkeit im Sinne von Absatz 2 mehr besteht oder gemäß Absatz 5 genehmigt wird. Dies gilt auch sinngemäß für die Masterarbeit.

### **§ 9 Versäumnis, Rücktritt, Täuschung, Ordnungsverstoß**

(1) Der Studierende kann bei Erfolgskontrollen gemäß § 4 Absatz 2 Nr. 1 ohne Angabe von Gründen noch vor Ausgabe der Prüfungsaufgaben zurücktreten. Bei mündlichen Erfolgskontrollen muss der Rücktritt spätestens drei Werktage vor dem betreffenden Prüfungstermin erklärt werden. Die verbindlichen Regelungen zur ordentlichen Abmeldung werden gemäß § 6 Absatz 2 bekannt gegeben. Eine durch Widerruf abgemeldete Prüfung gilt als nicht angemeldet.

(2) Eine Modulprüfung wird mit „nicht ausreichend“ bewertet, wenn der Studierende einen Prüfungstermin ohne triftigen Grund versäumt oder wenn er nach Beginn der Prüfung ohne triftigen Grund von der Prüfung zurücktritt. Dasselbe gilt, wenn die Masterarbeit nicht innerhalb der vorgesehenen Bearbeitungszeit erbracht wird, es sei denn, der Studierende hat die Fristüberschreitung nicht zu vertreten.

(3) Der für den Rücktritt nach Beginn der Prüfung oder das Versäumnis geltend gemachte Grund muss dem Prüfungsausschuss unverzüglich schriftlich angezeigt und glaubhaft gemacht werden. Bei Krankheit des Studierenden oder eines von ihm allein zu versorgenden Kindes oder pflegebedürftigen Angehörigen kann in Zweifelsfällen die Vorlage des Attestes eines vom Prüfungsausschuss benannten Arztes oder ein amtsärztliches Attest verlangt werden.

Die Anerkennung des Rücktritts ist ausgeschlossen, wenn bis zum Eintritt des Hinderungsgrundes bereits Prüfungsleistungen erbracht worden sind und nach deren Ergebnis die Prüfung nicht bestanden werden kann.

Wird der Grund anerkannt, wird ein neuer Termin anberaumt. Die bereits vorliegenden Prüfungsergebnisse sind in diesem Fall anzurechnen.

Bei Modulprüfungen, die aus mehreren Prüfungen bestehen, werden die Prüfungsleistungen dieses Moduls, die bis zu einem anerkannten Rücktritt bzw. einem anerkannten Versäumnis einer Prüfungsleistung dieses Moduls erbracht worden sind, angerechnet.

(4) Versucht der Studierende das Ergebnis einer Erfolgskontrolle durch Täuschung oder Benutzung nicht zugelassener Hilfsmittel zu beeinflussen, gilt die betreffende Erfolgskontrolle als mit „nicht ausreichend“ (5.0) bewertet.

(5) Ein Studierender, der den ordnungsgemäßen Ablauf der Prüfung stört, kann vom jeweiligen Prüfer oder der aufsichtsführenden Person von der Fortsetzung der Modulprüfung ausgeschlossen werden. In diesem Fall wird die betreffende Prüfungsleistung mit „nicht ausreichend“ (5.0) bewertet. In schwerwiegenden Fällen kann der Prüfungsausschuss den Studierenden von der Erbringung weiterer Prüfungsleistungen ausschließen.

(6) Der Studierende kann innerhalb einer Frist von einem Monat verlangen, dass Entscheidungen gemäß Absatz 4 und Absatz 5 vom Prüfungsausschuss überprüft werden. Belastende Entscheidungen des Prüfungsausschusses sind unverzüglich schriftlich mitzuteilen. Sie sind zu begründen und mit einer Rechtsbehelfsbelehrung zu versehen. Vor einer Entscheidung ist Gelegenheit zur Äußerung zu geben.

(7) Näheres regelt die Allgemeine Satzung der Universität Karlsruhe (TH) über die Redlichkeit bei Prüfungen und Praktika.

### **§ 10 Mutterschutz, Elternzeit**

(1) Auf Antrag sind die Mutterschutzfristen, wie sie im jeweils gültigen Gesetz zum Schutz der erwerbstätigen Mutter (MuSchG) festgelegt sind, entsprechend zu berücksichtigen. Dem Antrag sind die erforderlichen Nachweise beizufügen. Die Mutterschutzfristen unterbrechen jede Frist nach dieser Prüfungsordnung. Die Dauer des Mutterschutzes wird nicht in die Frist eingerechnet.

(2) Gleichfalls sind die Fristen der Elternzeit nach Maßgabe des jeweiligen gültigen Gesetzes (BERzGG) auf Antrag zu berücksichtigen. Der Studierende muss bis spätestens vier Wochen vor dem Zeitpunkt, von dem er die Elternzeit antreten will, dem Prüfungsausschuss unter Beifügung der erforderlichen Nachweise schriftlich mitteilen, in welchem Zeitraum er Elternzeit in Anspruch nehmen will. Der Prüfungsausschuss hat zu prüfen, ob die gesetzlichen Voraussetzungen vorliegen, die bei einem Arbeitnehmer den Anspruch auf Elternzeit auslösen würden, und teilt dem Studierenden das Ergebnis sowie die neu festgesetzten Prüfungszeiten unverzüglich mit. Die Bearbeitungszeit der Masterarbeit kann nicht durch Elternzeit unterbrochen werden. Die gestellte Arbeit gilt als nicht vergeben. Nach Ablauf der Elternzeit erhält der Studierende ein neues Thema.

### **§ 11 Masterarbeit**

(1) Voraussetzung für die Zulassung zur Masterarbeit ist, dass der Studierende sich in der Regel im 2. Studienjahr befindet und nicht mehr als vier der Fachprüfungen laut § 16 Absatz 2 Nr. 1 bis 6 noch nachzuweisen sind.

Vor Zulassung sind Betreuer, Thema und Anmeldedatum dem Prüfungsausschuss bekannt zu geben und im Falle einer Betreuung außerhalb der Fakultät für Wirtschaftswissenschaften durch den Prüfungsausschuss zu genehmigen.

Auf Antrag des Studierenden sorgt der Vorsitzende des Prüfungsausschusses dafür, dass der Studierende innerhalb von vier Wochen nach Antragstellung von einem Betreuer ein Thema für die Masterarbeit erhält. Die Ausgabe des Themas erfolgt in diesem Fall über den Vorsitzenden des Prüfungsausschusses.

(2) Thema, Aufgabenstellung und Umfang der Masterarbeit sind vom Betreuer so zu begrenzen, dass sie mit dem in Absatz 3 festgelegten Arbeitsaufwand bearbeitet werden kann.

(3) Der Masterarbeit werden 30 Leistungspunkte zugeordnet. Die empfohlene Bearbeitungsdauer beträgt sechs Monate. Die maximale Bearbeitungsdauer beträgt einschließlich einer Verlängerung neun Monate. Die Masterarbeit soll zeigen, dass der Studierende in der Lage ist, ein Problem aus seinem Fach selbstständig und in begrenzter Zeit nach wissenschaftlichen Methoden zu bearbeiten. Sie kann auch in englischer Sprache abgefasst werden.

(4) Die Masterarbeit kann von jedem Prüfer nach § 14 Absatz 2 vergeben und betreut werden. Soll die Masterarbeit außerhalb der Fakultät angefertigt werden, so bedarf dies der Genehmigung des Prüfungsausschusses gemäß Absatz 1. Dem Studierenden ist Gelegenheit zu geben,

für das Thema Vorschläge zu machen. Die Masterarbeit kann auch in Form einer Gruppenarbeit zugelassen werden, wenn der als Prüfungsleistung zu bewertende Beitrag des einzelnen Studierenden aufgrund objektiver Kriterien, die eine eindeutige Abgrenzung ermöglichen, deutlich unterscheidbar ist und die Anforderung nach Absatz 3 erfüllt.

(5) Bei der Abgabe der Masterarbeit hat der Studierende schriftlich zu versichern, dass er die Arbeit selbstständig verfasst hat und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt hat, die wörtlich oder inhaltlich übernommenen Stellen als solche kenntlich gemacht und die Satzung der Universität Karlsruhe (TH) zur Sicherung guter wissenschaftlicher Praxis in der jeweils gültigen Fassung beachtet hat. Wenn diese Erklärung nicht enthalten ist, wird die Arbeit nicht angenommen. Bei Abgabe einer unwahren Versicherung wird die Masterarbeit mit „nicht ausreichend“ (5.0) bewertet.

(6) Der Zeitpunkt der Ausgabe des Themas der Masterarbeit und der Zeitpunkt der Abgabe der Masterarbeit sind beim Prüfungsausschuss aktenkundig zu machen. Das Thema kann nur einmal und nur innerhalb des ersten Monats der Bearbeitungszeit zurückgegeben werden. Ein neues Thema ist binnen vier Wochen zu stellen und auszugeben. Auf begründeten Antrag des Studierenden kann der Prüfungsausschuss die in Absatz 3 festgelegte Bearbeitungszeit um höchstens drei Monate verlängern. Wird die Masterarbeit nicht fristgerecht abgeliefert, gilt sie als „nicht ausreichend“ bewertet, es sei denn, dass der Studierende dieses Versäumnis nicht zu vertreten hat. § 8 gilt entsprechend.

(7) Die Masterarbeit wird von einem Betreuer sowie in der Regel von einem weiteren Prüfer bewertet. Einer der beiden muss Juniorprofessor oder Professor sein. Bei nicht übereinstimmender Beurteilung der beiden Prüfer setzt der Prüfungsausschuss im Rahmen der Bewertung der beiden Prüfer die Note der Masterarbeit fest. Der Bewertungszeitraum soll acht Wochen nicht überschreiten.

## **§ 12 Zusatzmodule, Zusatzleistungen**

(1) Der Studierende kann sich weiteren Prüfungen in Modulen unterziehen. § 3, § 4 und § 8 Absatz 10 der Prüfungsordnung bleiben davon unberührt.

(2) Maximal zwei Zusatzmodule mit jeweils mindestens neun Leistungspunkten werden auf Antrag des Studierenden in das Masterzeugnis aufgenommen und entsprechend gekennzeichnet.

Zusatzmodule müssen nicht im Studienplan oder Modulhandbuch definiert sein. Im Zweifelsfall entscheidet der Prüfungsausschuss.

Zusatzmodule werden bei der Festsetzung der Gesamtnote nicht mit einbezogen. Alle Zusatzleistungen werden im Transcript of Records automatisch aufgenommen und als Zusatzleistungen gekennzeichnet. Zusatzleistungen werden mit den nach § 7 vorgesehenen Noten gelistet. Diese Zusatzleistungen gehen nicht in die Festsetzung der Gesamt-, Fach- und Modulnoten ein.

(3) Der Studierende hat bereits bei der Anmeldung zu einer Prüfung in einem Modul diese als Zusatzleistung zu deklarieren.

## **§ 13 Prüfungsausschuss**

(1) Für den Masterstudiengang Wirtschaftsingenieurwesen wird ein Prüfungsausschuss gebildet. Er besteht aus fünf stimmberechtigten Mitgliedern: vier Professoren, Juniorprofessoren, Hochschul- oder Privatdozenten, einem Vertreter der Gruppe der wissenschaftlichen Mitarbeiter nach § 10 Absatz 1 Satz 2 Nr. 2 LHG und einem Vertreter der Studierenden mit beratender Stimme. Die Amtszeit der nichtstudentischen Mitglieder beträgt zwei Jahre, die des studentischen Mitglieds ein Jahr.

(2) Der Vorsitzende, sein Stellvertreter, die weiteren Mitglieder des Prüfungsausschusses sowie deren Stellvertreter werden vom Fakultätsrat bestellt, die Mitglieder der Gruppe der wissenschaftlichen Mitarbeiter nach § 10 Absatz 1 Satz 2 Nr. 2 LHG und der Vertreter der Studierenden

auf Vorschlag der Mitglieder der jeweiligen Gruppe; Wiederbestellung ist möglich. Der Vorsitzende und dessen Stellvertreter müssen Professor oder Juniorprofessor sein. Der Vorsitzende des Prüfungsausschusses nimmt die laufenden Geschäfte wahr und wird durch ein Prüfungssekretariat unterstützt.

(3) Der Prüfungsausschuss regelt die Auslegung und die Umsetzung der Prüfungsordnung in die Prüfungspraxis der Fakultät. Er achtet darauf, dass die Bestimmungen der Prüfungsordnung eingehalten werden. Er berichtet regelmäßig dem Fakultätsrat über die Entwicklung der Prüfungen und Studienzeiten sowie über die Verteilung der Fach- und Gesamtnoten und gibt Anregungen zur Reform des Studienplans und der Prüfungsordnung.

(4) Der Prüfungsausschuss kann die Erledigung seiner Aufgaben in dringenden Angelegenheiten und für alle Regelfälle auf den Vorsitzenden des Prüfungsausschusses übertragen.

(5) Die Mitglieder des Prüfungsausschusses haben das Recht, an Prüfungen teilzunehmen. Die Mitglieder des Prüfungsausschusses, die Prüfer und die Beisitzenden unterliegen der Amtsverschwiegenheit. Sofern sie nicht im öffentlichen Dienst stehen, sind sie durch den Vorsitzenden zur Verschwiegenheit zu verpflichten.

(6) In Angelegenheiten des Prüfungsausschusses, die eine an einer anderen Fakultät zu absolvierende Prüfungsleistung betreffen, ist auf Antrag eines Mitgliedes des Prüfungsausschusses ein fachlich zuständiger und von der betroffenen Fakultät zu nennender Professor, Juniorprofessor, Hochschul- oder Privatdozent hinzuzuziehen. Er hat in diesem Punkt Stimmrecht.

(7) Belastende Entscheidungen des Prüfungsausschusses sind schriftlich mitzuteilen. Sie sind zu begründen und mit einer Rechtsbehelfsbelehrung zu versehen. Widersprüche gegen Entscheidungen des Prüfungsausschusses sind innerhalb eines Monats nach Zugang der Entscheidung schriftlich oder zur Niederschrift an den Prüfungsausschuss zu richten. Hilft der Prüfungsausschuss dem Widerspruch nicht ab, ist er zur Entscheidung dem für die Lehre zuständigen Mitglied des Rektorats vorzulegen.

#### **§ 14 Prüfer und Beisitzende**

(1) Der Prüfungsausschuss bestellt die Prüfer und die Beisitzenden. Er kann die Bestellung dem Vorsitzenden übertragen.

(2) Prüfer sind Hochschullehrer und habilitierte Mitglieder sowie wissenschaftliche Mitarbeiter der jeweiligen Fakultät, denen die Prüfungsbefugnis übertragen wurde. Bestellt werden darf nur, wer mindestens die dem jeweiligen Prüfungsgegenstand entsprechende fachwissenschaftliche Qualifikation erworben hat. Bei der Bewertung der Masterarbeit muss ein Prüfer Hochschullehrer sein.

(3) Soweit Lehrveranstaltungen von anderen als den unter Absatz 2 genannten Personen durchgeführt werden, sollen diese zum Prüfer bestellt werden, wenn die Fakultät ihnen eine diesbezügliche Prüfungsbefugnis erteilt hat.

(4) Zum Beisitzenden darf nur bestellt werden, wer einen dem jeweiligen Prüfungsgegenstand entsprechenden akademischen Abschluss erworben hat.

#### **§ 15 Anrechnung von Studienzeiten, Anerkennung von Studienleistungen und Modulprüfungen**

(1) Studienzeiten und gleichwertige Studienleistungen und Modulprüfungen, die in gleichen oder anderen Studiengängen an anderen Hochschulen erbracht wurden, werden auf Antrag angerechnet. Gleichwertigkeit ist festzustellen, wenn Leistungen in Inhalt, Umfang und in den Anforderungen denjenigen des Studiengangs im Wesentlichen entsprechen. Dabei ist kein schematischer Vergleich, sondern eine Gesamtbetrachtung vorzunehmen. Bezüglich des Umfangs einer zur Anerkennung vorgelegten Studienleistung und Modulprüfung werden die Grundsätze des ECTS herangezogen; die inhaltliche Gleichwertigkeitsprüfung orientiert sich an den Qualifikationszielen des Moduls.

(2) Werden Leistungen angerechnet, so werden die Noten – soweit die Notensysteme vergleichbar sind – übernommen und in die Berechnung der Modulnoten und der Gesamtnote einbezogen. Falls es sich dabei um Leistungen handelt, die im Rahmen eines Auslandsstudiums erbracht werden, während der Studierende an der Universität Karlsruhe (TH) für Wirtschaftsingenieurwesen immatrikuliert ist, kann der Prüfungsausschuss für ausgewählte Sprachen die Dokumentation anerkannter Studienleistungen im Transcript of Records mit ihrer fremdsprachlichen Originalbezeichnung festlegen. Liegen keine Noten vor, wird die Leistung nicht anerkannt. Der Studierende hat die für die Anrechnung erforderlichen Unterlagen vorzulegen.

(3) Bei der Anrechnung von Studienzeiten und der Anerkennung von Studienleistungen und Modulprüfungen, die außerhalb der Bundesrepublik erbracht wurden, sind die von der Kultusministerkonferenz und der Hochschulrektorenkonferenz gebilligten Äquivalenzvereinbarungen sowie Absprachen im Rahmen der Hochschulpartnerschaften zu beachten.

(4) Absatz 1 gilt auch für Studienzeiten, Studienleistungen und Modulprüfungen, die in staatlich anerkannten Fernstudien und an anderen Bildungseinrichtungen, insbesondere an staatlichen oder staatlich anerkannten Berufsakademien erworben wurden.

(5) Die Anerkennung von Teilen der Masterprüfung kann versagt werden, wenn in einem Studiengang mehr als die Hälfte aller Erfolgskontrollen und/oder mehr als die Hälfte der erforderlichen Leistungspunkte und/oder die Masterarbeit anerkannt werden sollen.

(6) Zuständig für die Anrechnungen ist der Prüfungsausschuss. Vor Feststellungen über die Gleichwertigkeit sind die zuständigen Fachvertreter zu hören. Der Prüfungsausschuss entscheidet in Abhängigkeit von Art und Umfang der anzurechnenden Studien- und Prüfungsleistungen über die Einstufung in ein höheres Fachsemester.

## II. Masterprüfung

### § 16 Umfang und Art der Masterprüfung

(1) Die Masterprüfung besteht aus den Fachprüfungen nach Absatz 2, einem Seminarmodul nach Absatz 3 sowie der Masterarbeit nach § 11.

(2) Es sind Fachprüfungen im Umfang von neun Modulen mit je neun Leistungspunkten abzulegen. Die Module verteilen sich wie folgt auf die Fächer:

1. Betriebswirtschaftslehre: zwei Module im Umfang von je 9 Leistungspunkten,
2. Volkswirtschaftslehre: ein Modul im Umfang von 9 Leistungspunkten,
3. Informatik: ein Modul im Umfang von 9 Leistungspunkten,
4. Operations Research: ein Modul im Umfang von 9 Leistungspunkten,
5. Ingenieurwissenschaften: zwei Module im Umfang von je 9 Leistungspunkten,
6. Wahlbereich: zwei Module im Umfang von je 9 Leistungspunkten aus den Fächern Betriebswirtschaftslehre, Volkswirtschaftslehre, Informatik, Operations Research, Statistik, Ingenieurwissenschaften, Recht und Soziologie. Auf die Fächer Recht und Soziologie darf dabei in Summe höchstens ein Modul entfallen.

(3) Ferner sind im Rahmen des Seminarmoduls bestehend aus zwei Seminaren mindestens sechs Leistungspunkte nachzuweisen. Neben den hier im Umfang von drei Leistungspunkten vermittelten Schlüsselqualifikationen müssen zusätzliche Schlüsselqualifikationen im Umfang von mindestens drei Leistungspunkten erworben werden.

(4) Die Module, die ihnen zugeordneten Lehrveranstaltungen und Leistungspunkte sowie die Zuordnung der Module zu Fächern sind im Studienplan oder im Modulhandbuch geregelt.

Studienplan oder Modulhandbuch können auch Mehrfachmodule definieren, die aus 18 Leistungspunkten (Doppelmodul) bzw. 27 Leistungspunkten (Dreifachmodul) bestehen und für Fachprüfungen nach 1. bis 6. bei in Summe mindestens gleicher Leistungspunktezahl entsprechend anrechenbar sind. Auch die Mehrfachmodule mit ihren zugeordneten Lehrveranstaltungen, Leistungspunkten und Fächern bzw. Fächerkombinationen sind im Studienplan oder Modulhandbuch geregelt.

(5) Im Studienplan oder Modulhandbuch können darüber hinaus inhaltliche Schwerpunkte definiert werden, denen Module zugeordnet werden können.

Legen die Studierenden ihre Fachprüfungen nach Absatz 2 und 3 in Modulen ab, die nach Art und Umfang den im Studienplan oder Modulhandbuch definierten Anforderungen an diese inhaltlichen Schwerpunkte entsprechen, und wird darüber hinaus die Masterarbeit diesem inhaltlichen Schwerpunkt zugeordnet, so wird der inhaltliche Schwerpunkt auf Antrag des Studierenden in das Diploma Supplement aufgenommen.

### **§ 17 Bestehen der Masterprüfung, Bildung der Gesamtnote**

(1) Die Masterprüfung ist bestanden, wenn alle in § 16 genannten Prüfungsleistungen mindestens mit „ausreichend“ bewertet wurden.

(2) Die Gesamtnote der Masterprüfung errechnet sich als ein mit Leistungspunkten gewichteter Notendurchschnitt. Dabei werden die Fachprüfungen nach § 16 Absatz 2, das Seminarmodul nach § 16 Absatz 3 und die Masterarbeit nach § 11 mit ihren Leistungspunkten gewichtet.

(3) Hat der Studierende die Masterarbeit mit der Note 1.0 und die Masterprüfung mit einem Durchschnitt von 1.1 oder besser abgeschlossen, so wird das Prädikat „mit Auszeichnung“ (with distinction) verliehen.

### **§ 18 Masterzeugnis, Masterurkunde, Transcript of Records und Diploma Supplement**

(1) Über die Masterprüfung wird nach Bewertung der letzten Prüfungsleistung eine Masterurkunde und ein Zeugnis erstellt. Die Ausfertigung von Masterurkunde und Zeugnis soll nicht später als sechs Wochen nach der Bewertung der letzten Prüfungsleistung erfolgen. Masterurkunde und Masterzeugnis werden in deutscher und englischer Sprache ausgestellt. Masterurkunde und Masterzeugnis tragen das Datum der letzten nachgewiesenen Prüfungsleistung. Sie werden dem Studierenden gleichzeitig ausgehändigt. In der Masterurkunde wird die Verleihung des akademischen Mastergrades beurkundet. Die Masterurkunde wird vom Rektor und vom Dekan unterzeichnet und mit dem Siegel der Universität versehen.

(2) Das Zeugnis enthält die in den Fachprüfungen, den Modulprüfungen sowie dem Seminarmodul und der Masterarbeit erzielten Noten, deren zugeordnete Leistungspunkte und ECTS-Noten und die Gesamtnote und die ihr entsprechende ECTS-Note. Das Zeugnis ist vom Dekan der Fakultät und vom Vorsitzenden des Prüfungsausschusses zu unterzeichnen.

(3) Weiterhin erhält der Studierende als Anhang ein Diploma Supplement in deutscher und englischer Sprache, das den Vorgaben des jeweils gültigen ECTS User's Guide entspricht. Das Diploma Supplement enthält eine Abschrift der Studiendaten des Studierenden (Transcript of Records) sowie auf Antrag des Studierenden einen möglichen inhaltlichen Schwerpunkt gemäß § 16 Absatz 4.

(4) Die Abschrift der Studiendaten (Transcript of Records) enthält in strukturierter Form alle erbrachten Prüfungsleistungen. Dies beinhaltet alle Fächer, Fachnoten und ihre entsprechende ECTS-Note samt den zugeordneten Leistungspunkten, die dem jeweiligen Fach zugeordneten Module mit den Modulnoten, entsprechender ECTS-Note und zugeordneten Leistungspunkten sowie die den Modulen zugeordneten Lehrveranstaltungen samt Noten und zugeordneten Leistungspunkten. Aus der Abschrift der Studiendaten soll die Zugehörigkeit von Lehrveranstaltungen zu den einzelnen Modulen und die Zugehörigkeit der Module zu den einzelnen Fächern sowie

bei entsprechendem Antrag des Studierenden zum möglichen inhaltlichen Schwerpunkt gemäß § 16 Absatz 4 deutlich erkennbar sein. Angerechnete Studienleistungen sind im Transcript of Records aufzunehmen.

(5) Die Masterurkunde, das Masterzeugnis und das Diploma Supplement einschließlich des Transcript of Records werden vom Studienbüro der Universität ausgestellt.

### **III. Schlussbestimmungen**

#### **§ 19 Bescheid über Nicht-Bestehen, Bescheinigung von Prüfungsleistungen**

(1) Der Bescheid über die endgültig nicht bestandene Masterprüfung wird dem Studierenden durch den Prüfungsausschuss in schriftlicher Form erteilt. Der Bescheid ist mit einer Rechtsbehelfsbelehrung zu versehen.

(2) Hat der Studierende die Masterprüfung endgültig nicht bestanden, wird ihm auf Antrag und gegen Vorlage der Exmatrikulationsbescheinigung eine schriftliche Bescheinigung ausgestellt, die die erbrachten Prüfungsleistungen und deren Noten sowie die zur Prüfung noch fehlenden Prüfungsleistungen enthält und erkennen lässt, dass die Prüfung insgesamt nicht bestanden ist. Dasselbe gilt, wenn der Prüfungsanspruch erloschen ist.

#### **§ 20 Aberkennung des Mastergrades**

(1) Hat der Studierende bei einer Prüfungsleistung getäuscht und wird diese Tatsache nach der Aushändigung des Zeugnisses bekannt, so können die Noten der Modulprüfungen, bei denen getäuscht wurde, berichtigt werden. Gegebenenfalls kann die Modulprüfung für „nicht ausreichend“ (5.0) und die Masterprüfung für „nicht bestanden“ erklärt werden.

(2) Waren die Voraussetzungen für die Zulassung zu einer Prüfung nicht erfüllt, ohne dass der Studierende darüber täuschen wollte, und wird diese Tatsache erst nach Aushändigung des Zeugnisses bekannt, wird dieser Mangel durch das Bestehen der Prüfung geheilt. Hat der Studierende die Zulassung vorsätzlich zu Unrecht erwirkt, so kann die Modulprüfung für „nicht ausreichend“ (5.0) und die Masterprüfung für „nicht bestanden“ erklärt werden.

(3) Vor einer Entscheidung ist Gelegenheit zur Äußerung zu geben.

(4) Das unrichtige Zeugnis ist zu entziehen und gegebenenfalls ein neues zu erteilen. Mit dem unrichtigen Zeugnis ist auch die Masterurkunde einzuziehen, wenn die Masterprüfung auf Grund einer Täuschung für nicht bestanden erklärt wurde.

(5) Eine Entscheidung nach Absatz 1 und Absatz 2 Satz 2 ist nach einer Frist von fünf Jahren ab dem Datum des Zeugnisses ausgeschlossen.

(6) Die Aberkennung des akademischen Grades richtet sich nach den gesetzlichen Vorschriften.

#### **§ 21 Einsicht in die Prüfungsakten**

(1) Nach Abschluss der Masterprüfung wird dem Studierenden auf Antrag innerhalb eines Jahres Einsicht in seine Masterarbeit, die darauf bezogenen Gutachten und in die Prüfungsprotokolle gewährt.

(2) Die Einsichtnahme in die schriftlichen Modulprüfungen bzw. Prüfungsprotokolle erfolgt zu einem durch den Prüfer festgelegten, angemessenen Termin innerhalb der Vorlesungszeit. Der Termin ist mit einem Vorlauf von mindestens 14 Tagen anzukündigen und angemessen bekannt zu geben.

(3) Prüfungsunterlagen sind mindestens fünf Jahre aufzubewahren.

**§ 22 In-Kraft-Treten**

(1) Diese Studien- und Prüfungsordnung tritt am 1. Oktober 2007 in Kraft.

(2) Gleichzeitig tritt die Prüfungsordnung der Universität Karlsruhe (TH) für den Diplomstudiengang Wirtschaftsingenieurwesen vom 15. November 2001 (Amtliche Bekanntmachung der Universität Karlsruhe (TH), Nr. 29 vom 24. November 2001), zuletzt geändert durch Satzung vom 4. Juli 2004 (Amtliche Bekanntmachung der Universität Karlsruhe (TH), Nr. 36 vom 14. Juli 2004) außer Kraft, behält jedoch ihre Gültigkeit bis zum 30. September 2013 für Prüflinge, die auf Grundlage der Prüfungsordnung der Universität Karlsruhe (TH) für den Studiengang Wirtschaftsingenieurwesen vom 15. November 2001 (Amtliche Bekanntmachung der Universität Karlsruhe (TH), Nr. 29 vom 24. November 2001) ihr Studium an der Universität Karlsruhe (TH) aufgenommen haben. Über eine Fristverlängerung darüber hinaus entscheidet der Prüfungsausschuss auf Antrag des Studierenden.

Über einen Antrag an den Prüfungsausschuss können Studierende, die auf Grundlage der Prüfungsordnung der Universität Karlsruhe (TH) für den Studiengang Wirtschaftsingenieurwesen vom 15. November 2001 (Amtliche Bekanntmachung der Universität Karlsruhe (TH), Nr. 29 vom 24. November 2001) ihr Studium an der Universität Karlsruhe (TH) aufgenommen haben, ihr Studium auf Grundlage dieser Prüfungsordnung fortsetzen. Der Prüfungsausschuss stellt dabei fest, ob und wie die bisher erbrachten Prüfungsleistungen in den neuen Studienplan integriert werden können und nach welchen Bedingungen das Studium nach einem Wechsel fortgeführt werden kann.

Karlsruhe, den 06.03.2007

*Professor Dr. sc. tech. Horst Hippler  
(Rektor)*



### Aufbau des Masterstudiengangs Wirtschaftsingenieurwesen

Die Regelstudienzeit im Masterstudiengang Wirtschaftsingenieurwesen beträgt vier Semester. Im Masterstudium sollen die im Bachelorstudium erworbenen wissenschaftlichen Qualifikationen weiter vertieft oder ergänzt werden. Der Studierende soll in die Lage versetzt werden, die wissenschaftlichen Erkenntnisse und Methoden selbstständig anzuwenden und ihre Bedeutung und Reichweite bei der Lösung komplexer wissenschaftlicher und gesellschaftlicher Problemstellungen zu bearbeiten.

Ferner sind im Rahmen des Seminarmoduls bestehend aus zwei Seminaren mindestens sechs Leistungspunkte nachzuweisen. Neben den hier im Umfang von drei Leistungspunkten vermittelten Schlüsselqualifikationen müssen zusätzliche Schlüsselqualifikationen im Umfang von mindestens drei Leistungspunkten erworben werden.

Die folgende Abbildung zeigt die Fach- und Modulstruktur und die Zuordnung der Leistungspunkte (LP) zu den Fächern. Im Wahlpflichtbereich sind zwei Module aus den Fächern Betriebswirtschaftslehre, Volkswirtschaftslehre, Informatik, Operations Research, Ingenieurwissenschaften, Statistik, Recht und Soziologie zu wählen. Auf die Fächer Recht und Soziologie darf aber in Summe höchstens ein Modul entfallen.

Semester					Summe LP
1.	<b>Modul BWL 9</b>	<b>Modul ING 9</b>	<b>Modul Info 9</b>	<b>Modul Wahlpflicht 9</b>	30
2.	<b>Modul VWL 9</b>	<b>Modul ING 9</b>	<b>Modul OR 9</b>		30
3.	<b>Modul BWL 8</b>	<b>Modul Wahlpflicht 9</b>	<b>Modul Seminare + SQ 6 + 3</b>		30
4.	<b>Masterarbeit 30</b>				30
					<b>Gesamt: 120</b>

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