

Industrial Engineering and Management (M.Sc.)

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Department of Economics and Management
Karlsruhe Institute of Technology (KIT)
76128 Karlsruhe
www.wiwi.kit.edu

Contact: modul@wiwi.kit.edu

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Strategic Management of Information Technology- 2511602	581
Structural Ceramics- 2126775	582
Superhard Thin Film Materials- 2177618	583
Supply chain management- 2117062	584
Supply Chain Management in the automotive industry- 2581957	585
Supply Chain Management in the Process Industry - 2550494	586
Supply Chain Management with Advanced Planning Systems- 2581961	587
Systematic Product Development in Sensor Technology- 23209	588
Systematic Selection of Materials- 2174576	589
Tactical and Operational Supply Chain Management- 2550488	590
Technology Assessment- 2545017	591
Technologies for Innovation Management- 2545018	592
Technological Change in Energy Economics- 2581000	593

Telecommunication and Internet Economics- 2561232	594
Telecommunications Law- 24632	595
Theoretical Sociology- thSoz	596
Theory of Business Cycles- 25549	597
Theory of Economic Growth- 2520543	598
Thermodynamics and Energy Conversion in Internal Combustion Engines- 2133120	599
Operation Methods for Foundation and Marine Construction- 6241911	600
Topics in Experimental Economics- n.n.	601
Transport Economics- 2560230	602
Exercrcises in Chemical Technology of Water - 22602	604
Exercises in Transportation Planning and Traffic Engineering- 19035	605
Metal Forming- 2150681	606
Environmental and Ressource Policy- 2560548	607
Environmental Aspects of Guided Transport Systems- 6234901	608
Environmental Chemistry- 0170110	609
Environment Communication- 19212	610
Environmental Economics and Sustainability- 2521547	611
Environmental Law- 24140	612
- 0170605	613
Environmental Impact Assessment- 6233804	614
Management and Strategy- 2577900	615
Urban Water Management- 6220902	616
Copyright- 24121	617
Valuation- 2530212	618
Combustion Engines A- 2133101	619
Combustion Engines B- 2134135	620
Construction Methods in Environmental Engineering- 6241814	621
Process Technologies in Storm Water Treatment- 6223801	622
Process Technologies in Water Supply and Wastewater Disposal- 6223803	623
Behavioral Approaches in Marketing- 2572167	624
Laws concerning Traffic and Roads- 6233803	625
Traffic Management and Transport Telematics - 6232802	626
Fundamentals of Transportation Planning and Traffic Engineering- 19027	627
Failure of Structural Materials: Fatigue and Creep- 2181715	628
Failure of structural materials: deformation and fracture- 2181711	629
Civil Law for Advanced- 24650	630
Seminar: Governance, Risk & Compliance- GRCsem	631
Law of Contracts- 24671	632
Computer Contract Law- VGE	633
Sales Management and Retailing- 2572156	634
Gear Cutting Technology- 2149655	635
Virtual Engineering for Mechatronic Products- 2121370	636
Virtual Engineering I- 2121352	637
Virtual Engineering II- 2122378	638
Virtual Reality Laboratory- 2123375	639
Heat Economy- 2581001	640
Elective „Educational development for student teachers“ - SQ PEW1	641
Laboratory Work “Water”- 22664	642
Water Resource Management and Engineering Hydrology- 0170617	643
Materials Science and Engineering III- 2173553	644
Machine Tools and Industrial Handling- 2149902	645
Competition in Networks- 26240	646
Tendering, Planning and Financing in Public Transport- 6232807	647
Windpower- 23381	648
Economic Efficiency of Guided Transport Systems- 6234902	649
Seminar Economic Theory- SemWIOR2	650
Knowledge Management- 2511300	651
Knowledge Transfer in Innovation Management- 2545020	652

Welfare Economics- 2520517	653
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1 Structure of the Master Programme in Industrial Engineering and Management (M.Sc.)

The master programme in Industrial Engineering and Management (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.

Industrial Engineering and Management (M.Sc.)										
Semester	Compulsory								Elective	
1	BA	BA	EC	INFO	OR	ENG	ENG	Seminar + KS	Elective	Elective
2	9 CP	9 CP	9 CP	9 CP	9 CP	9 CP	9 CP	6 + 3 CP	9 CP	9 CP
3										
4	Master Thesis 30 CP									
120 CP (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 Industrial Engineering and Management (M.Sc.) at the Department of Economics and Management distinguishes itself by an exceptionally high level of interdisciplinarity. With the combination of business science, economics, informatics, operations research, mathematics as well as engineering and natural science, the integration of knowledge of different disciplines is an inherent element of the programme. As a result, interdisciplinary and connected thinking is encouraged in a natural way. Furthermore, 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. Students may choose freely among the offered courses of HoC, ZAK and Sprachenzenrtum.

Art der Schlüsselqualifikation	Masterstudium				
	BWL	VWL	INFO	Seminar	Masterarbeit
Basiskompetenzen (soft skills)					
Teamarbeit, soziale Kommunikation und Kreativitätstechniken			x		
Präsentationserstellung und -techniken				x	
Logisches und systematisches Argumentieren und Schreiben				x	x
Strukturierte Problemlösung und Kommunikation				x	x
Praxisorientierung (enabling skills)					
Handlungskompetenz im beruflichen Kontext					(x)*
Kompetenzen im Projektmanagement					(x)*
Betriebswirtschaftliche Grundkenntnisse	x				
Englisch als Fachsprache	x	x			
Orientierungswissen					
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

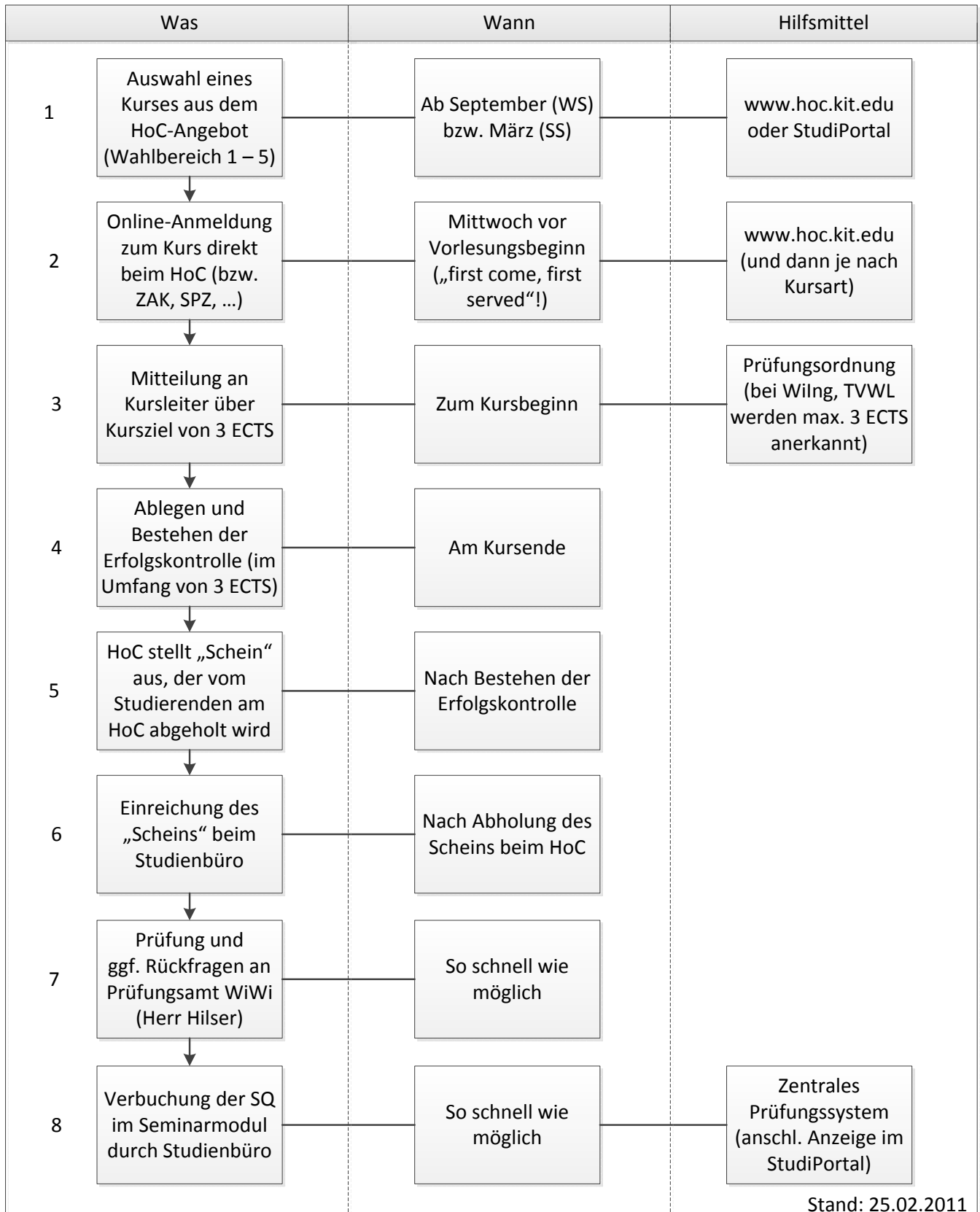


Figure 3: Process of gaining additive key skills

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://studium.kit.edu/Seiten/FAQ.aspx>

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 loosing 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.

WI4BWLISM5 - Communications & Markets (S. 36)

Anmerkungen

All practical Seminars offered at the IM can be chosen for *Special Topics in Information Engineering & Management*. Please update yourself on www.iism.kit.edu/im/lehre.
The module will be offered latest until SS 2014.

WI4BWLISM7 - Information Engineering (S. 38)

Anmerkungen

All practical Seminars offered at the IM can be chosen for *Special Topics in Information Engineering & Management*. Please update yourself on www.iism.kit.edu/im/lehre.
The course "Communications Economics" will be offered latest until summer term 2014. The examination will be offered latest until winter term 2014/15 (repeaters only).

WI4VWL9 - Social Choice Theory (S. 58)

Anmerkungen

See German version.

WI4VWL10 - Telecommunications Markets (S. 59)

Anmerkungen

The module will be offered latest until SS 2014.

WI4STAT1 - Mathematical and Empirical Finance (S. 78)

Anmerkungen

The course Portfolio and Asset Liability Management [2520357] will not be offered any more from summer term 2015 on. The examination will probably be offered latest until summer term 2014.
The course Stochastic Calculus and Finance [2521331] will not be offered any more from winter term 2014/2015 on. The examination will probably be offered latest until winter term 2013/14.

WI4INGMBWBK1 - Automated Manufacturing Systems (S. 103)

Erfolgskontrolle

The assessment is carried out as partial exams (according to Section 4(2), 1-3 SPO of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately. The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal. To improve the overall grade of the module up to one grading scale (0.3) there might be taken an optional term paper in the field of the wbk. The term paper may not be convalidated in the seminar module.

19307s / 6234809 - Construction and Maintenance of Track Infrastructure (S. 179)

Anmerkungen

See German version.

6232807 - Tendering, Planning and Financing in Public Transport (S. 647)

Erfolgskontrolle

The assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation.

6232808 - Freight Transport (S. 318)

Erfolgskontrolle

The assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation.

2540506 - Recommender Systems (S. 465)

Anmerkungen

As of summer term 2014 this lecture is hold in alternation with the lecture "2540533 - Personalization and Services". The current schedule can be seen on the chair's website (<http://www.em.uni-karlsruhe.de>).

2511402 - Intelligent Systems in Finance (S. 340)

Anmerkungen

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).

2520525 - Introduction to Game Theory (S. 232)

Erfolgskontrolle

The assessment consists of a written exam (60 minutes) according to Section 4(2),1 of the examination regulation. The exam takes place in the recess period and can be resited at every ordinary examination date.

Anmerkungen

This course was formerly named "Game Theory I".

2540502 - Markets and Organizations: Principles (S. 363)

Anmerkungen

The former name of the lecture was *Electronic Markets (Foundations)*.

As of winter term 2014/15 this lecture is held in alternation with "2540531 - Business Dynamics". The current schedule can be seen on the chair's website (<http://www.em.uni-karlsruhe.de>).

2520357/2520358 - Portfolio and Asset Liability Management (S. 432)

Anmerkungen

The course Portfolio and Asset Liability Management [2520357] will not be offered any more from summer term 2015 on. The examination will probably be offered latest until summer term 2014.

2511400 - Complexity Management (S. 213)

Anmerkungen

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).

2560236 - Innovationtheory and -policy (S. 334)

Anmerkungen

The credits have been changed from 5 to 4,5.

2560254 - International Economic Policy (S. 344)

Anmerkungen

The credits have been changed to 4,5.

2520517 - Welfare Economics (S. 653)

Anmerkungen

For details see German version.

2520337 - Stochastic and Econometric Models in Credit Risk Management (S. 571)

Anmerkungen

The course Stochastic and Econometric Models in Credit Risk Management [2520337] will no longer be offered. The examination will be offered latest until summer term 2014.

2540462 - Communications Economics (S. 212)

Anmerkungen

The course will be offered latest until summer term 2014. The examination will be offered latest until winter term 2014/15 (repeaters only).

2540531 - Business Dynamics (S. 203)

Anmerkungen

As of winter term 2014/15 this lecture is hold in alternation with "2540502 - Markets and Organizations: Principles". The current schedule can be seen on the chair's website (<http://www.em.uni-karlsruhe.de>).

2581961 - Supply Chain Management with Advanced Planning Systems (S. 587)

Anmerkungen

This lecture will have 3,5 Credits from summer term 2014.

2150904 - Automated Manufacturing Systems (S. 176)

Erfolgskontrolle

The assessment consists of an written exam (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Reexaminations are offered at every ordinary examination date.

2149610 - Global Production and Logistics - Part 1: Global Production (S. 288)

Erfolgskontrolle

See German version.

2521353 - Statistical Methods in Financial Risk Management (S. 566)

Anmerkungen

URL: <http://statistik.econ.kit.edu/>

The course Statistical Methods in Financial Risk Management [2521353] will not be offered any more from winter term 2014/2015 on. The examination will be offered latest until winter term 2013/2014.

2521331 - Stochastic Calculus and Finance (S. 572)

Anmerkungen

The course Stochastic Calculus and Finance [2521331] will not be offered any more from winter term 2014/2015 on. The examination will be offered latest until winter term 2013/2014.

19027 - Fundamentals of Transportation Planning and Traffic Engineering (S. 627)

Erfolgskontrolle

In the module Fundamentals of Transportation [WI4INGBGU15] the assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation. For other modules and more information, see the corresponding module description.

6232901 - Transportation Data Analysis (S. 236)

Erfolgskontrolle

The assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation.

2581992 - Risk Management in Industrial Supply Networks (S. 475)

Anmerkungen

This lecture will bel held for the first time again in winter term 2014/15.

2540533 - Personalization and Services (S. 422)

Anmerkungen

As of summer term 2014 this lecture is hold in alternation with the lecture "2540506 - Recommendersystems". The current schedule can be seen on the chair's website (<http://www.em.uni-karlsruhe.de>).

5 Modules

5.1 Business Administration

Module: Finance 1 [WI4BWLFBV1]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2530550	Derivatives (p. 222)	2/1	S	4,5	M. Uhrig-Homburg
2530212	Valuation (p. 618)	2/1	W	4,5	M. Ruckes
2530555	Asset Pricing (p. 167)	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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2530260	Fixed Income Securities (p. 270)	2/1	W	4,5	M. Uhrig-Homburg
2530214	Corporate Financial Policy (p. 215)	2/1	S	4,5	M. Ruckes
2530240	Market Microstructure (p. 375)	2/0	W	3	T. Lüdecke
2530565	Credit Risk (p. 354)	2/1	W	4,5	M. Uhrig-Homburg
2530210	Cost and Management Accounting (p. 345)	2/1	S	4,5	T. Lüdecke
2530555	Asset Pricing (p. 167)	2/1	S	4,5	M. Uhrig-Homburg, M. Ruckes
2530212	Valuation (p. 618)	2/1	W	4,5	M. Ruckes
2530550	Derivatives (p. 222)	2/1	S	4,5	M. Uhrig-Homburg
2530570	International Finance (p. 343)	2	S	3	M. Uhrig-Homburg, Dr. Walter
2530299	Business Strategies of Banks (p. 284)	2	W	3	W. Müller
2530296	Exchanges (p. 199)	1	S	1,5	J. Franke
2530232	Financial Intermediation (p. 271)	3	W	4,5	M. Ruckes
2540454	eFinance: Information Engineering and Management for Securities Trading (p. 230)	2/1	W	4,5	C. Weinhardt

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: Insurance Management I [WI4BWLFBV6]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2550055	Principles of Insurance Management (p. 446)	3/0	S	4,5	U. Werner
2530323	Insurance Marketing (p. 335)	3/0	S	4,5	E. Schwake
2530324	Insurance Production (p. 336)	3/0	W/S	4,5	U. Werner
2530050	Private and Social Insurance (p. 447)	2/0	W	2,5	W. Heilmann, K. Besserer
2530350	Current Issues in the Insurance Industry (p. 216)	2/0	S	2,5	W. Heilmann
2530335	Insurance Risk Management (p. 337)	2/0	S	2,5	H. Maser
INSGAME	P&C Insurance Simulation Game (p. 419)	3	W	3	U. Werner
2530353	International Risk Transfer (p. 342)	2/0	W	2,5	W. Schwehr
2530395	Risk Communication (p. 474)	3/0	W/S	4,5	U. Werner
2530355	Modelling, Measuring and Managing of Extreme Risks (p. 391)	2	S	2,5	U. Werner, S. Hochrainer
2530356	Seminar in Modelling, Measuring and Managing of Extreme Risks (p. 505)	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

None.

Learning Outcomes

See German version.

Content

See German version.

Module: Insurance Management II [WI4BWLFBV7]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2530323	Insurance Marketing (p. 335)	3/0	S	4,5	E. Schwake
2530324	Insurance Production (p. 336)	3/0	W/S	4,5	U. Werner
2530050	Private and Social Insurance (p. 447)	2/0	W	2,5	W. Heilmann, K. Besserer
2530350	Current Issues in the Insurance Industry (p. 216)	2/0	S	2,5	W. Heilmann
2530335	Insurance Risk Management (p. 337)	2/0	S	2,5	H. Maser
2530353	International Risk Transfer (p. 342)	2/0	W	2,5	W. Schwehr
2530395	Risk Communication (p. 474)	3/0	W/S	4,5	U. Werner
INSGAME	P&C Insurance Simulation Game (p. 419)	3	W	3	U. Werner
2550055	Principles of Insurance Management (p. 446)	3/0	S	4,5	U. Werner
2530355	Modelling, Measuring and Managing of Extreme Risks (p. 391)	2	S	2,5	U. Werner, S. Hochrainer
2530356	Seminar in Modelling, Measuring and Managing of Extreme Risks (p. 505)	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

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

See German version.

Module: Finance 3 [WI4BWLFBV11]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2530555	Asset Pricing (p. 167)	2/1	S	4,5	M. Uhrig-Homburg, M. Ruckes
2530212	Valuation (p. 618)	2/1	W	4,5	M. Ruckes
2530550	Derivatives (p. 222)	2/1	S	4,5	M. Uhrig-Homburg
2530260	Fixed Income Securities (p. 270)	2/1	W	4,5	M. Uhrig-Homburg
2530565	Credit Risk (p. 354)	2/1	W	4,5	M. Uhrig-Homburg
2530214	Corporate Financial Policy (p. 215)	2/1	S	4,5	M. Ruckes
2530240	Market Microstructure (p. 375)	2/0	W	3	T. Lüdecke
2530210	Cost and Management Accounting (p. 345)	2/1	S	4,5	T. Lüdecke
2530232	Financial Intermediation (p. 271)	3	W	4,5	M. Ruckes
2530296	Exchanges (p. 199)	1	S	1,5	J. Franke
2530299	Business Strategies of Banks (p. 284)	2	W	3	W. Müller
2530570	International Finance (p. 343)	2	S	3	M. Uhrig-Homburg, Dr. Walter
2540454	eFinance: Information Engineering and Management for Securities Trading (p. 230)	2/1	W	4,5	C. Weinhardt

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: Strategic Corporate Management and Organization [WI4BWL01]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2577904	Organization Theory (p. 417)	2	W	4,5	H. Lindstädt
2577902	Managing Organizations (p. 416)	2/0	W	4	H. Lindstädt
2577908	Modeling Strategic Decision Making (p. 389)	2	S	4,5	H. Lindstädt
2577900	Management and Strategy (p. 615)	2/0	S	4	H. Lindstädt
2577910	Problem solving, communication and leadership (p. 449)	1/0	S	2	H. Lindstädt

Learning Control / Examinations

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

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

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

Module: Strategic Decision Making and Organization Theory [WI4BWL03]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2577904	Organization Theory (p. 417)	2	W	4,5	H. Lindstädt
2577908	Modeling Strategic Decision Making (p. 389)	2	S	4,5	H. Lindstädt
2561127	Public Management (p. 456)	2	W	4,5	B. Wigger, Assistenten

Learning Control / Examinations

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2579900	Management Accounting 1 (p. 365)	2/2	S	4,5	M. Wouters
2579902	Management Accounting 2 (p. 366)	2/2	W	4,5	M. Wouters

Learning Control / Examinations

The assessment is carried out as partial exams (according to Section 4 (2), 13 SPO) of the courses of this module. The assessment procedures are described for each course of the module separately.

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

Conditions

None.

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540508	Customer Relationship Management (p. 217)	2/1	W	4,5	A. Geyer-Schulz
2540506	Recommender Systems (p. 465)	2/1	S	4,5	A. Geyer-Schulz
2540533	Personalization and Services (p. 422)	2/1	S	4,5	A. Sonnenbichler
2540518	Social Network Analysis in CRM (p. 550)	2/1	S	4,5	A. Geyer-Schulz
2540531	Business Dynamics (p. 203)	2/1	W	4,5	A. Geyer-Schulz, P. Glenn
2595501	Service Analytics (p. 534)	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 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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540502	Markets and Organizations: Principles (p. 363)	2/1	W	4,5	A. Geyer-Schulz
2540460	Market Engineering: Information in Institutions (p. 372)	2/1	S	4,5	C. Weinhardt, M. Adam
2561232	Telecommunication and Internet Economics (p. 594)	2/1	W	4,5	K. Mitusch
2540531	Business Dynamics (p. 203)	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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540460	Market Engineering: Information in Institutions (p. 372)	2/1	S	4,5	C. Weinhardt, M. Adam
2590408	Auction Theory (p. 172)	2/1	W	4.5	K. Ehrhart
2540454	eFinance: Information Engineering and Management for Securities Trading (p. 230)	2/1	W	4,5	C. Weinhardt
2590458	Computational Economics (p. 214)	2/1	W	4,5	P. Shukla, S. Caton
2540489	Experimental Economics (p. 258)	2/1	W	4,5	M. Adam, C. Weinhardt
2540464	eEnergy: Markets, Services, Systems (p. 227)	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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540456	Business Models in the Internet: Planning and Implementation (p. 282)	2/1	S	4,5	H. Gimpel, R. Knapper
2540498	Special Topics in Information Engineering & Management (p. 554)	3	W/S	4,5	C. Weinhardt
2540506	Recommender Systems (p. 465)	2/1	S	4,5	A. Geyer-Schulz
2540533	Personalization and Services (p. 422)	2/1	S	4,5	A. Sonnenbichler
2595468	Service Innovation (p. 537)	2/1	S	5	G. Satzger, M. Kohler, N. Feldmann
2595477	Practical Seminar Service Innovation (p. 531)	3		5	G. Satzger, M. Kohler, H. Fromm, N. Feldmann

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.

Module: Communications & Markets [WI4BWLISM5]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540462	Communications Economics (p. 212)	2/1	S	4,5	J. Kraemer
2540460	Market Engineering: Information in Institutions (p. 372)	2/1	S	4,5	C. Weinhardt, M. Adam
2590408	Auction Theory (p. 172)	2/1	W	4.5	K. Ehrhart
2540498	Special Topics in Information Engineering & Management (p. 554)	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.

The module will be offered latest until SS 2014.

Module: Service Management [WI4BWLISM6]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2595484	Business and IT Service Management (p. 202)	2/1	W	5	G. Satzger, J. Kunze von Bischoffshausen
2595468	Service Innovation (p. 537)	2/1	S	5	G. Satzger, M. Kohler, N. Feldmann
2595501	Service Analytics (p. 534)	2/1	S	4,5	T. Setzer, H. Fromm
2595505	Industrial Services (p. 326)	2/1	W	4,5	H. Fromm, P. Korevaar

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

ECTS Credits	Cycle	Duration
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. 317)	2/1	W	5	H. Gimpel, W. Michalk
2540462	Communications Economics (p. 212)	2/1	S	4,5	J. Kraemer
2540460	Market Engineering: Information in Institutions (p. 372)	2/1	S	4,5	C. Weinhardt, M. Adam
2540498	Special Topics in Information Engineering & Management (p. 554)	3	W/S	4,5	C. Weinhardt
2540464	eEnergy: Markets, Services, Systems (p. 227)	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.

The course "Communications Economics" will be offered latest until summer term 2014. The examination will be offered latest until winter term 2014/15 (repeaters only).

Module: Industrial Production II [WI4BWLIIIP2]

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

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2581952	Planning and Management of Industrial Plants (p. 161)	2/2	W	5,5	F. Schultmann
2581962	Emissions into the Environment (p. 235)	2/0	W	3,5	U. Karl
2581995	Material Flow Analysis and Life Cycle Assessment (p. 576)	2/0	W	3,5	L. Schebek
2581956	International Production (p. 341)	2/0	W	3,5	H. Sasse

Learning Control / Examinations

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

Conditions

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

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.

Remarks

Apart from the core course the courses offered are recommendations and can be replaced by courses from the Module Industrial Production III.

Module: Energy Economics and Energy Markets [WI4BWLIIIP4]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2581998	Basics of Liberalised Energy Markets (p. 178)	2/1	W	3,5	W. Fichtner
2581020	Energy Trade and Risk Management (p. 243)	2/1	S	3,5	K. Hufendiek
2581959	Energy Policy (p. 244)	2/0	S	3,5	M. Wietschel
2581022	Gas-Markets (p. 253)	2/0	W	3	A. Pustisek
2581025	Simulation Game in Energy Economics (p. 426)	2/0	S	3	W. Fichtner
2560234	Regulation Theory and Practice (p. 469)	2/1	S	4,5	K. Mitusch
2540464	eEnergy: Markets, Services, Systems (p. 227)	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

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

Recommendations

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

Learning Outcomes

The student

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

Content

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

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

Gas-Markets: producing countries, provision structures, market places, pricing

Energy Policy: Management of energy flows, energy-political targets and instruments (emission trading etc.)

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

Module: Energy Economics and Technology [WI4BWLIIIP5]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2581003	Energy and Environment (p. 239)	2/1	S	4,5	U. Karl, n.n.
2581958	Strategical Aspects of Energy Economy (p. 579)	2/0	W	3,5	A. Ardone
2581000	Technological Change in Energy Eco- nomics (p. 593)	2/0	W	3	M. Wietschel
2581001	Heat Economy (p. 640)	2/0	S	3	W. Fichtner
2581002	Energy Systems Analysis (p. 246)	2/0	W	3	V. Bertsch
2581006	Efficient Energy Systems and Electric Mobility (p. 228)	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.

Recommendations

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

Learning Outcomes

The student

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

Content

Strategical Aspects of Energy Economy: Long-term planning methods, generation technologies

Technological Change in Energy Economics: Future energy technologies, learning curves, energy demand

Heat Economy: district heating, heating technologies, reduction of heat demand, statutory provisions

Energy Systems Analysis: Interdependencies in energy economics, energy systems modelling approaches in energy economics

Energy and Environment: emission factors, emission reduction measures, environmental impact

Efficient Energy Systems and Electric Mobility: concepts and current trends in energy efficiency, Overview of and economical, ecological and social impacts through electric mobility

Module: Industrial Production III [WI4BWLIIIP6]

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

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)
2581954	Production and Logistics Management (p. 451)	2/2	S	5,5	M. Fröhling
2581963	The Management of R&D Projects with Case Studies (p. 260)	2/2	W/S	3,5	H. Schmied
2581961	Supply Chain Management with Advanced Planning Systems (p. 587)	2	S	3,5	M. Göbelt, C. Sürle
2581992	Risk Management in Industrial Supply Networks (p. 475)	2/0	W	3,5	M. Wiens
2581957	Supply Chain Management in the automotive industry (p. 585)	2/0	W	3,5	T. Heupel, H. Lang

Learning Control / Examinations

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

Conditions

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

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" [WW3BWLIIIP] (Bachelor) and "Industrial Production II" [WI4BWLIIIP2] (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.

Remarks

Apart from the core course the courses offered are recommendations and can be replaced by courses from the Module Industrial Production II.

Module: Marketing Management [WI4BWL MAR5]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2571154	Product and Innovation Marketing (p. 450)	2/0	S	3	M. Klarmann
2571150	Market Research (p. 374)	2/1	S	4,5	M. Klarmann
2572167	Behavioral Approaches in Marketing (p. 624)	2/1	W	4,5	B. Neibecker
2571165	Strategic and Innovative Decision Making in Marketing (p. 580)	2/1	S	4,5	B. Neibecker
2572184	Business Plan Workshop (p. 204)	1	S	3	M. Klarmann, O. Terzidis
2571176	Marketing Strategy Business Game (p. 373)	1	S	1,5	M. Klarmann, Mitarbeiter
2571185	Strategic Brand Management (p. 578)	1/0	S	1,5	M. Klarmann, J. Blickhäuser

Learning Control / Examinations

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

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

Conditions

Only one of the following courses can be counted towards the final grade of the module:

Marketing Strategy Business Game, Business Plan Workshop or Strategic Brand Management.

Learning Outcomes

Content

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

- “Product and Innovation Marketing”
- “Market Research” – this course has to be completed successfully by students interested in seminar or master thesis positions at the chair of marketing
- “Strategic and Behavioral Marketing”
- “Strategic and Innovative Decision Making in Marketing”
- “Business Plan Workshop”
- “Marketing and Strategy Business Game”

Remarks

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

Module: Sales Management [WI4BWL MAR6]

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

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2572156	Sales Management and Retailing (p. 634)	2	W	3	M. Klarmann
2572157	Pricing (p. 445)	2	W	3	M. Klarmann
2571150	Market Research (p. 374)	2/1	S	4,5	M. Klarmann
2572182	Case Studies in Pricing (p. 207)	1	W	1,5	M. Klarmann, Mitarbeiter
2572180	Sales Strategy and Control (p. 477)	1	W	1,5	M. Artz

Learning Control / Examinations

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

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

Conditions

None.

Learning Outcomes**Content**

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

- "Sales Management and Retailing"
- "Pricing"
- "Market Research" - this course has to be completed successfully by students interested in seminar or master thesis positions at the chair of marketing
- "Case Studies in Pricing"
- "Sales Strategy and Control"

Remarks

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

Module: Strategy, Communication, and Data Analysis [WI4BWL MAR7]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2572167	Behavioral Approaches in Marketing (p. 624)	2/1	W	4,5	B. Neibecker
2571165	Strategic and Innovative Decision Making in Marketing (p. 580)	2/1	S	4,5	B. Neibecker
2571162	Information Technology and Business Information (p. 328)	2/1	S	4,5	B. Neibecker
2572157	Pricing (p. 445)	2	W	3	M. Klarmann

Learning Control / Examinations

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

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

Remarks

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

Module: Entrepreneurship (EnTechnon) [WI4BWLENT1]

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2545001	Entrepreneurship (p. 249)	2	W/S	3	O. Terzidis, W. Runge, A. Presse
2545010	Design Thinking (p. 223)	2	W/S	3	O. Terzidis, B. Kneisel, Dr. H. Haller
2545005	Business Planning (p. 283)	2	W/S	3	O. Terzidis, A. Presse, J. Stohr
2545024	Developing and Validating Business Ideas (p. 281)	2	W	3	H. Haller, C. Hardt, M. Völkel
2545012	Entrepreneurial Leadership & Innovation Management (p. 248)	2	W	3	O. Terzidis, C. Linz
2545003	Managing New Technologies (p. 368)	2/1	S	5	T. Reiß
2572184	Business Plan Workshop (p. 204)	1	S	3	M. Klarmann, O. Terzidis
2545015	Innovation Management (p. 333)	2	S	3	M. Weissenberger-Eibl
2540456	Business Models in the Internet: Planning and Implementation (p. 282)	2/1	S	4,5	H. Gimpel, R. Knapper
2513305	Developing Business Models for the Semantic Web (p. 224)	2	W	3	R. Studer, M. Maleshkova, F. Keppmann
2545019	Case studies seminar: Innovation management (p. 266)	2	W	3	M. Weissenberger-Eibl
2545016	Roadmapping (p. 476)	2	S	3	D. Koch

Learning Control / Examinations

See German version.

Conditions

None.

Learning Outcomes**Content**

Module: Innovation Management [WI4BWLENT2]

Coordination: M. Weissenberger-Eibl
Degree programme: Wirtschaftsingenieurwesen (M.Sc.)
Subject: Business Administration

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2545015	Innovation Management (p. 333)	2	S	3	M. Weissenberger-Eibl
2545016	Roadmapping (p. 476)	2	S	3	D. Koch
2545017	Technology Assessment (p. 591)	2	S	3	D. Koch
2545018	Technologies for Innovation Management (p. 592)	2	W	3	D. Koch
2545019	Case studies seminar: Innovation management (p. 266)	2	W	3	M. Weissenberger-Eibl
2545020	Knowledge Transfer in Innovation Management (p. 652)	2	W	3	M. Weissenberger-Eibl, P. Roth
2545018	Current issues in Innovation Management (p. 154)	2	W/S	3	M. Weissenberger-Eibl
2545001	Entrepreneurship (p. 249)	2	W/S	3	O. Terzidis, W. Runge, A. Presse
2545010	Design Thinking (p. 223)	2	W/S	3	O. Terzidis, B. Kneisel, Dr. H. Haller
2545012	Entrepreneurial Leadership & Innovation Management (p. 248)	2	W	3	O. Terzidis, C. Linz

Learning Control / Examinations

See German version.

Conditions

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

Recommendations

None.

Learning Outcomes

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

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

Content

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

Module: Service Analytics [WI4BWLKSR1]

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2595501	Service Analytics (p. 534)	2/1	S	4,5	T. Setzer, H. Fromm
2595505	Industrial Services (p. 326)	2/1	W	4,5	H. Fromm, P. Korevaar
2540498	Special Topics in Information Engineering & Management (p. 554)	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 Service Analytics [2595501] is compulsory and must be examined.

Recommendations

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

Learning Outcomes

The student should learn to

- Understand different scenarios where analytics is applied in a service context
- Distinguish different analytics methods and concepts and learn when to apply them
- Apply analytics tools in a service context
- Analyze and solve real-world business problems through leveraging analytics

Content

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

Module: Service Design Thinking [WI4BWLKSR2]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2595600	Service Design Thinking (p. 536)	6	W/S	9	C. Weinhardt

Learning Control / Examinations

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

Conditions

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

Recommendations

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

Learning Outcomes

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

Content

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

Remarks

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

Module: Real Estate Economics and Sustainability [WI4BWLÖÖW1]

Coordination: D. Lorenz
Degree programme: Wirtschaftsingenieurwesen (M.Sc.)
Subject: Business Administration

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2586407/2586408	Real Estate Economics and Sustainability Part 1: Basics and Valuation (p. 324)	2/1	W	4,5	D. Lorenz
2585406/2585407	Real Estate Economics and Sustainability Part 2: Reporting and Rating (p. 325)	2/1	S	4,5	D. Lorenz

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 examination for the courses generally consist of a 60 minute written exam. A 20 minute oral exam is only offered after the second failure of the written exam. The exams for the respective parts (Part 1: Basics and Valuation and Part 2: Reporting and Rating) happen in the same semester in which the lectures take place.

Therefore, Part I currently only takes place in the winter semester and Part II takes place in the summer semester. In each semester there are two alternative dates for the exam and exams can be re-sat at any regular exam date.

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

It is possible to include the grade of a seminar paper, dealing with a topic from the area of Real Estate Economics and Sustainability, into the final grade of the module (according to Section 4(2), 3 of the examination regulation). The seminar has a weight of 20 percent.

Conditions

None.

Recommendations

A combination with courses in the area of

- Finance
- Insurance
- Civil engineering and architecture

is recommended.

Particularly recommended is the successful completion of the following Bachelor-Modules:

- Real Estate Management I and II
- Design, Construction and Assessment of Green Buildings I and II

Learning Outcomes

The student

- possesses an overview of key interrelationships within the real estate industry concerning macro- and microeconomic questions as well as the interaction of the industry's key players;
- is aware of the basics concerning the sustainable development debate and knows about the possible contribution of buildings and the real estate industry to a more sustainable development;
- knows the basics, key methods and tools of property valuation and is able to apply them;
- is aware of the key influencing factors of a building's market value and is able to factor in sustainability considerations into market value estimates;
- possess an overview of important other methods and processes – besides property valuation – which are applied within the real estate industry to assess property related risks (e.g. property ratings) and to communicate property performance towards third parties (e.g. sustainability assessment of buildings and sustainability reporting of companies).

Content

The implementation of sustainable development principles within the real estate industry requires taking into account sustainability considerations within real estate related procedures and decision making processes. Within this context, property valuation and valuation professionals play an important role.

Property valuations are carried out in almost any phase of the building life cycle and support, for example, financing as well as buy and sell decisions.

Valuation methods and procedures, however, have to be adjusted to changing market participants' preferences and their willingness to pay. For this reason, the issue of "valuation and sustainability" is of particular topicality and relevance.

Within the real estate industry professionals are sought which combine micro- and macroeconomic knowledge and real estate specific expertise with knowledge and skills regarding the sustainability of buildings and building stocks.

The real estate industry offers attractive working and career opportunities. This teaching module / course therefore offers insights into key methods applied within the real estate industry (particularly valuation) and places them into the context of sustainable development. The focus of the module / course, however, is not only on theoretical content but also on the provisioning of linkages to real estate practice; this will be realized, amongst other issues, by practical tutorials which are offered in addition to the course lectures.

Remarks

See German version.

5.2 Economics

Module: Applied Strategic Decisions [WI4VWL2]

Coordination: P. Reiss
Degree programme: Wirtschaftsingenieurwesen (M.Sc.)
Subject: Economics

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
n.n.	Advanced Game Theory (p. 151)	2/1	W	4,5	P. Reiss, C. Puppe
2590408	Auction Theory (p. 172)	2/1	W	4,5	K. Ehrhart
2540460	Market Engineering: Information in Institutions (p. 372)	2/1	S	4,5	C. Weinhardt, M. Adam
2540489	Experimental Economics (p. 258)	2/1	W	4,5	M. Adam, C. Weinhardt
2520402/ 2520403	Predictive Mechanism and Market Design (p. 444)	2/1	W	4,5	P. Reiss
2530214	Corporate Financial Policy (p. 215)	2/1	S	4,5	M. Ruckes
2530232	Financial Intermediation (p. 271)	3	W	4,5	M. Ruckes
2520365	Decision Theory (p. 250)	2/1	S	4,5	K. Ehrhart

Learning Control / Examinations

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

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

Conditions

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

Recommendations

Basic knowledge in game theory is assumed.

Learning Outcomes

Students

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

Content

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

Remarks

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

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

Module: Economic Policy II [WI4VWL3]

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

ECTS Credits	Cycle	Duration
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. 256)	2/1	W	4,5	J. Kowalski
2560236	Innovationtheory and -policy (p. 334)	2/1	S	4,5	I. Ott
2560254	International Economic Policy (p. 344)	2/1	S	4,5	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

ECTS Credits	Cycle	Duration
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. 646)	2/1	W	4,5	K. Mitusch
2560234	Regulation Theory and Practice (p. 469)	2/1	S	4,5	K. Mitusch
2560230	Transport Economics (p. 602)	2/1	S	4,5	G. Liedtke, E. Szimba
2561232	Telecommunication and Internet Economics (p. 594)	2/1	W	4,5	K. Mitusch
2520527	Advanced Topics in Economic Theory (p. 152)	2/1	S	4,5	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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2521547	Environmental Economics and Sustainability (p. 611)	2/1	W	5	R. Walz
2560548	Environmental and Ressource Policy (p. 607)	2	S	4	R. Walz
2581003	Energy and Environment (p. 239)	2/1	S	4,5	U. Karl, n.n.
24140	Environmental Law (p. 612)	2	W	3	G. Sydow
2560230	Transport Economics (p. 602)	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**

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

Module: Allocation and Equilibrium [WI4VWL7]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520527	Advanced Topics in Economic Theory (p. 152)	2/1	S	4,5	M. Hillebrand, K. Mitusch
2520517	Welfare Economics (p. 653)	2/1	S	4,5	C. Puppe
25549	Theory of Business Cycles (p. 597)	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 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****Remarks**

See German version.

Module: Macroeconomic Theory [WI4VWL8]

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520543	Theory of Economic Growth (p. 598)	2/1	S	4,5	M. Hillebrand
25549	Theory of Business Cycles (p. 597)	2/1	W	4,5	M. Hillebrand
2561503	Theory of endogenous growth (p. 238)	2/1	W	4,5	I. Ott

Learning Control / Examinations

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520517	Welfare Economics (p. 653)	2/1	S	4,5	C. Puppe
2520525	Introduction to Game Theory (p. 232)	2/1	S	4,5	C. Puppe, P. Reiss
25539	Mathematical Theory of Democracy (p. 379)	2/1	W	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****Remarks**

See German version.

Module: Telecommunications Markets [WI4VWL10]

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2561232	Telecommunication and Internet Economics (p. 594)	2/1	W	4,5	K. Mitusch
2540462	Communications Economics (p. 212)	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.

Remarks

The module will be offered latest until SS 2014.

Module: Transport infrastructure policy and regional development [WI4VWL11]

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2560230	Transport Economics (p. 602)	2/1	S	4,5	G. Liedtke, E. Szimba
2561260 / 2561261	Spatial Economics (p. 552)	2/1	W	4,5	I. Ott
2561220	Assessment of Public Policies and Projects 1 (p. 191)	2	W	3	A. Kopp
2560220	Assessment of Public Policies and Projects 2 (p. 192)	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: Growth and Agglomeration [WI4VWL12]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2561503	Theory of endogenous growth (p. 238)	2/1	W	4,5	I. Ott
2561260 / 2561261	Spatial Economics (p. 552)	2/1	W	4,5	I. Ott
2560254	International Economic Policy (p. 344)	2/1	S	4,5	J. Kowalski

Learning Control / Examinations

The assessment is carried out as partial written exams (see the lectures descriptions).
 The overall grade for the module is the average of the grades for each course weighted by the credits.

Conditions

Successful completion of the courses *Economics I: Microeconomics* [2600012] and *Economics II: Macroeconomics* [2600014] is required.

Recommendations

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

Learning Outcomes

The student

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

Content

The module includes the contents of the lectures *Endogenous Growth Theory* [2561503], *Spatial Economics* [2561260] and *International Economic Policy* [2560254]. While the first two lectures have a more formal-analytic focus, the third lecture approaches fundamental ideas and problems from the field of international economic policy from a more verbal perspective. The common underlying principle of all three lectures in this module is that, based on different theoretical models, economic policy recommendations are derived.

Module: Agglomeration and Innovation [WI4VWL13]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2561260 / 2561261	Spatial Economics (p. 552)	2/1	W	4,5	I. Ott
2560236	Innovationtheory and -policy (p. 334)	2/1	S	4,5	I. Ott
2520527	Advanced Topics in Economic Theory (p. 152)	2/1	S	4,5	M. Hillebrand, K. Mitusch

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 add up to at least 9.

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

Conditions

Successful completion of the courses *Economics I: Microeconomics* [2600012] and *Economics II: Macroeconomics* [2600014] is required.

Learning Outcomes

The student

- applies quantitative methods in the context of economic models
- learns advanced micro- and macroeconomic theories
- is able to derive policy recommendations based on theory
- can identify the importance of alternative incentive mechanisms for the development and spread of innovations
- begins to understand the connections between market form and the development of innovations
- analyzes the determinants of the spatial distribution of economic activity
- understands how processes of concentration result from the interplay of agglomeration and dispersion forces

Content

The module comprises theories of incentives for the development of innovations as well as theories of wage-based labor mobility, which leads to spatial concentration processes. The microfounded optimality decisions of the actors are in each case transformed into macroeconomic results. In the context of the theory of innovations the diffusion of technological knowledge and the resulting effect on growth due to technological progress is discussed and economic-policy implications are derived. Spatial economics adds to the picture of economic activity by introducing a spatial point of view.

Remarks

See German version.

Module: Economic Theory and its Application in Finance [WI4VWL14]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520527	Advanced Topics in Economic Theory (p. 152)	2/1	S	4,5	M. Hillebrand, K. Mitusch
2530214	Corporate Financial Policy (p. 215)	2/1	S	4,5	M. Ruckes
2530232	Financial Intermediation (p. 271)	3	W	4,5	M. Ruckes
2530555	Asset Pricing (p. 167)	2/1	S	4,5	M. Uhrig-Homburg, M. Ruckes

Learning Control / Examinations

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

Conditions

The course „Advanced Topics in Economic Theory“ is compulsory and must be examined.
 It is only possible to choose this module in the Elective Programme.

Recommendations

None.

Learning Outcomes

Students will learn the methods of formal economic modeling, particularly of General Equilibrium Theory and contract theory, as well as their applications to the topics in Finance, specifically the areas of financial markets and institutions and corporate finance. This will yield many useful insights into the relationship between firms and investors and the functioning of financial markets.

Content

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

Module: Microeconomic Theory [WI4VWL15]

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
n.n.	Advanced Game Theory (p. 151)	2/1	W	4,5	P. Reiss, C. Puppe
2520527	Advanced Topics in Economic Theory (p. 152)	2/1	S	4,5	M. Hillebrand, K. Mitusch
n.n.	Social Choice Theory (p. 547)	2/1	S	4,5	C. Puppe

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

None.

Learning Outcomes**Content**

Module: Collective Decision Making [WI4VWL16]

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
25539	Mathematical Theory of Democracy (p. 379)	2/1	W	4,5	A. Melik-Tangyan
n.n.	Social Choice Theory (p. 547)	2/1	S	4,5	C. Puppe
2561127	Public Management (p. 456)	2	W	4,5	B. Wigger, Assistenten

Learning Control / Examinations

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

None.

Learning Outcomes**Content**

Module: Experimental Economics [WI4VWL17]

Coordination: P. Reiss
Degree programme: Wirtschaftsingenieurwesen (M.Sc.)
Subject: Economics

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2540489	Experimental Economics (p. 258)	2/1	W	4,5	M. Adam, C. Weinhardt
2520402/ 2520403	Predictive Mechanism and Market Design (p. 444)	2/1	W	4,5	P. Reiss
n.n.	Topics in Experimental Economics (p. 601)	2/1	S	4,5	P. Reiss

Learning Control / Examinations

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

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

Conditions

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

Recommendations

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

Learning Outcomes

Students

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

Content

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

Remarks

- The course *Advanced Game Theory* is not offered before Winter 2014/15.
- The course *Predictive Mechanism and Market Design* is not offered each year.

Module: Innovation and growth [WI4VWLIWW1]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520543	Theory of Economic Growth (p. 598)	2/1	S	4,5	M. Hillebrand
2560236	Innovationtheory and -policy (p. 334)	2/1	S	4,5	I. Ott
2561503	Theory of endogenous growth (p. 238)	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

ECTS Credits 9	Cycle Every term	Duration 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. 155)	2/1	W	5	H. Schmeck
2511030	Applied Informatics I - Modelling (p. 159)	2/1	W	5	A. Oberweis, R. Studer, S. Agarwal
2511032	Applied Informatics II - IT Systems for e-Commerce (p. 160)	2/1	S	5	S. Tai
2511400	Complexity Management (p. 213)	2/1	S	5	D. Seese
2511200	Database Systems (p. 219)	2/1	S	5	A. Oberweis, Dr. D. Sommer
2511500	Service Oriented Computing 1 (p. 538)	2/1	W	5	S. Tai
2511300	Knowledge Management (p. 651)	2/1	W	5	R. Studer
2511504	Cloud Computing (p. 210)	2/1	W	5	S. Tai
2511202	Database Systems and XML (p. 220)	2/1	W	5	A. Oberweis
2511212	Document Management and Groupware Systems (p. 225)	2	S	4	S. Klink
2511100	Efficient Algorithms (p. 229)	2/1	S	5	H. Schmeck
2511600	Enterprise Architecture Management (p. 247)	2/1	W	5	T. Wolf
2511402	Intelligent Systems in Finance (p. 340)	2/1	S	5	D. Seese
2511404	IT Complexity in Practice (p. 370)	2/1	W	5	D. Seese, Kreidler
2511302	Knowledge Discovery (p. 351)	2/1	W	5	R. Studer
2511214	Management of IT-Projects (p. 369)	2/1	S	5	R. Schätzle
2511210	Business Process Modelling (p. 390)	2/1	W	5	A. Oberweis
2511106	Nature-inspired Optimisation Methods (p. 400)	2/1	S	5	S. Mostaghim, P. Shukla
2511104	Organic Computing (p. 414)	2/1	S	5	H. Schmeck, S. Mostaghim
2590458	Computational Economics (p. 214)	2/1	W	4,5	P. Shukla, S. Caton
2511216	Capability maturity models for software and systems engineering (p. 470)	2	S	4	R. Kneuper
2511308	Service Oriented Computing 2 (p. 539)	2/1	S	5	R. Studer, S. Agarwal, B. Norton
2511208	Software Technology: Quality Management (p. 549)	2/1	S	5	A. Oberweis
25700sp	Special Topics of Efficient Algorithms (p. 556)	2/1	W/S	5	H. Schmeck
SBI	Special Topics of Enterprise Information Systems (p. 555)	2/1	W/S	5	A. Oberweis
KompMansp	Special Topics of Complexity Management (p. 557)	2/1	W/S	5	D. Seese
SSEsp	Special Topics of Software- and Systemsengineering (p. 558)	2/1	W/S	5	A. Oberweis, D. Seese
25860sem	Special Topics of Knowledge Management (p. 559)	2/1	W/S	5	R. Studer
2511602	Strategic Management of Information Technology (p. 581)	2/1	S	5	T. Wolf
2511204	Workflow-Management (p. 654)	2/1	S	5	A. Oberweis
25810	Practical Seminar Knowledge Discovery (p. 530)	2	S	4	R. Studer
PraBI	Computing Lab Information Systems (p. 436)	2	W/S	4	A. Oberweis, D. Seese, R. Studer

25700p	Advanced Lab in Efficient Algorithms (p. 438)	3	W/S	4	H. Schmeck
25762p	Computing Lab in Intelligent Systems in Finance (p. 439)	3	W/S	4	D. Seese
25818	Computing Lab in Complexity Management (p. 440)	3	W/S	4	D. Seese
25820	Lab Class Cloud Computing (p. 437)	3	W	4	S. Tai
25740p	Exercises in Knowledge Management (p. 441)	3	W/S	4	R. Studer
2511218	Requirements Analysis and Requirements Management (p. 158)	2/0	W	4	R. Kneuper
2511506	Business Activity Management (p. 201)	2/1	S	5	C. Janiesch
2511310	Semantic Web Technologies (p. 491)	2/1	S	5	R. Studer, A. Harth

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], *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.

Module: Emphasis in Informatics [WI4INFO2]

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

ECTS Credits	Cycle	Duration
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. 155)	2/1	W	5	H. Schmeck
2511030	Applied Informatics I - Modelling (p. 159)	2/1	W	5	A. Oberweis, R. Studer, S. Agarwal
2511032	Applied Informatics II - IT Systems for e-Commerce (p. 160)	2/1	S	5	S. Tai
2511400	Complexity Management (p. 213)	2/1	S	5	D. Seese
2511200	Database Systems (p. 219)	2/1	S	5	A. Oberweis, Dr. D. Sommer
2511500	Service Oriented Computing 1 (p. 538)	2/1	W	5	S. Tai
2511300	Knowledge Management (p. 651)	2/1	W	5	R. Studer
2511202	Database Systems and XML (p. 220)	2/1	W	5	A. Oberweis
2511212	Document Management and Groupware Systems (p. 225)	2	S	4	S. Klink
2511100	Efficient Algorithms (p. 229)	2/1	S	5	H. Schmeck
2511600	Enterprise Architecture Management (p. 247)	2/1	W	5	T. Wolf
2511402	Intelligent Systems in Finance (p. 340)	2/1	S	5	D. Seese
2511404	IT Complexity in Practice (p. 370)	2/1	W	5	D. Seese, Kreidler
2511302	Knowledge Discovery (p. 351)	2/1	W	5	R. Studer
2511214	Management of IT-Projects (p. 369)	2/1	S	5	R. Schätzle
2511210	Business Process Modelling (p. 390)	2/1	W	5	A. Oberweis
2511106	Nature-inspired Optimisation Methods (p. 400)	2/1	S	5	S. Mostaghim, P. Shukla
2511104	Organic Computing (p. 414)	2/1	S	5	H. Schmeck, S. Mostaghim
2590458	Computational Economics (p. 214)	2/1	W	4,5	P. Shukla, S. Caton
2511216	Capability maturity models for software and systems engineering (p. 470)	2	S	4	R. Kneuper
2511308	Service Oriented Computing 2 (p. 539)	2/1	S	5	R. Studer, S. Agarwal, B. Norton
2511208	Software Technology: Quality Management (p. 549)	2/1	S	5	A. Oberweis
SBI	Special Topics of Enterprise Information Systems (p. 555)	2/1	W/S	5	A. Oberweis
25700sp	Special Topics of Efficient Algorithms (p. 556)	2/1	W/S	5	H. Schmeck
KompMansp	Special Topics of Complexity Management (p. 557)	2/1	W/S	5	D. Seese
SSEsp	Special Topics of Software- and Systemsengineering (p. 558)	2/1	W/S	5	A. Oberweis, D. Seese
25860sem	Special Topics of Knowledge Management (p. 559)	2/1	W/S	5	R. Studer
2511602	Strategic Management of Information Technology (p. 581)	2/1	S	5	T. Wolf
2511204	Workflow-Management (p. 654)	2/1	S	5	A. Oberweis
PraBI	Computing Lab Information Systems (p. 436)	2	W/S	4	A. Oberweis, D. Seese, R. Studer
25700p	Advanced Lab in Efficient Algorithms (p. 438)	3	W/S	4	H. Schmeck
25762p	Computing Lab in Intelligent Systems in Finance (p. 439)	3	W/S	4	D. Seese

25818	Computing Lab in Complexity Management (p. 440)	3	W/S	4	D. Seese
25810	Practical Seminar Knowledge Discovery (p. 530)	2	S	4	R. Studer
25820	Lab Class Cloud Computing (p. 437)	3	W	4	S. Tai
25740p	Exercises in Knowledge Management (p. 441)	3	W/S	4	R. Studer
2511504	Cloud Computing (p. 210)	2/1	W	5	S. Tai
2511218	Requirements Analysis and Requirements Management (p. 158)	2/0	W	4	R. Kneuper
2511506	Business Activity Management (p. 201)	2/1	S	5	C. Janiesch
2511310	Semantic Web Technologies (p. 491)	2/1	S	5	R. Studer, A. Harth

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 seperately.

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

Conditions

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] 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.

Module: Electives in Informatics [WI4INFO3]

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

ECTS Credits	Cycle	Duration
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. 155)	2/1	W	5	H. Schmeck
2511030	Applied Informatics I - Modelling (p. 159)	2/1	W	5	A. Oberweis, R. Studer, S. Agarwal
2511032	Applied Informatics II - IT Systems for e-Commerce (p. 160)	2/1	S	5	S. Tai
2511400	Complexity Management (p. 213)	2/1	S	5	D. Seese
2511200	Database Systems (p. 219)	2/1	S	5	A. Oberweis, Dr. D. Sommer
2511500	Service Oriented Computing 1 (p. 538)	2/1	W	5	S. Tai
2511300	Knowledge Management (p. 651)	2/1	W	5	R. Studer
2511202	Database Systems and XML (p. 220)	2/1	W	5	A. Oberweis
2511212	Document Management and Groupware Systems (p. 225)	2	S	4	S. Klink
2511100	Efficient Algorithms (p. 229)	2/1	S	5	H. Schmeck
2511600	Enterprise Architecture Management (p. 247)	2/1	W	5	T. Wolf
2511402	Intelligent Systems in Finance (p. 340)	2/1	S	5	D. Seese
2511404	IT Complexity in Practice (p. 370)	2/1	W	5	D. Seese, Kreidler
2511302	Knowledge Discovery (p. 351)	2/1	W	5	R. Studer
2511214	Management of IT-Projects (p. 369)	2/1	S	5	R. Schätzle
2511210	Business Process Modelling (p. 390)	2/1	W	5	A. Oberweis
2511106	Nature-inspired Optimisation Methods (p. 400)	2/1	S	5	S. Mostaghim, P. Shukla
2511104	Organic Computing (p. 414)	2/1	S	5	H. Schmeck, S. Mostaghim
2590458	Computational Economics (p. 214)	2/1	W	4,5	P. Shukla, S. Caton
2511216	Capability maturity models for software and systems engineering (p. 470)	2	S	4	R. Kneuper
2511308	Service Oriented Computing 2 (p. 539)	2/1	S	5	R. Studer, S. Agarwal, B. Norton
2511208	Software Technology: Quality Management (p. 549)	2/1	S	5	A. Oberweis
SBI	Special Topics of Enterprise Information Systems (p. 555)	2/1	W/S	5	A. Oberweis
25700sp	Special Topics of Efficient Algorithms (p. 556)	2/1	W/S	5	H. Schmeck
KompMansp	Special Topics of Complexity Management (p. 557)	2/1	W/S	5	D. Seese
SSEsp	Special Topics of Software- and Systemsengineering (p. 558)	2/1	W/S	5	A. Oberweis, D. Seese
25860sem	Special Topics of Knowledge Management (p. 559)	2/1	W/S	5	R. Studer
2511602	Strategic Management of Information Technology (p. 581)	2/1	S	5	T. Wolf
2511204	Workflow-Management (p. 654)	2/1	S	5	A. Oberweis
PraBI	Computing Lab Information Systems (p. 436)	2	W/S	4	A. Oberweis, D. Seese, R. Studer
25700p	Advanced Lab in Efficient Algorithms (p. 438)	3	W/S	4	H. Schmeck
25762p	Computing Lab in Intelligent Systems in Finance (p. 439)	3	W/S	4	D. Seese

25810	Practical Seminar Knowledge Discovery (p. 530)	2	S	4	R. Studer
25818	Computing Lab in Complexity Management (p. 440)	3	W/S	4	D. Seese
25820	Lab Class Cloud Computing (p. 437)	3	W	4	S. Tai
25740p	Exercises in Knowledge Management (p. 441)	3	W/S	4	R. Studer
2511504	Cloud Computing (p. 210)	2/1	W	5	S. Tai
2511218	Requirements Analysis and Requirements Management (p. 158)	2/0	W	4	R. Kneuper
2511506	Business Activity Management (p. 201)	2/1	S	5	C. Janiesch
2511310	Semantic Web Technologies (p. 491)	2/1	S	5	R. Studer, A. Harth

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

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.

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2550486	Facility Location and Strategic Supply Chain Management (p. 565)	2/1	W	4,5	S. Nickel
2550488	Tactical and Operational Supply Chain Management (p. 590)	2/1	S	4,5	S. Nickel
2550480	Operations Research in Supply Chain Management (p. 407)	2/1	W/S	4,5	S. Nickel
2550495	Operations Research in Health Care Management (p. 406)	2/1	W/S	4,5	S. Nickel
2550493	Hospital Management (p. 353)	2/0	W/S	3	S. Nickel, Hansis
2550498	Practical seminar: Health Care Management (with Case Studies) (p. 443)	2/1/2	W/S	7	S. Nickel
2550497	Software Laboratory: OR Models II (p. 548)	2/1	S	4,5	S. Nickel
2550488	Discrete-event Simulation in Production and Logistics (p. 255)	2/1	S	4,5	S. Nickel, S. Spieckermann
2550494	Supply Chain Management in the Process Industry (p. 586)	2/1	W	4,5	S. Nickel

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

See German version.

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

ECTS Credits	Cycle	Duration
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. 278)	2/1	S	4,5	O. Stein
25140	Mixed Integer Programming II (p. 279)	2/1	W	4,5	O. Stein
2550128	Special Topics in Optimization I (p. 560)	2/1	W/S	4,5	O. Stein
2550126	Special Topics in Optimization II (p. 561)	2/1	W/S	4,5	O. Stein
2550484	Graph Theory and Advanced Location Models (p. 290)	2/1	W/S	4,5	S. Nickel
2550111	Nonlinear Optimization I (p. 403)	2/1	S	4,5	O. Stein
2550113	Nonlinear Optimization II (p. 404)	2/1	S	4,5	O. Stein
2550134	Global Optimization I (p. 286)	2/1	W	4,5	O. Stein
2550136	Global Optimization II (p. 287)	2/1	W	4,5	O. Stein
2550120	Convex Analysis (p. 352)	2/1		4,5	O. Stein
2550115	Parametric Optimization (p. 420)	2/1		4,5	O. Stein

Learning Control / Examinations

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

See German version.

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).

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2550679	Markov Decision Models I (p. 573)	2/1/2	W	5	K. Waldmann
2550682	Markov Decision Models II (p. 574)	2/1/2	S	4,5	K. Waldmann
2550674	Quality Control I (p. 459)	2/1/2	W/S	4,5	K. Waldmann
25659	Quality Control II (p. 460)	2/1/2	W/S	4,5	K. Waldmann
25687	Optimization in a Random Environment (p. 411)	2/1/2	W/S	4,5	K. Waldmann
2550662	Simulation I (p. 543)	2/1/2	W/S	4,5	K. Waldmann
2550665	Simulation II (p. 544)	2/1/2	W/S	4,5	K. Waldmann
25688	OR-oriented modeling and analysis of real problems (project) (p. 413)	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

See German version.

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

Topics overview:

Markov Decision Models I: Markov Chains, Poisson Processes.

Markov Decision Models II: Queuing Systems, Stochastic Decision Processes

Simulation I: Generation of random numbers, Monte Carlo integration, Discrete event simulation, Discrete and continuous random variables, Statistical analysis of simulated data.

Simulation II: Variance reduction techniques, Simulation of stochastic processes, Case studies.

Quality Control I: Statistical Process Control, Acceptance Sampling, Design of experiments

Quality Control II: Reliability of complex systems with and without repair, Maintenance

OR-oriented modeling and analysis of real problems: project-based modelling and analysis

Remarks

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

5.5 Statistics

Module: Mathematical and Empirical Finance [WI4STAT1]

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

ECTS Credits	Cycle	Duration
9	Irregular	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2520357/2520358	Portfolio and Asset Liability Management (p. 432)	2/1	S	5	W. Heller
2521331	Stochastic Calculus and Finance (p. 572)	2/1	W	4,5	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 2015 on. The examination will probably be offered latest until summer term 2014.

The course Stochastic Calculus and Finance [2521331] will not be offered any more from winter term 2014/2015 on. The examination will probably be offered latest until winter term 2013/14.

Module: Statistical Methods in Risk Management [WI4STAT2]

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

ECTS Credits	Cycle	Duration
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. 571)	2/2	S	5	Y. Kim
2520357/2520358	Portfolio and Asset Liability Management (p. 432)	2/1	S	5	W. Heller
2520375	Data Mining (p. 218)	2	W/S	5	G. Nakhaeizadeh
2520317	Multivariate Methods (p. 396)	2/2	S	5	W. Heller
2521353	Statistical Methods in Financial Risk Management (p. 566)	2/1		4,5	A. Nazemi
2521325/2521326	Statistics and Econometrics in Business and Economics (p. 567)	2/2	W	4,5	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

5.6 Engineering Sciences

Module: Automotive Engineering [WI4INGMB5]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2113805	Automotive Engineering I (p. 292)	4	W	6	F. Gauterin, H. Unrau
2114835	Automotive Engineering II (p. 293)	2	S	3	F. Gauterin, H. Unrau
2115817	Project Workshop: Automotive Engineering (p. 453)	3	W/S	4,5	F. Gauterin
2113814	Fundamentals for Design of Motor-Vehicles Bodies I (p. 310)	1	W	1,5	H. Bardehle
2114840	Fundamentals for Design of Motor-Vehicles Bodies II (p. 311)	1	S	1,5	H. Bardehle
2114093	Fluid Technology (p. 273)	2	W	3	M. Geimer
2114092	BUS-Controls (p. 200)	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] and *Engineering Mechanics II* [8001092] 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

See course descriptions.

Module: Handling Characteristics of Motor Vehicles [WI4INGMB6]

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

ECTS Credits	Cycle	Duration
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. 263)	2	W	3	F. Gauterin
2114825	Vehicle Comfort and Acoustics II (p. 264)	2	S	3	F. Gauterin
2113807	Handling Characteristics of Motor Vehicles I (p. 261)	2	W	3	H. Unrau
2114838	Handling Characteristics of Motor Vehicles II (p. 262)	2	S	3	H. Unrau
2113816	Vehicle Mechatronics I (p. 265)	2	W	3	D. Ammon
2115817	Project Workshop: Automotive Engineering (p. 453)	3	W/S	4,5	F. Gauterin
2114850	Global vehicle evaluation within virtual road test (p. 280)	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

See courses.

Module: Vehicle Development [WI4INGMB14]

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

ECTS Credits	Cycle	Duration
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. 453)	3	W/S	4,5	F. Gauterin
2113816	Vehicle Mechatronics I (p. 265)	2	W	3	D. Ammon
2113812	Fundamentals in the Development of Commercial Vehicles I (p. 312)	1	W	1,5	J. Zürn
2114844	Fundamentals in the Development of Commercial Vehicles II (p. 313)	1	S	1,5	J. Zürn
2113810	Fundamentals of Automobile Development I (p. 314)	1	W	1,5	R. Frech
2114842	Fundamentals of Automobile Development II (p. 315)	1	S	1,5	R. Frech
2114843	Basics and Methods for Integration of Tires and Vehicles (p. 309)	2	S	3	G. Leister
2114095	Simulation of Coupled Systems (p. 542)	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

See courses.

Module: Mobile Machines [WI4INGMB15]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2114093	Fluid Technology (p. 273)	2	W	3	M. Geimer
2114095	Simulation of Coupled Systems (p. 542)	2	S	3	M. Geimer
2114092	BUS-Controls (p. 200)	2	S	3	M. Geimer
2114073	Mobile Machines (p. 387)	4	S	6	M. Geimer
2113812	Fundamentals in the Development of Commercial Vehicles I (p. 312)	1	W	1,5	J. Zürn
2114844	Fundamentals in the Development of Commercial Vehicles II (p. 313)	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

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2133101	Combustion Engines A (p. 619)	4/2	W	9	U. 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**

See course.

Module: Combustion Engines II [WI4INGMB19]

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

ECTS Credits	Cycle	Duration
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. 620)	2/1	S	5	U. Spicher
21112	Supercharging of Internal Combustion Engines (p. 171)	2	S	4	R. Golloch
2133109	Motor Fuels for Combustion Engines and their Verifications (p. 189)	2	W	4	J. Volz
2134138	Fundamentals of catalytic exhaust gas aftertreatment (p. 297)	2	S	4	E. Lox
21134	Methods in Analyzing Internal Combustion (p. 381)	2	S	4	U. Wagner
2134137	Engine Measurement Technologies (p. 394)	2	S	4	S. Bernhardt
21114	Simulation of Spray and Mixture Formation in Internal Combustion Engines (p. 545)	2	W	4	C. 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**

See courses.

Module: Combustion Engines I [WI4INGMB34]

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

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2133103	Combustion Engines I (p. 307)	2/1	W	5	H. Kubach, T. Koch
2133120	Thermodynamics and Energy Conversion in Internal Combustion Engines (p. 599)	2	W	4	T. Koch, H. Kubach

Learning Control / Examinations

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

Conditions

None.

Recommendations

None.

Learning Outcomes

The student can name and explain the working principle of combustion engines. He is able to analyse and evaluate the combustion process. He is able to evaluate influences of gas exchange, mixture formation, fuels and exhaust gas aftertreatment on the combustion performance. He can solve basic research problems in the field of engine development.

The student can name all important influences on the combustion process. He can analyse and evaluate the engine process considering efficiency, emissions and potential.

Content

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

Module: Combustion Engines II [WI4INGMB35]

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

ECTS Credits 9	Cycle Every term	Duration
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Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2134131	Combustion Engines II (p. 308)	2/1	S	5	H. Kubach, T. Koch
2133108	Fuels and Lubricants for Combustion Engines (p. 188)	2	W	4	B. Kehrwald, J. Volz
2134138	Fundamentals of catalytic exhaust gas aftertreatment (p. 297)	2	S	4	E. Lox
2134134	Analysis tools for combustion diagnostics (p. 382)	2	S	4	U. Wagner
2134137	Engine measurement techniques (p. 395)	2	S	4	S. Bernhardt
2134141	Gas Engines (p. 277)	2	S	4	R. Golloch
2134150	Analysis of Exhaust Gas und Lubricating Oil in Combustion Engines (p. 150)	2	S	4	M. Gohl
2134139	Model based Application Methods (p. 388)	2	S	4	F. Kirschbaum

Learning Control / Examinations

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

The course *Combustion Engines II* [2134131] has to be attended.

Recommendations

Basic skills in thermodynamics are recommended.

Learning Outcomes**Content**

Module: Introduction to Logistics [WI4INGMB20]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2117051	Material flow in logistic systems (p. 377)	3/1	W	6	K. Furmans
2118090	Quantitative Methods for Supply Chain Risk Management (p. 462)	3/1	S	6	A. Cardeneo
2118083	IT for facility logistics (p. 347)	3/1	S	6	F. Thomas
2118097	Warehousing and distribution systems (p. 355)	2	S	4	M. Schwab, J. Weiblen
2117056	Airport logistics (p. 362)	2	W	4	A. Richter
2117061	Safety engineering (p. 541)	2	W	4	H. Kany
2117064	Application of technical logistics in modern crane systems (p. 162)	2	W	4	M. Golder
2118089	Application of technical logistics in sorting- and distribution technology (p. 163)	2	S	4	J. Föller
2118085	Automotive Logistics (p. 361)	2	S	4	K. Furmans
2118094	Information Systems in Logistics and Supply Chain Management (p. 327)	2	S	4	C. Kilger
2117500	Energy efficient intralogistic systems (p. 242)	2	W	4	F. Schönung
2117095	Basics of Technical Logistics (p. 304)	3/1	W	6	M. Mittwollen, Madzharov
2117096	Elements of Technical Logistics (p. 234)	3/1	W	6	M. Mittwollen, 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: Specialization in Production Engineering [WI4INGMB22]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2149667	Quality Management (p. 458)	2	W	4	G. Lanza
2149669	Materials and Processes in Automotive Lightweight Construction (p. 378)	2	W	4	S. Kienzle, D. Steegmüller
2150681	Metal Forming (p. 606)	2	S	4	T. Herlan
2150683	Control Technology (p. 570)	2	S	4	C. Gönnheimer
2149655	Gear Cutting Technology (p. 635)	2	W	4	M. Klaiber

Learning Control / Examinations

The assessment is carried out as partial exams (according to Section 4 (2), 1-3 SPO) of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately. The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal. To improve the overall grade of the module up to one grading scale (0.3) there might be taken an optional term paper in the field of the wbk. The term paper may not be convalidated in the seminar module.

Conditions

None.

Learning Outcomes

The students

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

Content

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

Module: Manufacturing Technology [WI4INGMB23]

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

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2149657	Manufacturing Technology (p. 269)	4/2	W	9	V. Schulze, F. Zanger

Learning Control / Examinations

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

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

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

Conditions

None.

Learning Outcomes

The students

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

Content

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

Module: Integrated Production Planning [WI4INGMB24]

Coordination: V. Schulze, Gisela Lanza
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)
2150660	Integrated production planning (p. 339)	4/2	S	9	G. Lanza

Learning Control / Examinations

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

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

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

Conditions

None.

Learning Outcomes

The students

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

Content

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

Module: Material Flow in Logistic Systems [WI4INGMB25]

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

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2117051	Material flow in logistic systems (p. 377)	3/1	W	6	K. Furmans
2118097	Warehousing and distribution systems (p. 355)	2	S	4	M. Schwab, J. Weiblen
2117056	Airport logistics (p. 362)	2	W	4	A. Richter
2118085	Automotive Logistics (p. 361)	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: Material Flow in Networked Logistic Systems [WI4INGMB26]

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

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2117060	Analytical methods in material flow methodology (mach and wiwi) (p. 157)	3/1	W	6	J. Stoll, E. Özden
2118097	Warehousing and distribution systems (p. 355)	2	S	4	M. Schwab, J. Weiblen
2117056	Airport logistics (p. 362)	2	W	4	A. Richter
2118085	Automotive Logistics (p. 361)	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: Technical Logistics [WI4INGMB27]

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

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2117095	Basics of Technical Logistics (p. 304)	3/1	W	6	M. Mittwollen, Madzharov
2117096	Elements of Technical Logistics (p. 234)	3/1	W	6	M. Mittwollen, Madzharov
2118088	Selected Applications of Technical Logistics and Project (p. 174)	3/1	S	6	M. Mittwollen, Madzharov
2118087	Selected Applications of Technical Logistics (p. 173)	2/1	S	4	M. Mittwollen, Madzharov
2118083	IT for facility logistics (p. 347)	3/1	S	6	F. Thomas
2118097	Warehousing and distribution systems (p. 355)	2	S	4	M. Schwab, J. Weiblen
2117061	Safety engineering (p. 541)	2	W	4	H. Kany
2117064	Application of technical logistics in modern crane systems (p. 162)	2	W	4	M. Golder
2118089	Application of technical logistics in sorting- and distribution technology (p. 163)	2	S	4	J. Föller
2117500	Energy efficient intralogistic systems (p. 242)	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: Logistics in Value Chain Networks [WI4INGMB28]

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

ECTS Credits	Cycle	Duration
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. 360)	3/1	S	6	K. Furmans
2117062	Supply chain management (p. 584)	3/1	W	6	K. Aliche
2118097	Warehousing and distribution systems (p. 355)	2	S	4	M. Schwab, J. Weiblen
2118090	Quantitative Methods for Supply Chain Risk Management (p. 462)	3/1	S	6	A. Cardeneo
2117056	Airport logistics (p. 362)	2	W	4	A. Richter
2118085	Automotive Logistics (p. 361)	2	S	4	K. Furmans
2118094	Information Systems in Logistics and Supply Chain Management (p. 327)	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: Virtual Engineering A [WW4INGMB29]

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

ECTS Credits	Cycle	Duration
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. 637)	2/3	W	6	J. Ovtcharova
2121370	Virtual Engineering for Mechatronic Products (p. 636)	3	W	4	S. Rude
2122387	Computer Integrated Planning of New Products (p. 463)	2	S	4	R. Kläger
2123375	Virtual Reality Laboratory (p. 639)	3	W/S	4	J. Ovtcharova
2122376	PLM for product development in mechatronics (p. 427)	2/0	S	4	M. Eigner

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.

Module: Virtual Engineering B [WW4INGMB30]

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

ECTS Credits	Cycle	Duration
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. 638)	2/1	S	4	J. Ovtcharova
2121370	Virtual Engineering for Mechatronic Products (p. 636)	3	W	4	S. Rude
2122387	Computer Integrated Planning of New Products (p. 463)	2	S	4	R. Kläger
2123375	Virtual Reality Laboratory (p. 639)	3	W/S	4	J. Ovtcharova
2123356	CATIA CAD training course (p. 205)	2	W/S	2	J. Ovtcharova
2123355	CAD-NX training course (p. 206)	2	W/S	2	J. Ovtcharova
2122376	PLM for product development in mechatronics (p. 427)	2/0	S	4	M. Eigner

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) and current product development processes.

Module: Global Production and Logistics [WI4INGMB31]

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

ECTS Credits	Cycle	Duration
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. 288)	2	W	4	G. Lanza
2149600	Global Production and Logistics - Part 2: Global Logistics (p. 289)	2	S	4	K. Furmans
2118085	Automotive Logistics (p. 361)	2	S	4	K. Furmans
2118094	Information Systems in Logistics and Supply Chain Management (p. 327)	2	S	4	C. Kilger
2149667	Quality Management (p. 458)	2	W	4	G. Lanza
2149001	Production Technology and Management in Automotive (p. 452)	2	W	4	V. Stauch, S. Peters
2150601	Integrative Strategies in Production and Development of High Performance Cars (p. 338)	2	S	4	K. Schlichtenmayer

Learning Control / Examinations

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

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

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

Conditions

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 students

- are able to analyze the main topics of global production and logistics.
- can explain the main topics about planning and operations of global supply chains and are able to use simple models for planning.
- are capable to name the main topics about planning of 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 economic backgrounds, opportunities and risks of global 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: Machine Tools and Industrial Handling [WI4INGMB32]

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

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2149902	Machine Tools and Industrial Handling (p. 645)	4/2	W	9	J. Fleischer

Learning Control / Examinations

The assessment is carried out as partial exams (according to Section 4(2), 1-3 SPO of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately. The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal. To improve the overall grade of the module up to one grading scale (0.3) there might be taken an optional term paper in the field of the wbk. The term paper may not be convalidated in the seminar module.

Conditions

None.

Learning Outcomes

The students

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

Content

The 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: Specific Topics in Materials Science [WI4INGMB33]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2194643	Constitution and Properties of Wear resistant materials (p. 168)	2	S	4	S. Ulrich
2177601	Constitution and Properties of Protective Coatings (p. 169)	2	W	4	S. Ulrich
2125757	Introduction to Ceramics (p. 348)	3/1	W	6	M. Hoffmann
2173560	Welding Lab Course, in groupes (p. 259)	3	W	4	J. Hoffmeister
2174575	Foundry Technology (p. 285)	2	S	4	C. Wilhelm
2193010	Grundlagen der Herstellungsverfahren der Keramik und Pulvermetallurgie (p. 295)	2	W	4	R. Oberacker
2182642	Laser in automotive engineering (p. 358)	2	S	4	J. Schneider
2183640	Laboratory "Laser Materials Processing" (p. 433)	3	W/S	1	J. Schneider, W. Pfleging
2181612	Physical basics of laser technology (p. 425)	2/1	W	5	J. Schneider
2173590	Polymer Engineering I (p. 428)	2	W	4	P. Elsner
2174596	Polymer Engineering II (p. 429)	2	S	4	P. Elsner
2125751	Practical Course Technical Ceramics (p. 434)	2	W	1	R. Oberacker
21565/21570	Welding Technology I/II (p. 480)	2	W/S	4	Spies
2126784	Functional Ceramics (p. 276)	2	S	4	M. Hoffmann, M. Bäurer
2177618	Superhard Thin Film Materials (p. 583)	2	W	4	S. Ulrich
2174576	Systematic Selection of Materials (p. 589)	2/1	S	5	J. Hoffmeister
2181715	Failure of Structural Materials: Fatigue and Creep (p. 628)	2	W	4	O. Kraft, P. Gumbsch, P. Gruber
2181711	Failure of structural materials: deformation and fracture (p. 629)	2	W	4	P. Gumbsch, O. Kraft, D. Weygand
2173553	Materials Science and Engineering III (p. 644)	4/1	W	6	M. Heilmeier
2126749	Advanced powder metals (p. 457)	2	S	4	R. Oberacker
2126775	Structural Ceramics (p. 582)	2	S	4	M. Hoffmann
2126730	Ceramics Processing (p. 349)	2	S	4	J. Binder

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

Students acquire special basic knowledge in selected areas of materials science and engineering and can apply them to technical problems. Specific teaching objectives are agreed with the respective coordinator of the course.

Content

See courses.

Module: Automated Manufacturing Systems [WI4INGMBWBK1]

Coordination: J. Fleischer
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)
2150904	Automated Manufacturing Systems (p. 176)	4/2	S	9	J. Fleischer

Learning Control / Examinations

The assessment is carried out as partial exams (according to Section 4(2), 1-3 SPO of the examination regulation) of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately. The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal. To improve the overall grade of the module up to one grading scale (0.3) there might be taken an optional term paper in the field of the wbk. The term paper may not be convalidated in the seminar module.

Conditions

None.

Learning Outcomes

The students

- are able to analyze implemented automated manufacturing systems and describe their components.
- are capable to assess the implemented examples of implemented automated manufacturing systems and apply them to new problems.
- are able to name automation tasks in manufacturing plants and name the components which are necessary for the implementation of each automation task.
- are capable with respect to a given task to plan the configuration of an automated manufacturing system and to determine the necessary components to its realization.
- are able to design and select components for a given use case of the categories: "Handling Technology", "Industrial Robotics", "Sensory" and "Controls".
- are capable to compare different concepts for multi-machine systems and select a suitable concept for a given use case.

Content

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

Module: BioMEMS [WI4INGMBIMT1]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2143875	Introduction to Microsystem Technology - Practical Course (p. 442)	2	W/S	3	A. Last
2143892	Selected Topics on Optics and Microoptics for Mechanical Engineers (p. 175)	2	W/S	3	T. Mappes
2141864	BioMEMS - Microsystems Technologies for Life-Sciences and Medicine I (p. 195)	2	W	3	A. Guber
2142883	BioMEMS - Microsystems Technologies for Life-Sciences and Medicine II (p. 196)	2	S	3	A. Guber
2142879	BioMEMS - Microsystems Technologies for Life-Sciences and Medicine III (p. 197)	2	S	3	A. Guber
2142881	Microactuators (p. 385)	2	S	3	M. Kohl
2143893	Replication processes in micro system technologies (p. 471)	2	W/S	3	M. Worgull
2142140	Bionics for Engineers and Natural Scientists (p. 198)	2	S	3	H. Hölscher
2143873	Actual topics of BioMEMS (p. 153)	2	W/S	3	A. Guber, Wegner, L.ars; Cattaneo, Giorgio

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2143875	Introduction to Microsystem Technology - Practical Course (p. 442)	2	W/S	3	A. Last
2142890 / 2142891	Physics for Engineers (p. 424)	2/2	S	6	P. Gumbsch, A. Nesterov-Müller, D. Weygand, A. Last
2143882	Fabrication Processes in Microsystem Technology (p. 268)	2	W/S	3	K. Bade
2143893	Replication processes in micro system technologies (p. 471)	2	W/S	3	M. Worgull
2143500	Chemical, physical and material sci- ence aspects of plastics in the micro technology (p. 209)	2	W/S	3	M. Worgull, D. Häringer
2142007	Fundamentals of X-ray optics (p. 302)	2	W	3	A. Last
2181712	Nanotribology and -Mechanics (p. 399)	2		3	M. Dienwiebel, H. Hölscher

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2143875	Introduction to Microsystem Technology - Practical Course (p. 442)	2	W/S	3	A. Last
2142884	Microoptics and Lithography (p. 383)	2	S	3	T. Mappes
2143892	Selected Topics on Optics and Microoptics for Mechanical Engineers (p. 175)	2	W/S	3	T. Mappes
2142881	Microactuators (p. 385)	2	S	3	M. Kohl
2142007	Fundamentals of X-ray optics (p. 302)	2	W	3	A. Last
23840	Laser Physics (p. 357)	2/1	W	4,5	M. Eichhorn
23462/23463	Optical Sources and Detectors (p. 409)	2/1	S	4,5	C. Koos
23464/23465	Optical Waveguides and Fibers (p. 410)	2/1	W	4,5	C. Koos
2142007	Fundamentals of X-ray optics II (p. 303)	2	S	3	A. Last

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

ECTS Credits 9	Cycle Every term	Duration 1
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Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2141861	Introduction to Microsystem Technology I (p. 300)	2	W	3	A. Guber
2142874	Introduction to Microsystem Technology II (p. 301)	2	S	3	A. Guber
2143875	Introduction to Microsystem Technology - Practical Course (p. 442)	2	W/S	3	A. Last
2142890 / 2142891	Physics for Engineers (p. 424)	2/2	S	6	P. Gumbsch, A. Nesterov-Müller, D. Weygand, A. Last
2143892	Selected Topics on Optics and Microoptics for Mechanical Engineers (p. 175)	2	W/S	3	T. Mappes
2142883	BioMEMS - Microsystems Technologies for Life-Sciences and Medicine II (p. 196)	2	S	3	A. Guber
2142879	BioMEMS - Microsystems Technologies for Life-Sciences and Medicine III (p. 197)	2	S	3	A. Guber
2142881	Microactuators (p. 385)	2	S	3	M. Kohl
2141865	Novel Actuators and Sensors (p. 402)	2	W	3	M. Kohl, M. Sommer
2143876	Nanotechnology with Clusterbeams (p. 397)	2	W/S	3	J. Gspann
2142140	Bionics for Engineers and Natural Scientists (p. 198)	2	S	3	H. Hölscher
23486 / 23487	Optoelectronic Components (p. 412)	2 / 1	S	4,5	W. Freude
2141853	Polymers in MEMS A: Chemistry, Synthesis and Applications (p. 430)	2	W	3	B. Rapp
2141854	Polymers in MEMS B: Physics, Microstructuring and Applications (p. 431)	2	W	3	M. Worgull

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2143875	Introduction to Microsystem Technology - Practical Course (p. 442)	2	W/S	3	A. Last
2142860	Nanotechnologie using Scanning Probe Methods (p. 398)	2	S	3	H. Hölscher, M. Dienwiebel, S. Walheim
2141865	Novel Actuators and Sensors (p. 402)	2	W	3	M. Kohl, M. Sommer
2143876	Nanotechnology with Clusterbeams (p. 397)	2	W/S	3	J. Gspann
2181712	Nanotribology and -Mechanics (p. 399)	2		3	M. Dienwiebel, H. Hölscher
2142140	Bionics for Engineers and Natural Scientists (p. 198)	2	S	3	H. Hölscher
23476	Quantum Functional Devices and Semiconductor Technology (p. 319)	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 Every term	Duration 1
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Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2143882	Fabrication Processes in Microsystem Technology (p. 268)	2	W/S	3	K. Bade
2141865	Novel Actuators and Sensors (p. 402)	2	W	3	M. Kohl, M. Sommer
23616 / 23618	Communication Systems and Protocols (p. 211)	2/1	S	4,5	J. Leuthold, J. Becker, M. Hübner
23840	Laser Physics (p. 357)	2/1	W	4,5	M. Eichhorn
23476	Quantum Functional Devices and Semiconductor Technology (p. 319)	2	S	3	M. Walther
23462/23463	Optical Sources and Detectors (p. 409)	2/1	S	4,5	C. Koos
23464/23465	Optical Waveguides and Fibers (p. 410)	2/1	W	4,5	C. Koos
23460 / 23461	Optical Communication Systems (p. 408)	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: H. Wirbser
Degree programme: Wirtschaftsingenieurwesen (M.Sc.)
Subject: Engineering Science

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
2157961	Energy and Process Technology I (p. 241)	4/2	W	9	H. Bauer, 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 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: H. Wirbser
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)
2170832	Energy and Process Technology II (p. 240)	4/2	S	9	K. Dullenkopf

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. 183)	2/0	S	3	R. Roos
6233801	Design and Construction of Highways (p. 251)	1/1	S	3	R. Roos
6233802	Operation and Maintenance of Highways (p. 187)	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 conjoined oral exam about the lectures *Design and Construction Highways* [6233801] and *Operation and Maintenance Highways* [6233802] (according to §4(2), 2 of the examination regulation) (duration: 30 min.).

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

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)
6233801	Design and Construction of Highways (p. 251)	1/1	S	3	R. Roos
6233802	Operation and Maintenance of Highways (p. 187)	2	S	3	R. Roos
6233804	Environmental Impact Assessment (p. 614)	1	S	1,5	R. Roos
6233807	Special Topics in Highway Engineering (p. 186)	1	S	1,5	R. Roos

Learning Control / Examinations

The assessment of the module consists of a conjoined oral exam about the lectures *Special Topics in Highway Engineering* [6233807] and *Environmental Impact Assessment* [6233804] (according to §4(2), 2 of the examination regulation) (duration: 15 min.) and a conjoined oral exam about the lectures *Design and Construction Highways* [6233801] and *Operation and Maintenance Highways* [6233802] (according to §4(2), 2 of the examination regulation) (duration: 30 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 [WI4INGBGU9]

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
6233901	IT-based Road Design (p. 226)	1/1	W	3	M. Zimmermann
6233906	Safety Management in Highway Engineering (p. 540)	1/1	W	3	M. Zimmermann
6233803	Laws concerning Traffic and Roads (p. 625)	2/0	S	3	D. Hönig

Learning Control / Examinations

See German version.

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: Water Supply and Sanitation [WI4INGBGU13]

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
6223801	Process Technologies in Storm Water Treatment (p. 622)	1/1	S	3	S. Fuchs, E. Hoffmann
6223803	Process Technologies in Water Supply and Wastewater Disposal (p. 623)	1/1	S	3	E. Hoffmann
6220902	Urban Water Management (p. 616)	2/2	W	6	S. Fuchs, P. Klingel, U. Mohrlok
0170603	(p. 149)	1/1	S	3	S. Fuchs
0170110	Environmental Chemistry (p. 609)	1/1	W	3	J. Winter
0170605	(p. 613)	2	S	3	J. Winter

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

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: Environmental Management [WI4INGBGU14]

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
6223701	Mass Fluxes (p. 575)	2	W	3	S. Fuchs
19058	Principles of Bioengineering (p. 296)	1/1	S	3	J. Winter
6223805	Surface Water Quality (p. 272)	1/2	S	4,5	S. Fuchs
6221811	Groundwater Quality (p. 316)	1/0	S	1,5	U. Mohrlök
19241	(p. 350)	2	W	3	J. Winter

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 *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: Fundamentals of Transportation [WI4INGBGU15]

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	Fundamentals of Transportation Planning and Traffic Engineering (p. 627)	2/0	S	3	P. Vortisch, M. Kagerbauer
19035	Exercises in Transportation Planning and Traffic Engineering (p. 605)	0/1	S	1,5	P. Vortisch, M. Kagerbauer
6232806	Characteristics of Transportation Systems (p. 231)	2/0	S	3	P. Vortisch
6232808	Freight Transport (p. 318)	1/1	S	3	B. Chlond
6232904	Long-distance and Air Traffic (p. 267)	2/0	W	3	B. Chlond, N.N., Wilko Manz
6232807	Tendering, Planning and Financing in Public Transport (p. 647)	2/0	S	3	W. Weißkopf
6232801	Assessment and Evaluation Techniques (p. 193)	1/0	S	1,5	P. Vortisch, B. Chlond
6232903	Seminar in Transportation (p. 516)	2	W/S	3	P. Vortisch, B. Chlond
2595475	Seminar Mobility Services (p. 511)	2	W	4	W. Michalk, B. Chlond, U. Leyn, H. Fromm

Learning Control / Examinations

The assessment is carried out as partial exams (according to § 4(2), 2-3 of the examination regulation) of the core course(s) and further single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The overall grade of the module is the average of the grades for each course weighted by the credits. The partial exams will take place jointly (if possible) at individually appointed dates.

Conditions

One course has to be chosen from the core courses. Core courses are: Fundamentals of Transportation Planning and Traffic Engineering [19027] and Characteristics of Transportation Systems [6232806]. To achieve the required ECTS Credits, additional courses have to be chosen from the remaining courses.

From the courses Exercises in Transportation Planning and Traffic Engineering [19035], Seminar in Transportation [6232903] and Seminar Mobility Services [2595475] only one course can be chosen.

Recommendations

Without any basic knowledge of transportation it is strongly recommended to choose both core courses, Fundamentals of Transportation Planning and Traffic Engineering [19027] and Characteristics of Transportation Systems [6232806]. Otherwise only the core course Characteristics of Transportation Systems [6232806] should be chosen.

Learning Outcomes**Content**

Module: Transportation Modelling and Traffic Management [WI4INGBGU16]

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
6232701	Methods and Models in Transportation Planning (p. 185)	1/1	W	3	P. Vortisch, M. Kagerbauer
6232703	Traffic Engineering (p. 577)	1/1	W	3	P. Vortisch
6232802	Traffic Management and Transport Telematics (p. 626)	1/1	S	3	P. Vortisch
6232804	Traffic Flow Simulation (p. 546)	1/1	S	3	P. Vortisch
6232901	Transportation Data Analysis (p. 236)	1/1	W	3	M. Kagerbauer, T. Streit
6232808	Freight Transport (p. 318)	1/1	S	3	B. Chlond
6232904	Long-distance and Air Traffic (p. 267)	2/0	W	3	B. Chlond, N.N., Wilko Manz
6232807	Tendering, Planning and Financing in Public Transport (p. 647)	2/0	S	3	W. Weißkopf
6232801	Assessment and Evaluation Techniques (p. 193)	1/0	S	1,5	P. Vortisch, B. Chlond
6232903	Seminar in Transportation (p. 516)	2	W/S	3	P. Vortisch, B. Chlond
2595475	Seminar Mobility Services (p. 511)	2	W	4	W. Michalk, B. Chlond, U. Leyn, H. Fromm

Learning Control / Examinations

The assessment is carried out as partial exams (according to § 4(2), 2-3 of the examination regulation) of the core courses and further single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The overall grade of the module is the average of the grades for each course weighted by the credits.

The partial exams will take place jointly (if possible) at individually appointed dates.

Conditions

Two courses have to be chosen from the core courses. Core courses are: *Methods and Models in Transportation Planning* [6232701], *Traffic Engineering* [6232703], *Traffic Management and Transport Telematics* [6232802] and *Traffic Flow Simulation* [6232804]. To achieve the required ECTS Credits, additional courses have to be chosen from the remaining courses. From the two possible seminars, only one can be chosen.

Recommendations

Basic knowledge of transportation is required.

Learning Outcomes

Content

Module: Mechanical Process Engineering in Construction [WI4INGBGU17]

Coordination: S. Haghsheno, H. Schneider, H. Schlick
Degree programme: Wirtschaftsingenieurwesen (M.Sc.)
Subject: Engineering Science

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
6241704	Construction Equipment and Mechanical Process Engineering (p. 180)	2/1	W	4,5	H. Schneider, H. Schlick
6241814	Construction Methods in Environmental Engineering (p. 621)	1/1	S	3	H. Schneider
6241703	Fundamental Mechanics of Construction Equipment (p. 299)	1	W	1,5	S. Gentes, Mitarbeiter
6241821	Test Procedures in Construction (p. 455)	1	S	1,5	H. Schneider
6241911	Operation Methods for Foundation and Marine Construction (p. 600)	1	W	1,5	H. Schneider
6241916	Construction Equipment Seminar (p. 181)	2	W	3	H. Schneider
6241913	Operation Methods for Earthmoving (p. 252)	1	W	1,5	H. Schlick

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.

The exam must be repeated at the latest 1 semester after the first try. The exam will be based on the content of the latest lecture.

Examination of courses Construction Equipment and Mechanical Process Engineering [6241704] und Fundamental Mechanics of Construction Equipment [6241703] is carried out written. Combinations of courses Construction Equipment Seminar [6241916], Operation Methods for Foundation Construction [6241911], Operation Methods for Earthmoving [6241913], Construction Methods in Environmental Engineering [6241814] and Test Procedures in Construction [6241821] are examined jointly orally.

Conditions

The course *Construction Equipment and Mechanical Process Engineering* [6241704] is compulsory and must be examined.

Recommendations

It is recommended to take the module Fundamentals of construction [WI3INGBGU3] from the Bachelor's degree program.

Learning Outcomes

Students understand construction methods and the related construction equipment, their technology, capabilities and constraints. Students can define construction methods consisting of machinery and devices. They can evaluate existing methods through knowledge about process performance and operating conditions, and they can identify potential for improvement.

Content

Within the frame of this module, various construction methods und aggregate production processes will be presented as well as performance calculations conducted. Students learn about the construction machinery and devices of these methods. Transmission, generation, conversion and controlling of power are explained with the help of various practical examples. Moreover, the module includes possibilities for an on-site familiarization.

Remarks

Information regarding lectures and possible schedule changes is available in the timetable at http://www.tmb.kit.edu/Studium_und_Lehre.php

Students can build additional customized modules of the courses offered by TMB. Please consult with the lecturers of this

module.

Module: Project in Public Transportation [WI4INGBGU18]

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
6234810	Determination of Demand, Timetable Construction and Alignment (p. 182)	1/2	S	4,5	E. Hohnecker
6234904	Standard Valuation in Public Transport. Using an Example (p. 564)	0/1	W	1,5	E. Hohnecker
6234902	Economic Efficiency of Guided Transport Systems (p. 649)	1	W	1,5	E. Hohnecker
6232807	Tendering, Planning and Financing in Public Transport (p. 647)	2/0	S	3	W. Weißkopf
6234903	Law Aspects of Guided Transport Systems (p. 464)	1	W	1,5	R. Schweinsberg

Learning Control / Examinations

See German version.

Conditions

See German version.

Recommendations

See German version.

Learning Outcomes

See German version.

Content

See courses.

Remarks

See German version.

Module: Public Transportation Operations [WI4INGBGU19]

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
6234804	Operation Systems and Track Guided Infrastructure Capacity (p. 190)	2	S	3	E. Hohnecker
6234805	Management in Public Transport (p. 367)	2	S	3	E. Hohnecker
6234901	Environmental Aspects of Guided Transport Systems (p. 608)	2	W	3	E. Hohnecker
6234903	Law Aspects of Guided Transport Systems (p. 464)	1	W	1,5	R. Schweinsberg
19307s / 6234809	Construction and Maintenance of Track Infrastructure (p. 179)	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

See German version.

Recommendations

See German version.

Learning Outcomes

See German version.

Content

See courses.

Remarks

See German version.

Module: Guided Transport Systems / Engineering [WI4INGBGU20]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
6234806	Infrastructure Dimensioning and Rail- way Traffic (p. 330)	1/1	S	3	E. Hohnecker
6234808	Infrastructure Equipment of Railway Tracks (p. 329)	1	S	1,5	E. Hohnecker, Mitarbeiter
19307s / 6234809	Construction and Maintenance of Track Infrastructure (p. 179)	1	S	1,5	E. Hohnecker, H. Müller
6232808	Freight Transport (p. 318)	1/1	S	3	B. Chlond
2114346	Electrical Rail Vehicles (p. 233)	2	S	3	G. Clos
6234903	Law Aspects of Guided Transport Sys- tems (p. 464)	1	W	1,5	R. Schweinsberg

Learning Control / Examinations

See German version.

Conditions

See German version.

Recommendations

See German version.

Learning Outcomes

See German version.

Content

See courses.

Remarks

See German version.

Module: Logistics and Management of Guided Transport Systems [WI4INGBGU21]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
6234701	Track Guided Transport Systems - Technical Design and Components (p. 563)	3/1	W	6	E. Hohnecker
6234805	Management in Public Transport (p. 367)	2	S	3	E. Hohnecker
6234903	Law Aspects of Guided Transport Sys- tems (p. 464)	1	W	1,5	R. Schweinsberg
6234902	Economic Efficiency of Guided Trans- port Systems (p. 649)	1	W	1,5	E. Hohnecker

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

See German version.

Recommendations

See German version.

Learning Outcomes

See German version.

Content

See courses.

Remarks

See German version.

Module: Control Engineering II [WI4INGETIT2]

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

ECTS Credits	Cycle	Duration
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. 468)	3/1	W	6	M. Kluwe
23160	Automation of Discrete Event and Hybrid Systems (p. 177)	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]), which is recommended to have been attended beforehand.

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
23231	Sensors (p. 532)	2	W	3	W. Menesklou
23232	Experimental Laboratories in Sensors and Actuators (p. 435)	4	S	6	W. Menesklou
23209	Systematic Product Development in Sensor Technology (p. 588)	1/1	W	3	E. Ivers-Tiffée, Riegel
23240	Sensor Systems (Integrated Sensor Actuator Systems) (p. 533)	2	S	3	W. Wersing
23233/23234	Seminar: Sensorik (p. 527)	2	W/S	3	W. Menesklou
21881	Microactuators (p. 384)	2	S	3	M. 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

ECTS Credits	Cycle	Duration
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. 435)	4	S	6	W. Menesklou
23209	Systematic Product Development in Sensor Technology (p. 588)	1/1	W	3	E. Ivers-Tiffée, Riegel
23240	Sensor Systems (Integrated Sensor Actuator Systems) (p. 533)	2	S	3	W. Wersing
23233/23234	Seminar: Sensorik (p. 527)	2	W/S	3	W. Menesklou
21881	Microactuators (p. 384)	2	S	3	M. 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

ECTS Credits	Cycle	Duration
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. 322)	2/1	W	4,5	R. Badent
23361/23363	High-Voltage Technology II (p. 323)	2/1	S	4,5	R. 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

ECTS Credits	Cycle	Duration
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. 245)	2/1	S	4,5	T. Leibfried
23371/23373	Power Network Analysis (p. 184)	2/2	W	6	T. Leibfried
23381	Windpower (p. 648)	2/0	W	3	N. Lewald
23380	Photovoltaic Systems Technology (p. 423)	2/0	S	3	Schmidt
23392/23394	High-Voltage Test Technique (p. 321)	2/1	W	4,5	R. 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

ECTS Credits	Cycle	Duration
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. 305)	2/0	W	4	V. Gaukel
22214	Principles of Process Engineering referring to Food II (p. 306)	2/0	S	4	V. Gaukel
22205/6	Quality Management of Food Processing (p. 461)	1/1	S	3	Schuchmann
22207	Food Science and Functionality (p. 359)	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

ECTS Credits	Cycle	Duration
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. 461)	1/1	S	3	Schuchmann
22207	Food Science and Functionality (p. 359)	2	W	4	Watzl
22209	Microbiology of Food (p. 386)	2	W	4	Franz
22215	Product Design (p. 473)	2	S	4	Schuchmann
22218	Modern Measurement Techniques for Process Optimization (p. 392)	2	S	4	Regier
22417	Scale up in Biology and Engineering (p. 478)	2	W	4	Hausmann
6602	Fundamentals of Food Chemistry (p. 298)	2	W/S	4	Loske
22229	Emulsifying and Dispersing (p. 237)	2	S	4	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

See courses.

Module: Water Chemistry and Water Technology I [WI4INGCV6]

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

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

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
22601	Chemical Technology of Water (p. 208)	2	W	4	H. Horn
22602	Excercises in Chemical Technology of Water (p. 604)	1	W	2	H. Horn, Mitarbeiter
22664	Laboratory Work "Water" (p. 642)	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 and Water Technology II [WI4INGCV7]

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

ECTS Credits	Cycle	Duration
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. 401)	2	W	4	G. Abbt-Braun
22618	Fundamentals of Waste Water Treatment (p. 291)	2	S	4	S. Lackner
22612	Oxidation and Disinfection Processes (p. 418)	2	S	4	H. Horn
22605	Membrane Separation in Water Treatment (p. 170)	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 1 [WI4INGINTER7]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
19203	Morphodynamics of Rivers and Streams (p. 393)	1/1	S	3	F. Nestmann
19212	Environment Communication (p. 610)	2/1	W	4	Kämpf
8048	River Engineering and Ecology I (p. 294)	2	W	3	E. Dister
8056	River Engineering and Ecology II (p. 274)	2	S	2	E. Dister
2600211/212	Geophysical Engineering (p. 331)	1/1	S	4	Wenzel, A. Barth
0170617	Water Resource Management and Engineering Hydrology (p. 643)	1/1	S	3	Ihringer
2501031	Advanced Measurement Methods (p. 275)	2	W	3,5	Kottmeier
9050/9051	Hydrogeology (p. 156)	2/2	W	5	N. Goldscheider

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

None.

Learning Outcomes

See German version.

Content

See German version.

Remarks

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

Module: Understanding and Prediction of Disasters 2 [WI4INGINTER8]

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
19203	Morphodynamics of Rivers and Streams (p. 393)	1/1	S	3	F. Nestmann
19212	Environment Communication (p. 610)	2/1	W	4	Kämpf
8048	River Engineering and Ecology I (p. 294)	2	W	3	E. Dister
8056	River Engineering and Ecology II (p. 274)	2	S	2	E. Dister
2600211/212	Geophysical Engineering (p. 331)	1/1	S	4	Wenzel, A. Barth
0170617	Water Resource Management and Engineering Hydrology (p. 643)	1/1	S	3	Ihringer
2501031	Advanced Measurement Methods (p. 275)	2	W	3,5	Kottmeier
9050/9051	Hydrogeology (p. 156)	2/2	W	5	N. Goldscheider

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

None.

Learning Outcomes

See German version.

Content

See German version.

Remarks

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

Module: Extracurricular Module in Engineering [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: Z. (ZAR)
Degree programme: Wirtschaftsingenieurwesen (M.Sc.)
Subject: Law

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24504	Advanced Civil Law (p. 194)	2/0	S	3	T. Dreier
24011	Commercial and Corporate Law (p. 320)	2/0	W	3	Z. (ZAR), O. Knöfel
24017	Exercises in Civil Law (p. 448)	2/0	W/S	3	T. Dreier

Learning Control / Examinations

The assessment is conducted according to § 4(2), 2 of the study and examination regulations in form of exams. 2 of the 5 exams must be passed. The exams take place in the course *Exercises in Civil Law*.

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

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24354	Internet Law (p. 346)	2/0	W	3	T. Dreier
24121	Copyright (p. 617)	2/0	W	3	T. Dreier
24656	Patent Law (p. 421)	2/0	S	3	P. Bittner
24136 / 24609	Trademark and Unfair Competition Law (p. 371)	2/0	W/S	3	Y. Matz
VGE	Computer Contract Law (p. 633)	2/0	W	3	M. Bartsch

Learning Control / Examinations

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

Conditions

None.

Learning Outcomes**Content**

See courses.

Module: Private Business Law [WI4JURA5]

Coordination: Z. (ZAR)
Degree programme: Wirtschaftsingenieurwesen (M.Sc.)
Subject: Law

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24650	Civil Law for Advanced (p. 630)	2/0	S	3	Z. (ZAR)
24671	Law of Contracts (p. 632)	2/0	S	3	Z. (ZAR)
24167	Employment Law I (p. 164)	2	W	3	A. Hoff
24668	Employment Law II (p. 165)	2	S	3	A. Hoff
24168	Tax Law I (p. 568)	2/0	W	3	D. Dietrich
24646	Tax Law II (p. 569)	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: G. Sydow
Degree programme: Wirtschaftsingenieurwesen (M.Sc.)
Subject: Law

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24632	Telecommunications Law (p. 595)	2/0	S	3	G. Sydow
24082	Public Media Law (p. 405)	2	W	3	C. Kirchberg
24666	European and International Law (p. 257)	2/0	S	3	G. Sydow
24140	Environmental Law (p. 612)	2	W	3	G. Sydow
24018	Data Protection Law (p. 221)	2/0	W	3	G. Sydow

Learning Control / Examinations

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

Conditions

None.

Learning Outcomes**Content**

Module: Governance, Risk & Compliance [WI4INGRC]

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

ECTS Credits	Cycle	Duration
9	Every term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
24121	Copyright (p. 617)	2/0	W	3	T. Dreier
24018	Data Protection Law (p. 221)	2/0	W	3	G. Sydow
24168	Tax Law I (p. 568)	2/0	W	3	D. Dietrich
24671	Law of Contracts (p. 632)	2/0	S	3	Z. (ZAR)
GRC	Corporate Compliance (p. 467)	2	W	3	T. Dreier, N.N.
GRCsem	Seminar: Governance, Risk & Compliance (p. 631)	2	S	3	T. Dreier, N.N.

Learning Control / Examinations

Conditions

None.

Learning Outcomes

Content

5.8 Sociology

Module: Sociology [WI4SOZ1]

Coordination: G. Nollmann
Degree programme: Wirtschaftsingenieurwesen (M.Sc.)
Subject: Sociology

ECTS Credits	Cycle	Duration
9	Every term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
thSoz	Theoretical Sociology (p. 596)	2	W/S	2	G. Nollmann, Pfadenhauer, Haupt, Grenz, Eisewicht, Kunz, Albrecht, Enderle, Dukat
spezSoz	Special Sociology (p. 562)	2	W/S	4	G. Nollmann, Pfadenhauer, Haupt, Grenz, Eisewicht, Kunz, Dukat, Albrecht, Enderle
SozSem	Projectseminar (p. 454)	2	W/S	4	G. Nollmann, Kunz, Haupt, Grenz, Eisewicht, Enderle, Dukat, Albrecht

Learning Control / Examinations

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

ECTS Credits 9	Cycle Every term	Duration 1
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Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
SemAIFB1	Seminar in Enterprise Information Systems (p. 492)	2	W/S	3	R. Studer, A. Oberweis, T. Wolf, R. Kneuper
SemAIFB2	Seminar Efficient Algorithms (p. 493)	2	W/S	3	H. Schmeck
SemAIFB3	Seminar Complexity Management (p. 509)	2	W/S	3	D. Seese
SemAIFB4	Seminar Knowledge Management (p. 517)	2	W	3	R. Studer
SemAIFB5	Seminar eOrganization (p. 495)	2	S	3	S. Tai
2530280	Seminar in Finance (p. 501)	2	W/S	3	M. Uhrig-Homburg, M. Ruckes
SemFBV1	Seminar in Insurance Management (p. 518)	2	W/S	3	U. Werner
n.n.	Seminar Financial Economics and Risk Management (p. 502)	2	W/S	3	M. Ulrich
2577915	Seminar: Management and Organization (p. 528)	2	W/S	3	H. Lindstädt
2579904	Seminar Management Accounting (p. 510)	2	W/S	3	M. Wouters
2579905	Special Topics in Management Accounting (p. 553)	2		3	M. Wouters, S. Morales, M. Kirchberger
SemIIP3	Seminar Business Ethics (p. 515)	2	W/S	3	A. Wollert
SemTuE1	Entrepreneurship Seminar (p. 498)			3	O. Terzidis
SemTuE2	Seminar Innovation management (p. 499)			3	M. Weissenberger-Eibl
2577919	„Good Governance“ at German Corporations (p. 655)	2	W/S	6	T. Reitmeyer
2572197	Seminar in strategic and behavioral marketing (p. 519)	2	W	3	B. Neibecker
SemETU2	Seminar in Marketing and Sales (Master) (p. 504)	2	W	3	M. Klarmann
SemIIP2	Seminar in Industrial Production (p. 507)	2	W/S	3	F. Schultmann, M. Fröhling
2585420/2586420	Topics of Sustainable Management of Housing and Real Estate (p. 166)	2	W/S	3	T. Lützkendorf, D. Lorenz
SemEW	Seminar Energy Economics (p. 494)	2	W/S	3	W. Fichtner, P. Jochem, D. Kelles, R. McKenna, V. Bertsch
2540510	Master Seminar in Information Engineering and Management (p. 376)	2	W	3	A. Geyer-Schulz
SemIW	Seminar Information Engineering and Management (p. 508)	2	W/S	3	C. Weinhardt
2595470	Seminar Service Science, Management & Engineering (p. 513)	2	W/S	3	C. Weinhardt, R. Studer, S. Nickel, H. Fromm, W. Fichtner
2595477	Practical Seminar Service Innovation (p. 531)	3		5	G. Satzger, M. Kohler, H. Fromm, N. Feldmann
2595475	Seminar Mobility Services (p. 511)	2	W	4	W. Michalk, B. Chlond, U. Leyn, H. Fromm
SemWIOR2	Seminar Economic Theory (p. 650)	2	W/S	3	C. Puppe
SemWIOR3	Seminar in Experimental Economics (p. 521)	2	W/S	3	N. N.

n.n.	Seminar in Behavioral and Experimental Economics (p. 500)	2	W/S	3	P. Reiss
n.n.	Seminar on Morals and Social Behavior (p. 512)	2	W/S	3	N. Szech
SemIWW2	Seminar in International Economy (p. 503)	2/0	W/S	3	J. Kowalski
SemIWW3	(p. 506)	2	W/S	3	I. Ott
SemETS3	Seminar on Macroeconomic Theory (p. 523)	2		3	M. Hillebrand
2560130	Seminar Public Finance (p. 496)	2	W/S	3	B. Wigger, Assistenten
2560263	Seminar on Network Economics (p. 524)	2	W/S	3	K. Mitusch
2561209	Seminar Transport Economics (p. 525)		W/S	3	
2550491	Seminar in Discrete Optimization (p. 520)	2	W/S	3	S. Nickel
2550131	Seminar in Continuous Optimization (p. 522)	2	W/S	3	O. Stein
SemWIOR1	Seminar Stochastic Models (p. 514)	2	W/S	3	K. Waldmann
SemING	Seminar in Engineering Science (p. 332)	2	W/S	3	Fachvertreter ingenieurwissenschaftlicher Fakultäten
SemIFL	Seminar Conveying Technology and Logistics (p. 497)	2	W/S	3	K. Furmans
21690sem	Seminar paper "Production Engineering" (p. 529)	2	W/S	3	V. Schulze, G. Lanza, J. Fleischer
SemMath	Seminar in Mathematics (p. 380)	2	W/S	3	Fachvertreter der Fakultät für Mathematik
RECHT	Seminar: Legal Studies (p. 526)	2	W/S	3	Inst. ZAR
SQ HoC1	Working and Studying Effectively (p. 482)	meist 2	W/S	2-4	HoC
SQ HoC2	Oral Presentation and Communication Skills (p. 483)	meist 2	W/S	2-3	HoC
SQ HoC3	Scientific Writing (p. 484)	meist 2	W/S	2-3	HoC
SQ HoC4	Teaching and Learning Foreign Languages (p. 485)	k.A.	W/S	2-3	HoC
SQ HoC5	Qualitative Methods (p. 486)	k.A.	W/S	2-3	HoC
SQ HoC6	Law and Economics (p. 487)	k.A.	W/S	2-3	HoC
SQ HoC7	Competencies as a Research Topic (p. 488)	k.A.	W/S	2-3	HoC
SQ HoC 8	Transferring Knowledge in School, University and at the Workplace (p. 489)	k.A.	W/S	2-3	HoC
SQ HoC9	Professional Orientation and Job Specific Competencies (p. 490)	k.A.	W/S	2-3	HoC
SQ PEW1	Elective „Educational development for student teachers“ (p. 641)	k.A.	W/S	2 / 3	Personalentwicklung
SQ ZAK1	Key qualifications ZAK (p. 479)	k.A.	W/S	1-3	ZAK

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 Department of Economics and Management 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 Department of Economics and Management (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 Department of Economics and Management. 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 [HoC, ZAK, Sprachenzentrum].

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 autonomous.

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 Industrial Engineering and Management. 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 Department of Economics and Management, or, after approval by at least one examiner of another faculty. The examiner has to be involved in the degree programme. Involved in the degree programme are the persons that coordinate a module or a lecture of the degree programme.

The regular processing time takes 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 Industrial Engineering and Management 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. 117)[WI4INGBGU13]

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

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

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

Coordinators: M. Gohl
Part of the modules: Combustion Engines II (p. 87)[WI4INGMB35]

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

Learning Control / Examinations

Letter of attendance or oral exam (30 minutes, no testing aids)

Conditions

none

Recommendations

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

Learning Outcomes

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

Content

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

Media

Lecture with Powerpoint slides

Literature

The lecture documents are distributed during the courses.

Course: Advanced Game Theory [n.n.]

Coordinators: P. Reiss, C. Puppe

Part of the modules: Applied Strategic Decisions (p. 52)[WI4VWL2], Microeconomic Theory (p. 64)[WI4VWL15]

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

Learning Control / Examinations

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None.

Recommendations

Basic knowledge of mathematics and statistics is assumed.

Learning Outcomes

The purpose of the course is to offer a rigorous investigation of game theory paying attention to new developments in the field. Students shall be able to model strategic interaction situations on a general level and to provide adequate solutions.

Content

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

Media

Slides, problem sets.

Literature

Compulsory textbook:

Osborne, M. A. Rubinstein, A Course in Game Theory, MIT Press, 1994.

Additional Literature:

Aumann, R./Hart, S. (Hrsgb.), Handbook of Game Theory I-III, Elsevier, 1992/1994/2002.

Course: Advanced Topics in Economic Theory [2520527]

Coordinators: M. Hillebrand, K. Mitusch

Part of the modules: Network Economics (p. 54)[WI4VWL4], Allocation and Equilibrium (p. 56)[WI4VWL7], Agglomeration and Innovation (p. 62)[WI4VWL13], Economic Theory and its Application in Finance (p. 63)[WI4VWL14], Microeconomic Theory (p. 64)[WI4VWL15]

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

Learning Control / Examinations

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

Conditions

None.

Recommendations

This course is designed for advanced Master students with a strong interest in economic theory and mathematical models. Bachelor students who would like to participate are free to do so, but should be aware that the level is much more advanced than in other courses of their curriculum.

Learning Outcomes

Content

The course deals with basic elements of modern economic theory. It is divided into two parts. The first part introduces the microeconomic foundations of general equilibrium à la Debreu ("The Theory of Value", 1959) and Hildenbrand/Kirman ("Equilibrium Analysis", 1988). The second part deals with asymmetric information and introduces the basic techniques of contract theory.

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

Course: Actual topics of BioMEMS [2143873]

Coordinators: A. Guber, Wegner, L.ars; Cattaneo, Giorgio

Part of the modules: BioMEMS (p. 104)[WI4INGMBIMT1]

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

Learning Control / Examinations

The assessment takes the form of a different type of control success (report and presentation) according to § 4 (2), 3 SPO. The rating is 60% of the grade for the final paper to a special issue of BioMEMS and 40% of the grade for the seminar presentation held.

Conditions

None.

Recommendations

It is recommended to attend the courses BioMEMS I [2141864] , BioMEMS II [2142883] BioMEMS and III [2142879] beforehand.

Learning Outcomes

Knowledge in the actual activities in bio-medical and biological technologies under the view of micro technology. The student gets an overview on actual examples of new applications in BioMEMS.

Content

Media

Written preparations from the participants.

Course: Current issues in Innovation Management [2545018]

Coordinators: M. Weissenberger-Eibl

Part of the modules: Innovation Management (p. 47)[WI4BWLENT2]

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

Learning Control / Examinations

Die Erfolgskontrolle erfolgt in Form einer Erfolgskontrolle anderer Art (schriftliche Ausarbeitung) nach § 4(2), 3 SPO.
Die Note ist die Note der schriftlichen Ausarbeitung.

Conditions

None.

Recommendations

None.

Learning Outcomes

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

Content

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

Course: Algorithms for Internet Applications [2511102]

Coordinators: H. Schmeck

Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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: Hydrogeology [9050/9051]

Coordinators: N. Goldscheider

Part of the modules: Understanding and Prediction of Disasters 2 (p. 137)[WI4INGINTER8], Understanding and Prediction of Disasters 1 (p. 136)[WI4INGINTER7]

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

Learning Control / Examinations

The assessment consists of a written exam (following §4(2), 1 of the examination regulation).

Conditions

None.

Recommendations

None.

Learning Outcomes

see German version

Content

see German version

Course: Analytical methods in material flow methodology (mach and wiwi) [2117060]

Coordinators: J. Stoll, E. Özden

Part of the modules: Material Flow in Networked Logistic Systems (p. 94)[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

Students are able to:

- Describe material flow systems with analytical solvable stochastic models,
- Derive Approches for control systems (KANBAN) based on easy models of queueing theory,
- Execute practical exercised on workstations and
- Use simulation and exakt methods.

Content

- single server systems: M/M/1, M/G/1: priority rules, model of failures
- networks: open and closed approximations, exact solutions and approximations
- application to flexible manufacturing systems, AGV (automated guided vehicles) - systems
- modeling of control approaches like constant work in process (ConWIP) or kanban
- discrete-time modeling of queuing systems

Media

black board, lecture notes, presentations

Literature

Wolff: Stochastic Modeling and the Theory of Queues, Prentice Hall, 1989

Shanthikumar, Buzacott: Stochastic Models of Manufacturing Systems

Remarks

none

Course: Requirements Analysis and Requirements Management [2511218]

Coordinators: R. Kneuper

Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[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. 68)[WI4INFO1], Emphasis in Informatics (p. 70)[WI4INFO2], Electives in Informatics (p. 72)[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. 68)[WI4INFO1], Emphasis in Informatics (p. 70)[WI4INFO2], Electives in Informatics (p. 72)[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

None.

Recommendations

Knowledge of content of the module [WI1INFO].

Learning Outcomes

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

Content

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

Media

Slides, internet resources.

Literature

Tba in the lecture.

Course: Planning and Management of Industrial Plants [2581952]

Coordinators: F. Schultmann
Part of the modules: Industrial Production II (p. 39)[WI4BWLIIIP2]

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

Learning Control / Examinations

The assessment consists of a written exam (90 minutes) (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None.

Learning Outcomes

- Students shall be able to describe the tasks of plant management.
- Students shall be proficient in using selected methods of investment and cost estimates.
- Students shall be able to consider necessary processing and logistical requirements of designing industrial plants.
- Students shall be able to discuss interdependencies between capacity planning, process design and plant optimization.
- Students shall be proficient in discussing and applying selected methods of quality management, plant maintenance and plant dismantling.

Content

Industrial plant management incorporates a complex set of tasks along the entire life cycle of an industrial plant, starting with the initiation and erection up to operating and dismantling.

During this course students will get to know special characteristics of industrial plant management. Students will learn important methods to plan, realize and supervise the supply, start-up, maintenance, optimisation and shut-down of industrial plants. Alongside, students will have to handle the inherent question of choosing between technologies and evaluating each of them. This course pays special attention to the specific characteristics of plant engineering, commissioning and investment.

Media

Media will be provided on the e-learning platform.

Literature

will be announced in the course

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

Coordinators: M. Golder

Part of the modules: Technical Logistics (p. 95)[WI4INGMB27], Introduction to Logistics (p. 88)[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

Recommendations

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

Learning Outcomes

Students are able to:

- Dimension modern crane installations and transfer this approach to other material handling installations and
- Judge about the confirmity of the system by using relevant standards and set of rules.

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

Literature

None.

Remarks

none

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

Coordinators: J. Föllner

Part of the modules: Technical Logistics (p. 95)[WI4INGMB27], Introduction to Logistics (p. 88)[WI4INGMB20]

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.

Recommendations

None.

Learning Outcomes

Students are able to:

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

Content

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

Media

presentations, black board

Literature

None.

Remarks

none

Course: Employment Law I [24167]**Coordinators:** A. Hoff**Part of the modules:** Private Business Law (p. 141)[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. 141)[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, D. Lorenz

Part of the modules: Seminar Module (p. 145)[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: Asset Pricing [2530555]

Coordinators: M. Uhrig-Homburg, M. Ruckes

Part of the modules: Finance 1 (p. 24)[WI4BWLFBV1], Finance 3 (p. 28)[WI4BWLFBV11], Finance 2 (p. 25)[WI4BWLFBV2], Economic Theory and its Application in Finance (p. 63)[WI4VWL14]

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

Learning Control / Examinations

Conditions

None.

Recommendations

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

Learning Outcomes

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 and Portfolio Management / Bodie, Z., Kane, A., Marcus, A.J. - 9. ed., McGraw-Hill, 2011.

Course: Constitution and Properties of Wear resistant materials [2194643]

Coordinators: S. Ulrich
Part of the modules: Specific Topics in Materials Science (p. 101)[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

Basic understanding of constitution of wear-resistant materials, of the relations between constitution, properties and performance, of principles of increasing of hardness and toughness of materials as well as of the characteristics of the various groups of wear-resistant materials.

Content

introduction

materials and wear

unalloyed and alloyed tool steels

high speed steels

stellites and hard alloys

hard materials

hard metals

ceramic tool materials

superhard materials

new developments

Literature

Laska, R. Felsch, C.: *Werkstoffkunde für Ingenieure*, Vieweg Verlag, Braunschweig, 1981

Schedler, W.: *Hartmetall für den Praktiker*, VDI-Verlage, Düsseldorf, 1988

Schneider, J.: *Schneidkeramik*, Verlag moderne Industrie, Landsberg am Lech, 1995

Copies with figures and tables will be distributed

Course: Constitution and Properties of Protective Coatings [2177601]

Coordinators: S. Ulrich
Part of the modules: Specific Topics in Materials Science (p. 101)[W14INGMB33]

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* [W13INGMB9] should be completed successfully beforehand. Basic knowledge of physics, chemistry and material science is assumed.

Learning Outcomes

Transfer of the basic knowledge of surface engineering, of the relations between constitution, properties and performance, of the manifold methods of modification, coating and characterization of surfaces.

Content

introduction and overview

concepts of surface modification

coating concepts

coating materials

methods of surface modification

coating methods

characterization methods

state of the art of industrial coating of tools and components

new developments of coating technology

Literature

Bach, F.-W.: Modern Surface Technology, Wiley-VCH, Weinheim, 2006

Copies with figures and tables will be distributed

Course: Membrane Separation in Water Treatment [22605]

Coordinators: H. Horn, F. Saravia

Part of the modules: Water Chemistry and Water Technology II (p. 135)[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:** R. Golloch**Part of the modules:** Combustion Engines II (p. 85)[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. 52)[WI4VWL2], Market Engineering (p. 34)[WI4BWLISM3], Communications & Markets (p. 36)[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, Madzharov
Part of the modules: Technical Logistics (p. 95)[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

Students are able to:

- Model the dynamic behaviour of material handling systems and based on this calculate the dynamical behaviour and
- Transfer this approach autonomous to further, different material handling installations and
- Discuss the knowledge with subject related persons.

Content

design and dimension of machines from intralogistics // static and dynamic behaviour // operation properties and specifics // visit of real intralogistic system

Inside practical lectures: sample applications and calculations in addition to the lectures

Media

supplementary sheets, projector, blackboard

Literature

Recommendations during lessons

Remarks

-

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

Coordinators: M. Mittwollen, Madzharov
Part of the modules: Technical Logistics (p. 95)[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

Students are able to:

- Model the dynamic behaviour of material handling systems and based on this calculate the dynamical behaviour and
- Transfer this approach autonomous to further, different material handling installations,
- Discuss the knowledge with subject related persons and
- Judge about systems in place and justify it in front of subject related persons.

Content

design and dimension of machines from intralogistics // static and dynamic behaviour // operation properties and specifics // visit of real intralogistic system // self manufactured project report

Inside practical lectures: sample applications and calculations in addition to the lectures

Self manufacturing of a project report to recesses the topic.

Media

supplementary sheets, projector, blackboard

Literature

Recommendations during lessons

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

Coordinators: T. Mappes

Part of the modules: Microsystem Technology (p. 109)[WI4INGMBIMT4], Microoptics (p. 107)[WI4INGMBIMT3], BioMEMS (p. 104)[WI4INGMBIMT1]

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

The lecture introduces to the basics of optics and presents optical effects and methods used research and industry. Optical elements, optical effects, and optical instruments are introduced by discussing selected examples of each field. Fabrication processes for optical devices in macroscopic and microscopic scales are presented.

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

Literature

Hecht Eugene: Optik; 4., überarb. Aufl.; Oldenbourg Verlag, München und Wien, 2005

Lecture script as *.pdf

Course: Automated Manufacturing Systems [2150904]

Coordinators: J. Fleischer

Part of the modules: Automated Manufacturing Systems (p. 103)[WI4INGMBWBK1]

ECTS Credits	Hours per week	Term	Instruction language
9	4/2	Summer term	de

Learning Control / Examinations

The assessment consists of an written exam (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Reexaminations are offered at every ordinary examination date.

Conditions

None

Recommendations

None

Learning Outcomes

The students ...

- are able to analyze implemented automated manufacturing systems and describe their components.
- are capable to assess the implemented examples of implemented automated manufacturing systems and apply them to new problems.
- are able to name automation tasks in manufacturing plants and name the components which are necessary for the implementation of each automation task.
- are capable with respect to a given task to plan the configuration of an automated manufacturing system and to determine the necessary components to its realization.
- are able to design and select components for a given use case of the categories: "Handling Technology", "Industrial Robotics", "Sensory" and "Controls".
- are capable to compare different concepts for multi-machine systems and select a suitable concept for a given use case.

Content

The lecture provides an overview of the structure and functioning of automated manufacturing systems. In the introduction chapter the basic elements for the realization of automated manufacturing systems are given. This includes:

- Drive and control technology
- Handling technology for handling work pieces and tools
- Industrial Robotics
- Quality assurance in automated manufacturing
- automatic machines, cells, centers and systems for manufacturing and assembly
- structures of multi-machine systems
- planning of automated manufacturing systems

In the second part of the lecture, the basics are illustrated using implemented manufacturing processes for the production of automotive components (chassis and drive technology). The analysis of automated manufacturing systems for manufacturing of defined components is also included.

In the field of vehicle power train both, the automated manufacturing process for the production of the conventional internal-combustion engine and the automated manufacturing process for the production of the prospective electric power train (electric motor and battery) are considered. In the field of car body, the focus is on the analysis of the process chain for the automated manufacturing of conventional sheet metal body parts, as well as for automated manufacturing of body components made out of fiber-reinforced plastics.

Within tutorials, the contents from the lecture are advanced and applied to specific problems and tasks.

Media

Lecture notes will be provided in ilias (<https://ilias.studium.kit.edu/>).

Literature

Lecture Notes

Remarks

None

Course: Automation of Discrete Event and Hybrid Systems [23160]

Coordinators: M. Kluwe
Part of the modules: Control Engineering II (p. 127)[WI4INGETIT2]

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) according to §4(2), 2 of the examination regulation. The exam takes place at several dates in every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None.

Learning Outcomes

The students know some fundamental types and descriptions of discrete event models like automata or Petri nets and are able to use them systematically for the modeling of technical processes. Furthermore they are familiar with the analysis of the dynamic causal performance of a Petri net based on its reachability graph or its algebraic representation. Above that they are able to describe and analyze the dynamic temporal behaviour by means of the May-Plus-Algebra. The students know the hierarchy and the specifications of feedforward process control and have the knowledge to design especially interlocking control systems. Finally they have become acquainted with the basics of hybrid systems and means for their simulation, analysis and control.

Content

In the lecture the students get familiar with the basics of the modelling, simulation, analyses and control of discrete event and hybrid systems:

- *Introduction*
system classification, definition, example: controlled charging process
- *Model classification and modeling formalisms*
automata and formal languages, petri nets, net condition/event systems
- *Discrete process modeling*
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)[WI4BWLIP4]

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 Track Infrastructure [19307s / 6234809]

Coordinators: E. Hohnacker, H. Müller

Part of the modules: Public Transportation Operations (p. 124)[WI4INGBGU19], Guided Transport Systems / Engineering (p. 125)[WI4INGBGU20]

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 (10 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

methods of construction; strategies for maintenance; construction and operation

Remarks

See German version.

Course: Construction Equipment and Mechanical Process Engineering [6241704]

Coordinators: H. Schneider, H. Schlick

Part of the modules: Mechanical Process Engineering in Construction (p. 121)[WI4INGBGU17]

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

Learning Control / Examinations

The assesement consists of a written exam (90 minutes) (following §4(2), 1 of the examination regulation).

Conditions

The course Baumaschinen und maschinelle Verfahrenstechnik [6241704] is compulsory and must be examined.

Recommendations

It is recommended to attend the module Fundamentals of Construction [WI3INGBGU3] of the B.Sc. studies.

Learning Outcomes

Students understand the important fields of mechanical process engineering in construction. They can evaluate construction methods and aggregate production methods based on the context of use and they can analyze the use of important construction equipment, construction methods and aggregate production methods.

Content

The lecture comprises:

- Overview of construction equipment (Baugeräteliste BGL)
- Equipment characteristics and variants
- Operational characteristics of equipment
- Mode of operation of equipment and of systems of equipment
- Overview of mode of production in earth moving, foundation construction and marine construction.
- Design and mode of operation of aggregate production.

Media

Lecture slides.

Course: Construction Equipment Seminar [6241916]

Coordinators: H. Schneider

Part of the modules: Mechanical Process Engineering in Construction (p. 121)[WI4INGBGU17]

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

Learning Control / Examinations

The assessment consists of an oral exam (20 min.) taking place in the recess period (according to §4 (2), 2 of the examination regulation).

Conditions

None.

Learning Outcomes

Students

- have specialized knowledge about technology, performance and possible applications as well as limits of application of the presented construction equipment.
- can evaluate and determine appropriate variants of construction equipment based on the planned use.

Content

The lecture consists of presentations by practitioners from construction equipment manufacturers. The lecture comprises

- the current state of construction equipment technology focusing on design, innovations and development trends.
- Possible applications of construction equipment
- Application examples from practice.

regarding

- Tower cranes and mobile cranes,
- Hydraulic excavators,
- Road pavers
- Concrete pumps,
- caterpillars, wheel loaders

and heavy duty lorries.

Media

Documents as provided by presenters.

Course: Determination of Demand, Timetable Construction and Alignment [6234810]

Coordinators: E. Hohnecker

Part of the modules: Project in Public Transportation (p. 123)[WI4INGBGU18]

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

Learning Control / Examinations

The assessment of the lectures *Determination of demand, Timetable construction and Alignment (supported by CAD)* [6234810; 6234811] consists of non exam assessments (an oral presentation and a written paper according §4(2), 3 of the examination regulation).

The mark consist of both parts of the assessment (50% of the mark of the presentation and 50% 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 obligatory in the module *Project in Public Transportation*.

Recommendations

See module description.

Learning Outcomes

See German version.

Content

practise: urban traffic project: Planning and line-laying

Remarks

See German version.

Course: Design Basics in Highway Engineering [19026]

Coordinators: R. Roos

Part of the modules: Design, Construction, Operation and Maintenance Highways (p. 114)[WI4INGBGU1]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	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. 131)[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

See German version.

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: https://www.ieh.kit.edu/studium_und_lehre_bee.php and can be downloaded using a password.

Literature

Elective literature:

Will be announced in the lecture notes.

Course: Methods and Models in Transportation Planning [6232701]**Coordinators:** P. Vortisch, M. Kagerbauer**Part of the modules:** Transportation Modelling and Traffic Management (p. 120)[WI4INGBGU16]

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

Learning Control / Examinations

The assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation.

Conditions

See module description.

Learning Outcomes**Content**

Course: Special Topics in Highway Engineering [6233807]**Coordinators:** R. Roos**Part of the modules:** Highway Engineering (p. 115)[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 of Highways [6233802]**Coordinators:** R. Roos**Part of the modules:** Design, Construction, Operation and Maintenance Highways (p. 114)[WI4INGBGU1], Highway Engineering (p. 115)[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: Fuels and Lubricants for Combustion Engines [2133108]

Coordinators: B. Kehrwald, J. Volz
Part of the modules: Combustion Engines II (p. 87)[WI4INGMB35]

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

Learning Control / Examinations

oral examination, Duration: ca. 30 min., no auxiliary means

Conditions

None.

Recommendations

None.

Learning Outcomes

The students can name and explain composition and meaning of fuels, lubricants and coolants as important components in the system of today's Otto and Diesel engines as well as definition and chemical composition of fuels and lubricants, the meaning of crude oil as basic primary product, production processes, major properties, standards and specifications, testing methods.

They can point out future worldwide trends in the field of conventional and alternative fuels regarding emission standards and energy conservation

Content

Introduction and basics

Fuels for Gasoline and Diesel engines

Hydrogen

Lubricants for Gasoline and Diesel engines

Coolants for combustion engines

Literature

Lecturer notes

Course: Motor Fuels for Combustion Engines and their Verifications [2133109]**Coordinators:** J. Volz**Part of the modules:** Combustion Engines II (p. 85)[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].

Recommendations

Basic knowledge of chemistry is recommended.

Learning Outcomes**Content**

Course: Operation Systems and Track Guided Infrastructure Capacity [6234804]

Coordinators: E. Hohnecker

Part of the modules: Public Transportation Operations (p. 124)[WI4INGBGU19]

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

See German version.

Content

Special signalling equipments, automatic driving, safety case, capacity of railway equipments, dimensioning of marshaling yards.

Literature

Elective literature:

Fiedler: Grundlagen der Bahntechnik, Werner Verlag Düsseldorf

Pachl: Systemtechnik des Schienenverkehrs, Teubner-Verlag, Stuttgart

Remarks

See German version.

Course: Assessment of Public Policies and Projects 1 [2561220]

Coordinators: A. Kopp

Part of the modules: Transport infrastructure policy and regional development (p. 60)[WI4VWL11]

ECTS Credits	Hours per week	Term	Instruction language
3	2	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

Basic knowledge of microeconomics and skills of undergraduate studies or a bachelor's degree are required.

Recommendations

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. 60)[WI4VWL11]

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

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: Assessment and Evaluation Techniques [6232801]**Coordinators:** P. Vortisch, B. Chlond**Part of the modules:** Fundamentals of Transportation (p. 119)[WI4INGBGU15], Transportation Modelling and Traffic Management (p. 120)[WI4INGBGU16]

ECTS Credits	Hours per week	Term	Instruction language
1,5	1/0	Summer term	de

Learning Control / Examinations

The assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation.

Conditions

None.

Learning Outcomes**Content**

Course: Advanced Civil Law [24504]

Coordinators: T. Dreier
Part of the modules: Commercial Law (p. 139)[WI4JURA2]

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

Learning Control / Examinations

The assesment ist explained in the module description.

Conditions

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

Learning Outcomes

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

Content

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

Media

Transparencies/Slides

Literature

Tba at the beginning of the course.

Elective literature:

tba at the beginning of the course

Course: BioMEMS - Microsystems Technologies for Life-Sciences and Medicine I [2141864]

Coordinators: A. Guber
Part of the modules: BioMEMS (p. 104)[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.

Learning Outcomes

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

Content

Introduction into various microtechnical manufacturing methods: LIGA, Micro milling, Silicon Micromachining, Laser Microstructuring, μ EDM, Metal-Etching

Biomaterials, Sterilisation.

Examples of use in the life science sector: basic micro fluidic structures: micro channels, micro filters, micromixers, micropumps, microvalves, Micro and nanotiter plates, Microanalysis systems (μ TAS),

Lab-on-chip applications.

Literature

Menz, W., Mohr, J., O. Paul: Mikrosystemtechnik für Ingenieure, VCH-Verlag, Weinheim, 2001

Lecture script

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

Coordinators: A. Guber

Part of the modules: Microsystem Technology (p. 109)[WI4INGMBIMT4], BioMEMS (p. 104)[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 lecture will first address relevant microtechnical manufacturing methods. Then, selected biomedical applications will be presented, as the increasing use of microstructures and microsystems in Life-Sciences und in medicine leads to improved medico-technical products, instruments, and operation and analysis systems.

Content

Examples of use in Life-Sciences and biomedicine: Microfluidic Systems:

LabCD, Protein Crystallisation

Microarrays

Tissue Engineering

Cell Chip Systems

Drug Delivery Systems

Micro reaction technology

Microfluidic Cells for FTIR-Spectroscopy

Microsystem Technology for Anesthesia, Intensive Care and Infusion

Analysis Systems of Person's Breath

Neurobionics and Neuroprosthesis

Nano Surgery

Literature

Menz, W., Mohr, J., O. Paul: Mikrosystemtechnik für Ingenieure, VCH-Verlag, Weinheim, 2001

Buess, G.: Operationslehre in der endoskopischen Chirurgie, Band I und II; Springer-Verlag, 1994

Lecture script

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

Coordinators: A. Guber

Part of the modules: Microsystem Technology (p. 109)[WI4INGMBIMT4], BioMEMS (p. 104)[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 lecture will first address relevant microtechnical manufacturing methods. Then, selected biomedical applications will be presented, as the increasing use of microstructures and microsystems in Life-Sciences und in medicine leads to improved medico-technical products, instruments, and operation and analysis systems.

Content

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

Literature

Menz, W., Mohr, J., O. Paul: Mikrosystemtechnik für Ingenieure, VCH-Verlag, Weinheim, 2001

Buess, G.: Operationslehre in der endoskopischen Chirurgie, Band I und II;
 Springer-Verlag, 1994

Lecture script

Course: Bionics for Engineers and Natural Scientists [2142140]

Coordinators: H. Hölscher

Part of the modules: Nanotechnology (p. 110)[WI4INGMBIMT5], BioMEMS (p. 104)[WI4INGMBIMT1], Microsystem Technology (p. 109)[WI4INGMBIMT4]

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

Learning Control / Examinations

short presentation (15 min) and oral examination (30 min)

The resulting grade will be calculated 30% presentation and 70% examination

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 3 (p. 28)[WI4BWLFBV11], Finance 2 (p. 25)[WI4BWLFBV2]

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: BUS-Controls [2114092]

Coordinators: M. Geimer

Part of the modules: Mobile Machines (p. 83)[WI4INGMB15], Automotive Engineering (p. 80)[WI4INGMB5]

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:

- Etschberger, K.: Controller Area Network, Grundlagen, Protokolle, Bausteine, Anwendungen; München, Wien: Carl Hanser Verlag, 2002.
- Engels, H.: CAN-Bus - CAN-Bus-Technik einfach, anschaulich und praxisnah dargestellt; Poing: Franzis Verlag, 2002.

Remarks

The course will be replenished by interesting lectures of professionals.

Course: Business Activity Management [2511506]

Coordinators: C. Janiesch

Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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 (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

Students will acquire a deep and systematic understanding of how process data can be accessed and KPI can be measures in service-oriented and event-driven processes in order to allow for decision making in real-time. Equipped with practical and research-based knowledge, they will be enabled to engineer business activity management applications with state-of-art technologies and gain a broad understanding of methods and best practices for their own work.

Content

The lecture "Business Activity Management" covers technical and organizational aspects with respect to the development and use of modern real-time monitoring and management systems for business process management and service-oriented computing. It introduces background, trends, and technologies and of BPM, Business Intelligence, Complex Event Processing and their combination towards business activity management.

The topics of the lecture include e.g.:

-
- Business Intelligence
- Process Modeling
- Business Rules
- Complex Event Processing
- Event-driven Architectures
- Event-driven Business Process Management
- Software for BPM, BI, and CEP
- BPM in the Cloud

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 [2595484]

Coordinators: G. Satzger, J. Kunze von Bischoffshausen
Part of the modules: Service Management (p. 37)[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.

Students 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: Electronic Markets (p. 33)[WI4BWLISM2], Advanced CRM (p. 32)[WI4BWLISM1]

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

Learning Control / Examinations

Assessment consists of a written exam of 1 hour length following §4 (2), 1 of the examination regulation and by submitting written papers as part of the exercise following §4 (2), 3 of the examination regulation.

The course is considered successfully taken, if at least 50 out of 100 points are acquired in the written exam. In this case, all additional points (up to 10) from exercise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	95
1.3	90
1.7	85
2.0	80
2.3	75
2.7	70
3.0	65
3.3	60
3.7	55
4.0	50
5.0	0

Conditions

None.

Learning Outcomes

Students

- 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.

Remarks

As of winter term 2014/15 this lecture is hold in alternation with "2540502 - Markets and Organizations: Principles". The current schedule can be seen on the chair's website (<http://www.em.uni-karlsruhe.de>).

Course: Business Plan Workshop [2572184]**Coordinators:** M. Klarmann, O. Terzidis**Part of the modules:** Entrepreneurship (EnTechnon) (p. 46)[WI4BWLENT1], Marketing Management (p. 43)[WI4BWL MAR5]

ECTS Credits	Hours per week	Term	Instruction language
3	1	Summer term	de

Learning Control / Examinations

See German version.

Conditions

None.

Learning Outcomes**Content**

In this workshop the students work in groups to develop a business plan for an innovative business concept.

Remarks

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

Course: CATIA CAD training course [2123356]

Coordinators: J. Ovtcharova

Part of the modules: Virtual Engineering B (p. 98)[WW4INGMB30]

ECTS Credits	Hours per week	Term	Instruction language
2	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 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-NX training course [2123355]

Coordinators: J. Ovtcharova
Part of the modules: Virtual Engineering B (p. 98)[WW4INGMB30]

ECTS Credits	Hours per week	Term	Instruction language
2	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 NX 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 NX
- 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 NX

Literature

Practical course skript

Remarks

For the practical course compulsory attendance exists.

Course: Case Studies in Pricing [2572182]

Coordinators: M. Klarmann, Mitarbeiter
Part of the modules: Sales Management (p. 44)[WI4BWL MAR6]

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

Learning Control / Examinations

Conditions
None.

Learning Outcomes**Content**

The students work in groups applying theories to solve case studies for price management.

Remarks

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

Course: Chemical Technology of Water [22601]

Coordinators: H. Horn

Part of the modules: Water Chemistry and Water Technology I (p. 134)[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
Part of the modules: Microfabrication (p. 106)[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

Part of the modules: Informatics (p. 68)[WI4INFO1], Emphasis in Informatics (p. 70)[WI4INFO2], Electives in Informatics (p. 72)[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, Web (service) technology, and distributed systems, 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 and cost efficiency are associated with Cloud Computing. The lecture introduces Cloud Computing, covering topics such as:

- Fundamentals: Virtualization, Service-orientation
- Cloud services: IaaS, PaaS, SaaS
- Cloud storage, distributed systems architecture
- Cloud service engineering, programming models
- Cloud service quality

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. 111)[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 & 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: Information Engineering (p. 38)[WI4BWLISM7], Communications & Markets (p. 36)[WI4BWLISM5], Telecommunications Markets (p. 59)[WI4VWL10]

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

Learning Control / Examinations

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation) and by submitting written essays as part of the exercise (according to §4(2), 3 of the examination regulation). 80% of the final grade is based on the written exam and 20% is based on assignments from the exercises. The points obtained in the exercises only apply to the first and second exam of the semester in which they were obtained.

Conditions

None.

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
- E-learning 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 will be offered latest until summer term 2014. The examination will be offered latest until winter term 2014/15 (repeaters only).

Course: Complexity Management [2511400]

Coordinators: D. Seese

Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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 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

see 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: Electives in Informatics (p. 72)[WI4INFO3], Informatics (p. 68)[WI4INFO1], Market Engineering (p. 34)[WI4BWLISM3], Emphasis in Informatics (p. 70)[WI4INFO2]

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

Learning Control / Examinations

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation). By successful completion of the exercises (according to §4(2), 3 of the examination regulation) a bonus can be obtained. If the grade of the written exam is at least 4.0 and at most 1.3, the bonus will improve it by one grade level (i.e. by 0.3 or 0.4). The bonus only applies to the first and second exam of the semester in which it was obtained.

Conditions

None.

Learning Outcomes

The student

- understands the 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

- PowerPoint

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).

Course: Corporate Financial Policy [2530214]

Coordinators: M. Ruckes

Part of the modules: Finance 3 (p. 28)[WI4BWLFBV11], Finance 2 (p. 25)[WI4BWLFBV2], Economic Theory and its Application in Finance (p. 63)[WI4VWL14], Applied Strategic Decisions (p. 52)[WI4VWL2]

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. 27)[WI4BWLFBV7], Insurance Management I (p. 26)[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. 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. 32)[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 10) from exercise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	95
1.3	90
1.7	85
2.0	80
2.3	75
2.7	70
3.0	65
3.3	60
3.7	55
4.0	50
5.0	0

Conditions

None.

Learning Outcomes

The students

- understand service management as an economic basis for Customer Relationship Management and learn the resulting consequences for the management, the organisation itself and their departments,
- design and develop service concepts and service systems at a conceptual level,
- work on case studies in the CRM-area in small groups with limit time,
- learn English as the technical language in the area of CRM and consult internationale literature from this field for the case studies.

Content

The course begins with an introduction into Service Management as the strategic concept which also covers all CRM applications. The course is divided in the basics of Service Management as well as different topics within this concept like external and internal marketing, quality management and organizational requirements.

Media

Slides, Audio, Reader

Literature

Christian Grönroos. Service Management and Marketing : A Customer Relationship Management Approach. Wiley, Chichester, 2nd edition, 2000.

Elective literature:

Jill Dyché. The CRM Handbook: A Business Guide to Customer Relationship Management. Addison-Wesley, Boston, 2nd edition, 2002.

Ronald S. Swift. Accelerating Customer Relationships: Using CRM and RelationshipTechnologies. Prentice Hall, Upper Saddle River, 2001.

Stanley A. Brown. Customer Relationship Management: A Strategic Imperative in theWorld of E-Business. John Wiley, Toronto, 2000.

Course: Data Mining [2520375]**Coordinators:** G. Nakhaeizadeh**Part of the modules:** Statistical Methods in Risk Management (p. 79)[W14STAT2]

ECTS Credits	Hours per week	Term	Instruction language
5	2	Winter / Summer 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: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[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

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. 68)[WI4INFO1], Emphasis in Informatics (p. 70)[WI4INFO2], Electives in Informatics (p. 72)[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:** G. Sydow**Part of the modules:** Public Business Law (p. 142)[WI4JURA6], Governance, Risk & Compliance (p. 143)[WI4INGRC]

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

Learning Control / Examinations

The assessment consists of an written exam (approx. 60 min.) according to § 4(2), 1 SPO.

Conditions

None.

Recommendations

Parallel to the lectures tutoria are offered in which legal thinking and argumentation is practised. Their attendance is strongly recommended.

During the semester, test exams to each lecture are offered with extensive coaching. During the lecture-free time, a Q-and-A-lecture is offered. Details on the homepage of the ZAR (www.kit.edu/zar)

Learning Outcomes

Increasing significance of information technology for data processing and interconnectedness of the society by means of telecommunication does not only enhance the social and economical relevance of data in general, it raises the question about legal rules for the protection of personalised data as well. The problem for those who are responsible for the application of law is that national rules in this area are in constant flux due to technological progress and Europeanisation of law. Additionally there is a vast number of sector-specific regulation (such as labour law). Bearing all this in mind, the lecture's main focus is the presentation of the basic principles of the German Federal Act on Data Protection (Bundesdatenschutzgesetz). In doing so, new concepts of data protection like self-data protection or system data protection will be analysed. A further focal point is the examination of evolution of sector-specific data protection law, considering as example regulation of data protection in connection with teleservice or mediaservice. Students should learn how to negotiate their ways in the interaction of different levels of legal norms and solve simple problems of data protection law.

Content

After illustrating contents and history of data protection law there will be presented backgrounds with respect to Community law and under constitutional law. Further on, the German Federal Act on Data Protection will be focussed. At this will be set forth basic principles of regulation (such as necessity), personalised data as an object of regulation, rights of those who are affected as well as the legitimacy of different procedures of data processing. 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: Derivatives [2530550]**Coordinators:** M. Uhrig-Homburg**Part of the modules:** Finance 3 (p. 28)[WI4BWLFBV11], Finance 2 (p. 25)[WI4BWLFBV2], Finance 1 (p. 24)[WI4BWLFBV1]

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

Learning Control / Examinations**Conditions**

None.

Learning Outcomes

The objective of the Derivatives lecture is to become familiar with financial markets, especially derivatives markets. Traded securities and frequently used trading strategies will be introduced. Furthermore the pricing of derivatives will be derived and their use in risk management will be discussed.

Content

The lecture deals with the application areas and valuation of financial derivatives. After an overview of the most important derivatives and their relevance, forwards and futures are analysed. Then, an introduction to the Option Pricing Theory follows. The main emphasis is on option valuation in discrete and continuous time models. Finally, construction and usage of derivatives are discussed, e.g. in the context of risk management.

Media

Slides, Exercises/Exercise sheets

Literature

-
- Hull (2012): Options, Futures, & Other Derivatives, Prentice Hall, 8th Edition

Elective literature:

Cox/Rubinstein (1985): Option Markets, Prentice Hall

Course: Design Thinking [2545010]**Coordinators:** O. Terzidis, B. Kneisel, Dr. H. Haller**Part of the modules:** Entrepreneurship (EnTechnon) (p. 46)[WI4BWLENT1], Innovation Management (p. 47)[WI4BWLENT2]

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

Learning Control / Examinations**Conditions**

None.

Learning Outcomes

See German version.

Content

See German version.

Literature

See German version.

Remarks

The seminar content will be published on the website of the institute.

Up to two courses in the field of Design Thinking can be credited.

Course: Developing Business Models for the Semantic Web [2513305]

Coordinators: R. Studer, M. Maleshkova, F. Keppmann
Part of the modules: Entrepreneurship (EnTechnon) (p. 46)[WI4BWLENT1]

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

Learning Control / Examinations

Non exam assessment (seminar paper) (following §4(2), 3 of the examination regulation).

Conditions

None.

Recommendations

As a recommendation to attending the seminar, basic knowledge about semantic technologies and concepts should be available. This may be acquired by attending one of the following lectures – Wissensmanagement, Semantic Web Technologies 1, Semantic Web Technologies 2 or by studying related literature. Furthermore the topic entrepreneurship should be of interest.

Learning Outcomes

The Student

- analyzes and develops in small teams a business model from an idea to a complete business plan or
- treats a special topic from the area of Semantic Web in businesses and entrepreneurships.
- learns about basic concepts and problem areas and considers these while building the business plan for a particular business idea.
- understands and considers the viewpoints of different stakeholders in the area of entrepreneurships and their influences on an own business idea.

Content

Semantic technologies such as RDF, SPARQL, OWL, and RIF are still standardised only in their first versions. Still, the multitude of integrated technologies provides the basis for development of new applications and creates, with the help of the initial standardisations, a foundation for attracting investors. The potential and future developments in the field are exemplified by the growing popularity and importance of data, being published as Linked Data, as well as by the increase in applications developed outside the scope of research. The seminar “Developing Business Models for the Semantic Web” aims to explore these opportunities for new business models und business ventures.

The seminar takes place on a weekly basis and consists of two main parts. The first part is a series of presentations, held by external experts who share their experience in the area of entrepreneurship. The aim is to engage a wide variety of presenters, including applicants to programs for supporting young business ventures, startup founders, and people in leadership positions in established companies. Further guest lecturers include experts in the field of business and startup development, tax and enterprise law, as well as entrepreneurs, who have sold their startups or had to give up their ideas.

The second part consists of the contributions of seminar participants. They are required to develop a business model, starting with the initial idea and building it up to a complete business plan. This development process is accompanied by feedback sessions, pitches, mid-term presentations and a final presentation. The student presentations alternate with presentations given by external experts. Furthermore, besides on the development of a business plan, student can work on a specific topic such as “Analysing Existing Business Models on the Web” or “Using Open Source in Startups”.

The seminar pass can be obtained by submitting a completed seminar thesis (i.e. the business plan or the specific topic) and by regularly attending the seminar presentations.

Course: Document Management and Groupware Systems [2511212]

Coordinators: S. Klink
Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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: IT-based Road Design [6233901]**Coordinators:** M. Zimmermann**Part of the modules:** Safety, Computing and Law in Highway Engineering (p. 116)[WI4INGBGU9]

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: Information Engineering (p. 38)[WI4BWLISM7], Market Engineering (p. 34)[WI4BWLISM3], Energy Economics and Energy Markets (p. 40)[WI4BWLIIIP4]

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

Learning Control / Examinations

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation). By successful completion of the exercises (according to §4(2), 3 of the examination regulation) a bonus can be obtained. If the grade of the written exam is at least 4.0 and at most 1.3, the bonus will improve it by one grade level (i.e. by 0.3 or 0.4). The bonus only applies to the first and second exam of the semester in which it was obtained.

Conditions

None.

Learning Outcomes

The student

- understands the tasks and basic structure of the energy economy, in particular concerning electricity markets,
- understands the change in the energy economy and the necessity for the development of a Smart Grid,
- knows the market mechanisms in the energy market and their role in coordination and allocation of electric energy,
- is able to describe the relation between OTC, spot and balancing energy markets,
- knows the regulation specifications for energy markets and can reflect them critically,
- is able to model smart grid mechanisms and to evaluate them by simulation based methods.

Content

Scope of the lecture *eEnergy: Markets, Services, Systems* is economics and information management in energy markets. Integration of the growing number of renewable energy sources imposes new challenges on energy markets and the power system. To improve coordination between supply and demand it is necessary to interlink centralized and decentralized generators as well as consumers by means of ICT. Current electricity networks are extended by intelligent IT components thus incorporating the "Smart Grid". Existing market structures for electricity have to be adjusted for a successful implementation of demand side management and integration of an increasing number of renewable energy producers as well as electric vehicles. Apart from regulatory and economic concepts, methods for modeling and analysis of energy markets are introduced and explained during the course.

The lecture is structured as follows:

1. **Electricity Markets**
Market Models, EEX (spot and futures market), OTC Trading, Market Coupling
2. **Regulation**
Charges and Incentives, Network Congestion (Management)
3. **Demand Side Management**
Smart Meters, Tariffs, Price Elasticity, Storage Systems, Electric Mobility
4. **Modeling and Analysis of Energy Markets**

Media

- PowerPoint
- E-learning platform ILIAS

Literature

- Erdmann G, Zweifel P. *Energieökonomik, Theorie und Anwendungen*. Berlin Heidelberg: Springer; 2007.
- Grimm V, Ockenfels A, Zoettl G. Strommarktdesign: Zur Ausgestaltung der Auktionsregeln an der EEX *. *Zeitschrift für Energiewirtschaft*. 2008:147-161.
- Stoft S. *Power System Economics: Designing Markets for Electricity*. IEEE; 2002.,
- Ströbele W, Pfaffenberger W, Heuterkes M. *Energiewirtschaft: Einführung in Theorie und Politik*. 2nd ed. München: Oldenbourg Verlag; 2010:349.

Remarks

The lecture has also been added in the IIP Module *Basics of Liberalised Energy Markets*.

Course: Efficient Energy Systems and Electric Mobility [2581006]

Coordinators: R. McKenna, P. Jochem
Part of the modules: Energy Economics and Technology (p. 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:** Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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 period (wrt §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: eFinance: Information Engineering and Management for Securities Trading [2540454]

Coordinators: C. Weinhardt

Part of the modules: Finance 3 (p. 28)[WI4BWLFBV11], Market Engineering (p. 34)[WI4BWLISM3], Finance 2 (p. 25)[WI4BWLFBV2]

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

Learning Control / Examinations

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation) and by submitting written essays as part of the exercise (according to §4(2), 3 of the examination regulation). 70% of the final grade is based on the written exam and 30% is based on assignments from the exercises. The points obtained in the exercises only apply to the first and second exam of the semester in which they were obtained.

Conditions

None.

Learning Outcomes

The students

- are able to understand the theoretical and 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: Characteristics of Transportation Systems [6232806]**Coordinators:** P. Vortisch**Part of the modules:** Fundamentals of Transportation (p. 119)[WI4INGBGU15]

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

Learning Control / Examinations

The assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation.

Conditions

See module description.

Learning Outcomes**Content**

Course: Introduction to Game Theory [2520525]

Coordinators: C. Puppe, P. Reiss
Part of the modules: Social Choice Theory (p. 58)[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 (60 minutes) according to Section 4(2),1 of the examination regulation. The exam takes place in the recess period and can be resited at every ordinary examination date.

Conditions

None.

Recommendations

Basic knowledge of mathematics and statistics is assumed.

Learning Outcomes

This course offers an introduction to the theoretical analysis of strategic interaction situations. At the end of the course, students shall be able to analyze situations of strategic interaction systematically and to use game theory to predict outcomes and give advice in applied economics settings.

Content

The course focuses on non-cooperative game theory. It discusses models, solution concepts, and applications for simultaneous games as well as sequential games. Various solution concepts, e.g., Nash equilibrium and subgame-perfect equilibrium, are introduced along with more advanced concepts. A short introduction to cooperative game theory is given if there is sufficient time.

Media

Slides, problem sets.

Literature

Compulsory textbook:

Gibbons (1992): A Primer in Game Theory, Harvester-Wheatsheaf.

Additional Literature:

Berninghaus/Ehrhart/Güth (2010): Strategische Spiele, Springer Verlag.

Binmore (1991): Fun and Games, DC Heath.

Fudenberg/Tirole (1991): Game Theory, MIT Press.

Heifetz (2012): Game Theory, Cambridge Univ. Press.

Remarks

This course was formerly named "Game Theory I".

Course: Electrical Rail Vehicles [2114346]

Coordinators: G. Clos

Part of the modules: Guided Transport Systems / Engineering (p. 125)[WI4INGBGU20]

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.

Learning Outcomes

Content

traction modi; engines; power supply; electrical elements in signaling / operation

Literature

Elective literature:

Steimel: Elektrische Triebfahrzeuge und ihre Energieversorgung, Oldenbourg-Verlag, München

Course: Elements of Technical Logistics [2117096]

Coordinators: M. Mittwollen, Madzharov

Part of the modules: Technical Logistics (p. 95)[WI4INGMB27], Introduction to Logistics (p. 88)[WI4INGMB20]

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.

Recommendations

None.

Learning Outcomes

Students are able to:

- Describe elements and systems of technical logistics,
- Model and calculate structures and functions of special conveying machines,
- Describe interdependence of material flow systems and technique quantitatively and qualitatively and
- Equip material flow systems with appropriate machines.

Content

material flow systems and their (conveying) technical components

mechanical behaviour of conveyors;

structure and function of conveyor machines; elements of intralogistics (belt conveyor, racks, automatic guided vehicles, fan-in, bifurcation, and etc.)

sample applications and calculations in addition to the lectures inside practical lectures

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. 39)[WI4BWLIIIP2]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Winter term	de

Learning Control / Examinations

The assessment consists of an oral (30 minutes) or a written (60 minutes) exam (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None.

Learning Outcomes

The student should identify problems of industrial pollution control.
 The student knows solutions to these problems and their ways of application.

Content

The course will provide an overview of sources of air pollution, waste and municipal waste; methods to monitor and to reduce/manage pollutant flows; regulatory framework on national and international level.

A Air pollution control

- 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 [6232901]**Coordinators:** M. Kagerbauer, T. Streit**Part of the modules:** Transportation Modelling and Traffic Management (p. 120)[WI4INGBGU16]

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

Learning Control / Examinations

The assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation.

Conditions

See module description.

Learning Outcomes**Content**

Course: Emulsifying and Dispersing [22229]

Coordinators: Köhler

Part of the modules: Specialization in Food Process Engineering (p. 133)[WI4INGCV4]

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

Learning Control / Examinations

The assessment consists of an oral exam (25 min) (according to §4 (2), 2 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None.

Recommendations

None.

Learning Outcomes

Content

The lecture “emulsifying and dispersing” has the target to introduce the two basic operations of chemical engineering and to show how they are used today. Contents of the lectures are the definitions of the basic concepts, introduction to the mechanisms, presentation of representative machines for the production of dispersions, visit the pilot plant, identification of criteria for choosing the right equipment, introduction to current research topics in the field of emulsifying and dispersing.

Course: Theory of endogenous growth [2561503]

Coordinators: I. Ott

Part of the modules: Innovation and growth (p. 67)[WI4VWLIWW1], Macroeconomic Theory (p. 57)[WI4VWL8], Growth and Agglomeration (p. 61)[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. 55)[WI4VWL5], Energy Economics and Technology (p. 41)[WI4BWLIP5]

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

Learning Control / Examinations

The examination will be in form of a written exam acc. to §4(2), 2 ER.

Conditions

None.

Learning Outcomes

Content

The focus of the lecture is put on environmental impacts of fossil fuel conversion and related assessment methods. The list of topics is given below.

- Fundamentals of energy conversion
- Air pollutant formation from fossil fuel combustion
- Control of air pollutant emissions from fossil-fuelled power plants.
- Measures to improve conversion efficiency of fossil fuelled power plants.
- External effects of energy supply (Life Cycle Assessment of selected energy systems)
- Integrated Assessment models supporting the European Thematic Strategy on Air
- Cost-effectiveness analyses and cost-benefit analyses of air pollution control measures
- Monetary evaluation of external effects of energy supply (external costs)

Course: Energy and Process Technology II [2170832]

Coordinators: K. Dullenkopf

Part of the modules: Energy and Process Technology II (p. 113)[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

The students are able to:

-
- discuss and evaluate energy resources and reserves and their utility
- review the use of energy carriers for electrical power generation
- describe the design and functionality of fossile and nuclear power plants
- explain the concepts and properties of power-heat cogeneration, renewable energy conversion and fuel cells and their fields of application
- comment on and compare centralized and decentralized supply concepts
- calculate the potentials, risks and economic feasibility of different strategies aiming at the protection of resources and the reduction of CO₂ emissions

Content

Thermal Turbomaschinery - In the second half of the lecture deals with energy systems. Questions regarding global energy resources and their use, especially for the generation and provision of electrical energy, are addressed. Common fossile and nuclear power plants for the centralized supply with electrical power as well as concepts of power-heat cogeneration for the decentralized electrical power supply by means of block-unit heat and power plants, etc. are discussed. Moreover, the characteristics and the potential of renewable energy covnersion concepts, such as wind and hydro-power, photovoltaics, soalr heat, geothermal energy and fuel cells are compare and evaluated. The focus is on the description and calification of the potentials, the risks and the economic feasibility of the different strategies aimed to protect resources and reduce CO₂ emissions.

Course: Energy and Process Technology I [2157961]

Coordinators: H. Bauer, M. Gabi, A. Velji, H. Wirbser
Part of the modules: Energy and Process Technology I (p. 112)[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

The students are able to:

- describe and calculate the basic physical-technical processes
- apply the mathematical and thermodynamical description
- reflect on and explain the diagrams and schematics
- comment on diagrams
- explain the functionality of gas and steam turbines and their components
- name the applications of thermal turbomachinery and their role in the field of electricity generation and propulsion technology

Content

The last third of the lecture deals with the topic **Thermal Turbomachinery**. The basic principles, the functionality and the scope of application of gas and steam turbines for the generation of electrical power and propulsion technology are addressed.

Course: Energy efficient intralogistic systems [2117500]

Coordinators: F. Schönung

Part of the modules: Technical Logistics (p. 95)[WI4INGMB27], Introduction to Logistics (p. 88)[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.

Recommendations

Knowledge of Electrical Engineering and Technical Mechanics is recommended.

Learning Outcomes

Students are able to:

- Describe and choose basic measures to enhance energy efficiency,
- Specify this measures considering material handling processes like
 - steady conveyors,
 - unsteady conveyors,
 - as well as the necessary drives,
- Model based on this material handling systems and calculate their energy efficiency and
- Choose resource efficient material handling systems.

Content

The main focuses of the course are:

- green supply chain
- processes in Intralogistic systems
- evaluation of energy consumption of conveyors
- modeling of conveying systems
- methods for energy savings
- approaches for energy efficiency increasing of continuous and discontinuous conveyors
- dimensioning energy efficient drives
- new approaches for resource efficient conveying systems.

Media

presentations, black board

Literature

None.

Remarks

none

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

The student

- has acquired a broad understanding of the different energy commodity markets (power, emissions, gas, oil, hard coal)
- knows the major products traded on the relevant energy commodity markets
- has a deep understanding of pricing mechanisms on these markets
- knows the major evaluation methods from financial mathematics being able to be used for evaluating energy commodity products
- knows the key risk evaluation methods of energy commodity trading (VaR, CVaR, ...).

Content

1. Introduction to Markets, Mechanisms, Interactions
2. Basics of Risk Management
3. Oil Markets
4. Gas Markets
5. Coal Markets
6. Emission Markets
7. Simulation Game
8. Power Markets
9. Risk Management in Utilities

Media

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

Literature

Elective literature:

Burger, M., Graeber, B., Schindlmayr, G. (2007): *Managing energy risk: An integrated view on power and other energy markets*, Wiley&Sons, Chichester, England

EEX (2010): *Einführung in den Börsenhandel an der EEX auf Xetra und Eurex*, www.eex.de

Erdmann, G., Zweifel, P. (2008), *Energieökonomik, Theorie und Anwendungen*, Springer, ISBN: 978-3-540-71698-3

Hull, J.C. (2006): *Options, Futures and other Derivatives*, 6. Edition, Pearson Prentice Hall, New Jersey, USA

Borchert, J., Schlemm, R., Korth, S. (2006): *Stromhandel: Institutionen, Marktmodelle, Pricing und Risikomanagement (Gebundene Ausgabe)*, Schäffer-Poeschel Verlag

www.riskglossary.com

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: Power Transmission and Power Network Control [23372/23374]

Coordinators: T. Leibfried

Part of the modules: Generation and transmission of renewable power (p. 131)[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

See German version.

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 modeling 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: https://www.ieh.kit.edu/studium_und_lehre_euen.php 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: Energy Systems Analysis [2581002]

Coordinators: V. Bertsch

Part of the modules: Energy Economics and Technology (p. 41)[WI4BWLIP5]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Winter term	en

Learning Control / Examinations

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

Conditions

None.

Learning Outcomes

Content

1. Overview and classification of energy systems modelling approaches
2. Usage of scenario techniques for energy systems analysis
3. Unit commitment of power plants
4. Interdependencies in energy economics
5. Scenario-based decision making in the energy sector
6. Visualisation and GIS techniques for decision support in the energy sector

Media

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

Remarks

Since 2011 the lecture is offered in winter term. Exams can still be taken in summer term.

Course: Enterprise Architecture Management [2511600]

Coordinators: T. Wolf

Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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: Entrepreneurial Leadership & Innovation Management [2545012]

Coordinators: O. Terzidis, C. Linz

Part of the modules: Entrepreneurship (EnTechnon) (p. 46)[WI4BWLENT1], Innovation Management (p. 47)[WI4BWLENT2]

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

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Learning Outcomes

- Seize what determines entrepreneurial performance
- Identify entrepreneurial opportunities and evaluate them
- Develop and sharpen innovative business ideas
- Pitch a business idea in front of potential share-/stakeholders
- Lead new business growth by driving the enterprise evolution
- Effectively deal with critical challenges and overcome obstacles

Content

On campus the seminar combines foundational knowledge, real-world examples, and practical exercise/group work sessions.

Course: Entrepreneurship [2545001]**Coordinators:** O. Terzidis, W. Runge, A. Presse**Part of the modules:** Entrepreneurship (EnTechnon) (p. 46)[WI4BWLENT1], Innovation Management (p. 47)[WI4BWLENT2]

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

Learning Control / Examinations

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

Conditions

None.

Learning Outcomes

Students are generally introduced to the topic of entrepreneurship. After successful completion of the lecture they should have an overview of the sub-areas of entrepreneurship and have to be able to understand basic concepts of entrepreneurship.

Content

This lecture, as an obligatory part of the module "Entrepreneurship", introduces basic concepts of entrepreneurship. It approaches the individual steps of dynamic corporate development. The focus here is the introduction to methods for generating innovative business ideas, the translation of patents into business concepts and general principles of financial planning.

Other topics are the design and use of service-oriented information systems for founders, technology management, business model generation and lean startup methods for the implementation of business ideas in the way of controlled experiments in the market.

In WS 13/14, the lecture will have a technical and scientific focus. It will be lectured in cooperation with Dr. Wolfgang Runge.

Attention: Different lecture hall in 12 Feb 2014: HS III (Chemie).

Directly following the lectures the KIT Entrepreneurship Talks will take place from 17:30 to 18:15, where successful entrepreneurs share their experiences from the early stages of their companies.

More details: <http://etm.entechnon.kit.edu/211.php>

Course: Decision Theory [2520365]

Coordinators: K. Ehrhart
Part of the modules: Applied Strategic Decisions (p. 52)[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

Course: Design and Construction of Highways [6233801]**Coordinators:** R. Roos**Part of the modules:** Design, Construction, Operation and Maintenance Highways (p. 114)[WI4INGBGU1], Highway Engineering (p. 115)[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: Operation Methods for Earthmoving [6241913]

Coordinators: H. Schlick

Part of the modules: Mechanical Process Engineering in Construction (p. 121)[WI4INGBGU17]

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

Learning Control / Examinations

The assessment consists of an oral exam (15 min.) taking place in the recess period (according to §4 (2), 2 of the examination regulation).

Conditions

None.

Learning Outcomes

Students

- Gain specific knowledge regarding construction methods and equipment
- Can determine appropriate equipment and they can plan construction methods
- Can evaluate different construction methods and construction equipment based on context of use.

Content

The lecture comprises

- Operational characteristics of equipment and driving dynamics of construction equipment
- Impact of boundary conditions on operational characteristics
- Mode of operation of construction equipment and systems of construction equipment.

Media

Lecture slides.

Course: Gas-Markets [2581022]

Coordinators: A. Pustisek

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

None.

Learning Outcomes

- Technical and economic principles of the natural gas industry
- Assessment of natural gas as energetic source
- Classification and assessment of the natural gas industry in a political and economic context
- Assessment of decisions, actions taken and consequences thereof in the natural gas industry
- Recognition, assessment and valuation of interdependencies between different energy markets
- Development of a qualified market view for natural gas markets

Content

- Introduction and principles
 - Definition and composition of natural gas
 - Main physical parameters of natural gas
 - The natural gas value chain and its interdependencies to other fuels
- Natural gas markets
 - Brief overview of sources and production (incl. shale gas)
 - Worldwide reserves of natural gas
 - Worldwide and European natural gas production and consumption
 - Natural gas market structure in Europe and Germany (incl. the role of hubs)
 - European and German energy (esp. natural gas) prices and their development
 - Parameters not harmonized in European natural gas markets and consequences thereof
- Natural gas (commodity) contracts
 - The impact of the market structure modification to contract structure
 - Main elements of natural gas purchase and sales contracts
 - General comparison of traditional and market based pricing
- Natural gas transportation
 - Technical description of pipeline transportation
 - Historical development of the European natural gas (pipeline) transportation system (incl. new projects)
 - LNG transportation
 - Comparison of LNG and pipeline transportation
 - Main elements of natural gas transportation contracts
 - Costs of natural gas transportation
 - Natural gas transportation pricing systems
 - Transportation capacity trading
- Natural gas storage
 - Storage functions and parameters
 - Technical description of natural gas storages

- Storage types
- Natural gas storage in Europe
- Main elements of natural gas storage contracts
- Costs of storage
- Natural gas storage pricing
- Special topics
 - Selected aspects of regulation and legislation relevant for the natural gas industry
 - Portfolio management and risk management in the natural gas industry
 - „Gas-to-Liquids“ – technical description and economic impact
 - Brief overview of revenue management applied in the natural gas industry
 - Brief overview of bio-methane and its impact to natural gas markets in Germany

Media

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

Course: Discrete-event Simulation in Production and Logistics [2550488]

Coordinators: S. Nickel, S. Spieckermann

Part of the modules: Operations Research in Supply Chain Management and Health Care Management (p. 74)[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 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 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

Due to capacity restrictions, registration before course start is required. For further information see the webpage of the course. The course is planned to be held every summer term.

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

Course: Economic integration in Europe [2561257]

Coordinators: J. Kowalski
Part of the modules: Economic Policy II (p. 53)[WI4VWL3]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	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
 Pelkmans, J.: "European Integration - Methods and Economic Analysis". Pearson Education 3rd Edition, 2006.

Course: European and International Law [24666]

Coordinators: G. Sydow
Part of the modules: Public Business Law (p. 142)[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 (approx. 60 min.) according to § 4(2), 1 SPO.

Conditions

None.

Recommendations

Parallel to the lectures tutoria are offered in which legal thinking and argumentation is practised. Their attendance is strongly recommended.

During the semester, test exams to each lecture are offered with extensive coaching. During the lecture-free time, a Q-and-A-lecture is offered. Details on the homepage of the ZAR (www.kit.edu/zar)

Learning Outcomes

Due to the Europeanization of national law, the examination of European law is indispensable for everyone aiming to gain basic legal knowledge. Hardly any national activity can be imagined without the consideration of presetting of European Community law. By comparison, the influence of international law is of small importance. In light of this, the lecture predominantly deals with European law and imparts the knowledge of the EU law necessary for the students in order to comprehend how the national law is being covered by European Community law defaults. Afterwards, the student should be able to solve questions regarding European legislation in a problem-oriented manner. As the subject matter partly will be acquired in discourse with the students, it is necessary to acquire a corpus juris (e.g. Beck-Texte "Europarecht").

Content

The lecture predominantly deals with the European law: in the origin, this contains an analysis of history from the EEC to EC and EU, of participants (parliament, commission, council, European Court of Justice), of sources of law (regulations, directives, final judgements, opinions, recommendations) and legislative procedure. Further, the lecture focuses on the basic liberties of the EC, which enable a free flow of goods (for example of beer not matching the German purity law), persons (like the professional footballer Bosman), services (like entrepreneurial activities) and capital. In addition, the charter of fundamental rights of the EC and the rules of competition will be discussed, in each case in the light of a concrete legal case. Moreover, the fundamental rights of the European Convention on Human Rights (ECHR) are being introduced. Concluding, a short survey of international law, especially of the World Trade Organization (WTO), will be given.

Media

extensive script with cases; content structure, further information in the lectures

Literature

Further details will be announced in the lecture.

Elective literature:

Further details will be announced in the lecture.

Course: Experimental Economics [2540489]

Coordinators: M. Adam, C. Weinhardt

Part of the modules: Experimental Economics (p. 66)[WI4VWL17], Market Engineering (p. 34)[WI4BWLISM3], Applied Strategic Decisions (p. 52)[WI4VWL2]

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

Learning Control / Examinations

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation). By successful completion of the exercises (according to §4(2), 3 of the examination regulation) a bonus can be obtained. If the grade of the written exam is at least 4.0 and at most 1.3, the bonus will improve it by one grade level (i.e. by 0.3 or 0.4). The bonus only applies to the first and second exam of the semester in which it was obtained.

Conditions

See corresponding module information.

Learning Outcomes

The students should learn

- how to gain scientific experience and knowledge (philosophy of science),
- how Game Theory and Experimental Economics influenced each other in scientific research,
- about the methods as well as the strengths and weaknesses of Experimental Economics,
- some examples of experimental research, such as markets and auctions, coordination games, bargaining, decision making under risk,
- how to evaluate data.

Content

Experimental Economics have become a separate field in Economics. Nearly all fields of the economic discipline use economic experiments to verify theoretical results. Besides being used for 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

- PowerPoint
- E-learning platform ILIAS
- Classroom experiments or experiments in the computer laboratory will be conducted

Literature

- Strategische Spiele; S. Berninghaus, K.-M. Ehrhart, W. Güth; Springer Verlag, 2nd ed., 2006.
- Handbook of Experimental Economics; J. Kagel, A. Roth; Princeton University Press, 1995.
- Experiments in Economics; J.D. Hey; Blackwell Publishers, 1991.
- Experimental Economics; D.D. Davis, C.A. Holt; Princeton University Press, 1993.
- Experimental Methods: A Primer for Economists; D. Friedman, S. Sunder; Cambridge University Press, 1994.

Remarks

The Lecture was taken over by Marc Adam, PhD, in the winter term 2011/12.

Course: Welding Lab Course, in groupes [2173560]

Coordinators: J. Hoffmeister

Part of the modules: Specific Topics in Materials Science (p. 101)[W14INGMB33]

ECTS Credits	Hours per week	Term	Instruction language
4	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

The students are capable to name a survey of current welding processes and their suitability for joining different metals. The students can evaluate the advantages and disadvantages of the individual procedures. The students have weld with different welding processes.

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

Literature

distributed during the lab attendance

Remarks

The lab takes place at the beginning of the winter semester break once a year. The registration is possible during the lecture period in the secretariat of the Institute of Applied Materials (IAM – WK). The lab is carried out in the Handwerkskammer Karlsruhe.

You need sturdy shoes and long clothes!

Course: The Management of R&D Projects with Case Studies [2581963]

Coordinators: H. Schmied

Part of the modules: Industrial Production III (p. 42)[WI4BWLIP6]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/2	Winter / Summer Term	de

Learning Control / Examinations

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None.

Learning Outcomes

- Students 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. 81)[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. Consequently they are ready to analyze the most important influencing factors on the driving behaviour and to contribute to the optimization of the handling characteristics.

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

1. Willumeit, H.-P.: Modelle und Modellierungsverfahren in der Fahrzeugdynamik, B. G. Teubner Verlag, 1998
2. Mitschke, M./Wallentowitz, H.: Dynamik von Kraftfahrzeugen, Springer-Verlag, Berlin, 2004
3. Gnadler, R.; Unrau, H.-J.: Reprint collection to the lecture Handling Characteristics of Motor Vehicles I

Course: Handling Characteristics of Motor Vehicles II [2114838]

Coordinators: H. Unrau

Part of the modules: Handling Characteristics of Motor Vehicles (p. 81)[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. Consequently they are ready to judge the driving behaviour of vehicles and to change it by specific vehicle modifications.

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

1. Zomotor, A.: Fahrwerktechnik: Fahrverhalten, Vogel Verlag, 1991
2. Mitschke, M./Wallentowitz, H.: Dynamik von Kraftfahrzeugen, Springer-Verlag, Berlin, 2004
3. Gnadler, R. Unrau, H.-J.: Reprint collection to the lecture Handling Characteristics of Motor Vehicles II

Course: Vehicle Comfort and Acoustics I [2113806]

Coordinators: F. Gauterin

Part of the modules: Handling Characteristics of Motor Vehicles (p. 81)[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.

Recommendations

None.

Learning Outcomes

The students know what noises and vibrations mean, 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. They are ready to apply different tools and methods to analyze relations and to judge them. They are able to develop the chasis regarding driving comfort and acoustic under consideration of goal conflicts.

Content

1. Perception of noise and vibrations
3. Fundamentals of acoustics and vibrations
3. Tools and methods for measurement, computing, simulation and analysis of noise and vibrations
4. The relevance of tire and chasis for the acoustic and mechanical driving comfort: phenomena, influencing parameters, types of construction, optimization of components and systems, conflict of goals, methods of development

An excursion will give insights in the development practice of a car manufacturer or a system supplier.

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 Kraftfahrzeuge, Band B: Schwingungen, Springer, Berlin, 1997

The script will be supplied in the lectures

Course: Vehicle Comfort and Acoustics II [2114825]**Coordinators:** F. Gauterin**Part of the modules:** Handling Characteristics of Motor Vehicles (p. 81)[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].

Recommendations

None.

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. They are ready to analyze, to judge and to optimize the vehicle with its single components regarding acoustic and vibration phenomena. They are also able to contribute competently to the development of a vehicle regarding the noise emission.

Content

1. Summary of the fundamentals of acoustics and vibrations
2. The relevance of road surface, wheel imperfections, springs, dampers, brakes, bearings and bushings, suspensions, engines and drive train for the acoustic and mechanical driving comfort:
 - phenomena
 - influencing parameters
 - types of construction
 - optimization of components and systems
 - conflicts of goals
 - methods of development
3. Noise emission of motor vehicles
 - noise stress
 - sound sources and influencing parameters
 - legal restraints
 - optimization of components and systems
 - conflict of goals
 - methods of development

Literature

The script will be supplied in the lectures.

Course: Vehicle Mechatronics I [2113816]

Coordinators: D. Ammon

Part of the modules: Vehicle Development (p. 82)[WI4INGMB14], Handling Characteristics of Motor Vehicles (p. 81)[WI4INGMB6]

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

None.

Recommendations

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. They are ready to analyze, to judge and to optimize mechatronic 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

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: Case studies seminar: Innovation management [2545019]

Coordinators: M. Weissenberger-Eibl
Part of the modules: Entrepreneurship (EnTechnon) (p. 46)[WI4BWLENT1], Innovation Management (p. 47)[WI4BWLENT2]

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

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Recommendations

Prior attendance of the course *Innovation Management* [2545015] is recommended.

Learning Outcomes

Students develop a differentiated understanding of a specific method of innovation management and its application by actively participating in the block seminar.

Content

The objective of the seminar is to master selected concepts and methods of innovation management and then to apply these practically. Working in groups, the students apply the described concepts and methods of innovation management to a case study from the automotive industry to answer specific questions. Accordingly, the block seminar involves a switch from input to the application of this input. At the end, the results of the group work are presented in the form of a seminar paper and discussed by the whole course.

A short introduction to presentation techniques is planned to help students prepare the seminar papers.

Course: Long-distance and Air Traffic [6232904]**Coordinators:** B. Chlond, N.N., Wilko Manz**Part of the modules:** Fundamentals of Transportation (p. 119)[WI4INGBGU15], Transportation Modelling and Traffic Management (p. 120)[WI4INGBGU16]

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

Learning Control / Examinations

The assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation.

Conditions

None.

Learning Outcomes**Content**

Course: Fabrication Processes in Microsystem Technology [2143882]

Coordinators: K. Bade

Part of the modules: Microfabrication (p. 106)[WI4INGMBIMT2], Optoelectronics and Optical Communication (p. 111)[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

2nd Edition, ACS, Washington DC, 1994

Course: Manufacturing Technology [2149657]

Coordinators: V. Schulze, F. Zanger
Part of the modules: Manufacturing Technology (p. 91)[WI4INGMB23]

ECTS Credits	Hours per week	Term	Instruction language
9	4/2	Winter term	de

Learning Control / Examinations

The assessment consists of a written exam taking place during the recess period (according to Section 4(2), 1) of the examination regulation).

The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None

Recommendations

None

Learning Outcomes

The students ...

- are capable to specify the different manufacturing processes and to explain their functions.
- are able to classify the manufacturing processes by their general structure and functionality according to the specific main groups.
- have the ability to perform a process selection based on their specific characteristics.
- are enabled to identify correlations between different processes and to select a process regarding possible applications.
- are qualified to evaluate different processes regarding specific applications based on technical and economic aspects.
- are experienced to classify manufacturing processes in a process chain and to evaluate their specific influence on surface integrity of workpieces regarding the entire process chain.

Content

The objective of the lecture is to look at manufacturing technology within the wider context of production engineering, to provide an overview of the different manufacturing processes and to impart detailed process knowledge of the common processes. The lecture covers the basic principles of manufacturing technology and deals with the manufacturing processes according to their classification into main groups regarding technical and economic aspects. The lecture is completed with topics such as process chains in manufacturing.

The following topics will be covered:

- Quality control
- Primary processing (casting, plastics engineering, sintering, additive manufacturing processes)
- Forming (sheet-metal forming, massive forming, plastics engineering)
- Cutting (machining with geometrically defined and geometrically undefined cutting edges, separating, abrading)
- Joining
- Coating
- Heat treatment and surface treatment
- Process chains in manufacturing

Media

Lecture notes will be provided in ilias (<https://ilias.studium.kit.edu/>).

Literature

Lecture Notes

Remarks

None

Course: Fixed Income Securities [2530260]

Coordinators: M. Uhrig-Homburg

Part of the modules: Finance 3 (p. 28)[WI4BWLFBV11], Finance 2 (p. 25)[WI4BWLFBV2]

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 Renditestructur am Rentenmarkt, in Obst/Hintner, Geld-, Bank- und Börsenwesen - Handbuch des Finanzsystems, (2000), S.298-337.
- Sundaresan, S., Fixed Income Markets and Their Derivatives, Academic Press, 3rd Edition, (2009).

Elective literature:

-
- Hull, J., Options, Futures, & Other Derivatives, Prentice Hall, 8th Edition, (2012).

Course: Financial Intermediation [2530232]

Coordinators: M. Ruckes

Part of the modules: Finance 3 (p. 28)[WI4BWLFBV11], Applied Strategic Decisions (p. 52)[WI4VWL2], Finance 2 (p. 25)[WI4BWLFBV2], Economic Theory and its Application in Finance (p. 63)[WI4VWL14]

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: Surface Water Quality [6223805]

Coordinators: S. Fuchs
Part of the modules: Environmental Management (p. 118)[WI4INGBGU14]

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

Learning Control / Examinations

The assessment consists of an oral exam (30 minutes) (following §4(2), 2 of the examination regulation) and a non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Recommendations

Attendance to the course *Siedlungswasserwirtschaft* [0170603] is recommended.

Learning Outcomes

In this course, the theoretical background for an ecological assessment of surface water bodies will be examined. Based on this information, students will go on a field trip to apply their knowledge to real systems.

Content

General characterization of surface waters:

- natural cycles (carbon, nitrogen, phosphorus, oxygen)
- Interactions between sediment and water
- Biological water quality
- Hydromorphological quality

Media

Course and lecture notes

Literature

Schwörbel, J. & Brendelberger, H. (2005): *Einführung in die Limnologie*. 9. Auflage, Spektrum Akademischer Verlag.

Lampert, W. & Sommer, U. (1999): *Limnoökologie*. 2. Auflage, Georg Thieme Verlag, Stuttgart.

Schwörbel, J. (1994): *Methoden der Hydrobiologie: Süßwasserökologie*. 4. Auflage, UTB-Verlag Gustav Fischer, Stuttgart.

DIN 38410 (2004): Deutsche Einheitsverfahren zur Wasser-, Abwasser- und Schlammuntersuchung – Biologisch-ökologisch Gewässeruntersuchung. DIN Deutsches Institut für Normung e.V., Beuth Verlag, Berlin.

Course: Fluid Technology [2114093]

Coordinators: M. Geimer

Part of the modules: Mobile Machines (p. 83)[WI4INGMB15], Automotive Engineering (p. 80)[WI4INGMB5]

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.

Recommendations

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
- 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.

Literature

Scriptum for the lecture *Fluidtechnik*
Institute of Vehicle System Technology
downloadable

Course: River Engineering and Ecology II [8056]

Coordinators: E. Dister

Part of the modules: Understanding and Prediction of Disasters 2 (p. 137)[WI4INGINTER8], Understanding and Prediction of Disasters 1 (p. 136)[WI4INGINTER7]

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

Learning Control / Examinations

Conditions

None.

Recommendations

See German version.

Learning Outcomes

Content

Remarks

For further information, see http://www.iwk.uni-karlsruhe.de/kurse_vertiefungsstudium.php and <http://www.auen.uni-karlsruhe.de/489.php>

Course: Advanced Measurement Methods [2501031]**Coordinators:** Kottmeier**Part of the modules:** Understanding and Prediction of Disasters 2 (p. 137)[WI4INGINTER8], Understanding and Prediction of Disasters 1 (p. 136)[WI4INGINTER7]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2	Winter term	de

Learning Control / Examinations

The assessment consists of an oral exam (30 min.) taking place in the recess period (according to §4(2), 2 of the examination regulation).

Conditions

None.

Recommendations

None.

Learning Outcomes

see German version

Content

see German version

Course: Functional Ceramics [2126784]

Coordinators: M. Hoffmann, M. Bäurer
Part of the modules: Specific Topics in Materials Science (p. 101)[W14INGMB33]

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

Basic knowledge of experimental physics and chemistry is recommended.
 It is recommended to attend the course *Ceramics-Introduction* [2125757].

Learning Outcomes

The students know the correlation among crystal structure, defect chemistry and electrical, dielectric and piezoelectric properties and are familiar with the different methods for powder preparation, shaping and sintering. They know the functionality and application fields of semiconducting, piezoelectric and pyroelectric ceramics.

Content

The course gives an introduction to physics and chemistry of functional ceramics, provides an overview of the corresponding processing methods and highlights the properties and application of the most relevant materials.

It is arranged in the following units:

-
- Crystal structures and defect chemistry
- Thermodynamic of interfaces and grain boundaries
- Methods for the preparation of functional ceramics
- Dielectric materials and insulators
- Semiconducting ceramics (varistors, PTC- und NTC-ceramics)
- Ion conductive ceramics (oxygen sensors, solid oxid fuel cells)
- Piezoelectric ceramics
- Pyroelectric ceramics
- Elektrooptical ceramics

Media

Slides for the lecture:
 available under <http://www.iam.kit.edu/km/289.php>

Literature

Y.-M. Chiang, D. Birnie III and W.D. Kingery, "Physical Ceramics", Wiley (1997)
 A.J. Moulson, J.M. Herbert, "Electroceramics, Materials - Properties - Applications", Chapman and Hall (1990)
 Y. Xu, "Ferroelectric Materials and Their Applications", Elsevier (1991)
 H. Jaffe, W.R. Cook and H. Jaffe, "Piezoelectric Ceramics", Academic Press (1971)

Remarks

The course will not take place every year

Course: Gas Engines [2134141]

Coordinators: R. Golloch
Part of the modules: Combustion Engines II (p. 87)[WI4INGMB35]

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

Learning Control / Examinations

Oral examination, duration 30 min., no aid allowed

Conditions

none

Recommendations

Knowledge about „Verbrennungsmotoren A und B“

Learning Outcomes

The student can name and explain the function, characteristics and application areas of gas and dual fuel engines. He is able to distinguish from engines using liquid fuels. The student describe and explain gaseous fuels, engine subsystems, combustion processes and exhaust gas aftertreatment technologies. He is capable to analyse and evaluate current development areas and technical challenges.

Content

Based on the basics of internal combustion engines the students learn about functions of modern gas and dual fuel engines. Core learning areas are gaseous fuels, combustion processes including abnormal combustion characteristics, subsystems like gas admission, ignition, safety and control systems. Further knowledge will be teached on emissions, exhaust gas aftertreatment, applications and operation characteristics.

Media

Lecture with PowerPoint slides

Literature

Lecture Script, prepared by the lecturer. Obtainable at the Institut für Kolbenmaschinen

Recommended:

- Merker, Schwarz, Teichmann: Grundlagen Verbrennungsmotoren, Vieweg + Teubner Verlag 2011;
- Zacharias: Gasmotoren, Vogel Fachbuch 2001

Course: Mixed Integer Programming I [25138]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 76)[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.

Conditions

None.

Recommendations

It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Learning Outcomes

The student

- knows and understands the fundamentals of linear mixed integer programming,
- is able to choose, design and apply modern techniques of linear mixed integer programming in practice.

Content

Many optimization problems from economics, engineering and natural sciences are modeled with continuous as well as discrete variables. Examples are the energy minimal design of a chemical process in which several reactors may be switched on or off, or the time minimal covering of a distance with a vehicle equipped with a gear shift. While optimal points can be defined straightforwardly, for their numerical identification an interplay of ideas from discrete and continuous optimization is necessary. The lecture treats methods for the numerical solution of linear optimization problems which depend on continuous as well as discrete variables. It is structured as follows:

- Existence results and concepts of linear as well as convex optimization
- LP relaxation and error bounds for rounding
- Gomory's cutting plane method
- Benders decomposition

Part II of the lecture treats nonlinear mixed integer programs.

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Media

Lecture notes.

Literature

Elective literature:

- C.A. Floudas, *Nonlinear and Mixed-Integer Optimization: Fundamentals and Applications*, Oxford University Press, 1995
- J. Kallrath: *Gemischt-ganzzahlige Optimierung*, Vieweg, 2002
- D. Li, X. Sun: *Nonlinear Integer Programming*, Springer, 2006
- G.L. Nemhauser, L.A. Wolsey, *Integer and Combinatorial Optimization*, Wiley, 1988
- M. Tawarmalani, N.V. Sahinidis, *Convexification and Global Optimization in Continuous and Mixed-Integer Nonlinear Programming*, Kluwer, 2002.

Remarks

The lecture is offered irregularly. The curriculum of the next three years is available online (kop.ior.kit.edu).

Course: Mixed Integer Programming II [25140]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 76)[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.

Conditions

None.

Recommendations

It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Learning Outcomes

The student

- knows and understands the fundamentals of convex and of nonconvex mixed integer programming,
- is able to choose, design and apply modern techniques of nonlinear mixed integer programming in practice.

Content

Many optimization problems from economics, engineering and natural sciences are modeled with continuous as well as discrete variables. Examples are the energy minimal design of a chemical process in which several reactors may be switched on or off, or the time minimal covering of a distance with a vehicle equipped with a gear shift. While optimal points can be defined straightforwardly, for their numerical identification an interplay of ideas from discrete and continuous optimization is necessary. Part I of the lecture deals with linear mixed integer programs.

Part II treats methods for the numerical solution of optimization problems which depend nonlinearly on continuous as well as discrete variables. It is structured as follows:

- Concepts of convex optimization
- Mixed integer convex programming (branch and bound methods)
- Mixed integer nonconvex programming
- Generalized Benders decomposition
- Outer approximation methods
- Heuristics

The lecture is accompanied by computer exercises in which you can learn the programming language MATLAB and implement and test some of the methods for practically relevant examples.

Media

Lecture notes.

Literature

Elective literature:

- C.A. Floudas, *Nonlinear and Mixed-Integer Optimization: Fundamentals and Applications*, Oxford University Press, 1995
- J. Kallrath: *Gemischt-ganzzahlige Optimierung*, Vieweg, 2002
- D. Li, X. Sun: *Nonlinear Integer Programming*, Springer, 2006
- G.L. Nemhauser, L.A. Wolsey, *Integer and Combinatorial Optimization*, Wiley, 1988
- M. Tawarmalani, N.V. Sahinidis, *Convexification and Global Optimization in Continuous and Mixed-Integer Nonlinear Programming*, Kluwer, 2002.

Remarks

The lecture is offered irregularly. The curriculum of the next three years is available online (kop.iior.kit.edu).

Course: Global vehicle evaluation within virtual road test [2114850]

Coordinators: B. Schick

Part of the modules: Handling Characteristics of Motor Vehicles (p. 81)[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 analyze, to judge and to optimize 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

1. Reimpell, J.: Fahrwerktechnik: Grundlagen, Vogel Verlag, 1995
2. Unrau, H.-J.: Scriptum zur Vorlesung "Fahreigenschaften I"
3. Unrau, H.-J.: Scriptum zur Vorlesung "Fahreigenschaften II"
4. IPG: User Guide CarMaker

Course: Developing and Validating Business Ideas [2545024]

Coordinators: H. Haller, C. Hardt, M. Völkel

Part of the modules: Entrepreneurship (EnTechnon) (p. 46)[WI4BWLENT1]

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

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Recommendations

None.

Learning Outcomes

Students learn to take the first steps in order to detect and minimize risks before and while founding a business.

In particular, they have practical experience in

- 1) Finding and validating relevant customer problems
- 2) Designing and testing solutions for these problems
- 3) Finding target groups and testing channels to reach them
- 4) as well as their willingness to pay.

Content

The focus of this seminar is on the early stages of founding a business, up to the point where a start-up would be ready to acquire venture capital. In this seminar, you will acquire and actively use practical skills.

Contents include the Lean Startup process, interviews with potential customers, successful communication in teams, Business Model Canvas, Value Proposition Canvas, business modeling with spreadsheets, creative rapid prototyping of solutions and user experience basics.

Course: Business Models in the Internet: Planning and Implementation [2540456]

Coordinators: H. Gimpel, R. Knapper

Part of the modules: Entrepreneurship (EnTechnon) (p. 46)[WI4BWLENT1], Business & Service Engineering (p. 35)[WI4BWLISM4]

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

Learning Control / Examinations

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation) and by submitting written essays as part of the exercise (according to §4(2), 3 of the examination regulation). 50% of the final grade is based on the written exam and 50% is based on assignments from the exercises. Successful completion of the exercises is a prerequisite for admission to the written exam. The points obtained in the exercises only apply to the first and second exam of the semester in which they were obtained.

Conditions

None.

Learning Outcomes

The student

- is able to list the most important features of web application lifecycles,
- analyses, designs and implements web applications,
- evaluates and argues internet business models with special requirements and features,
- is able to estimate the practicability of business models.

Content

The emergence of internet economy has resulted in an accelerated evolution of commerce models in eBusiness. Early adopters have experimented with a variety of new business models, technologies and application designs. At the same time, there has been a growing demand for new standards to facilitate the exchange of information, catalogue content and transactions between buyers and sellers. But the true understanding of how to bring buyers and sellers together is still widely missing, leading to multiple cases of costly missed investments. This course focuses on the design and implementation of successful business models for eBusiness applications for the World Wide Web (WWW), imparting the basic knowledge for building successful eBusiness applications. We consider not only technical foundations of eBusiness applications but also economical aspects. In small groups, students develop and implement an eBusiness model that is eventually discussed with a representative from the venture capitalist industry.

Media

- PowerPoint
- Recorded lecture available on the internet
- Videoconferencing, if circumstances allow

Literature

Will be announced within the course.

Course: Business Planning [2545005]**Coordinators:** O. Terzidis, A. Presse, J. Stohr**Part of the modules:** Entrepreneurship (EnTechnon) (p. 46)[WI4BWLENT1]

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

Learning Control / Examinations**Conditions**

None.

Learning Outcomes

See German version.

Content

See German version.

Literature

See German version.

Course: Business Strategies of Banks [2530299]

Coordinators: W. Müller

Part of the modules: Finance 3 (p. 28)[WI4BWLFBV11], Finance 2 (p. 25)[WI4BWLFBV2]

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: Foundry Technology [2174575]**Coordinators:** C. Wilhelm**Part of the modules:** Specific Topics in Materials Science (p. 101)[W14INGMB33]

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

None.

Learning Outcomes

The students know the specific moulding and casting techniques and are able to describe them in detail. The students know the application of moulding and casting techniques concerning castings and metals, their advantages and disadvantages in comparison, their application limits and are able to describe these in detail.

The students know the applied metals and are able to describe advantages and disadvantages as well as the specific range of use.

The students are able, to describe detailed mould and core materials, technologies, their application focus and mould-affected casting defects.

The students know the basics of casting process of any casting parts concerning the above mentioned criteria and are able to describe detailed.

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

Reference to literature, documentation and partial lecture notes given in lecture

Course: Global Optimization I [2550134]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 76)[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 50% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

The examination can also be combined with the examination of *Global Optimization II* [2550136]. In this case, the duration of the written examination takes 120 minutes.

Conditions

None.

Learning Outcomes

The student

- knows and understands the fundamentals of deterministic global optimization,
- 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.

Media

Lecture notes.

Literature

Elective literature:

- W. Alt *Numerische Verfahren der konvexen, nichtglatten Optimierung* Teubner 2004
- C.A. Floudas *Deterministic Global Optimization* Kluwer 2000
- R. Horst, H. Tuy *Global Optimization* Springer 1996
- A. Neumaier *Interval Methods for Systems of Equations* Cambridge University Press 1990

Remarks

Part I and II of the lecture are held consecutively in the *same* semester.

Course: Global Optimization II [2550136]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 76)[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 50% 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.

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 α 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.

Media

Lecture notes.

Literature**Elective literature:**

- W. Alt *Numerische Verfahren der konvexen, nichtglatten Optimierung* Teubner 2004
- C.A. Floudas *Deterministic Global Optimization* Kluwer 2000
- R. Horst, H. Tuy *Global Optimization* Springer 1996
- A. Neumaier *Interval Methods for Systems of Equations* Cambridge University Press 1990

Remarks

Part I and II of the lecture are held consecutively in the *same* semester.

Course: Global Production and Logistics - Part 1: Global Production [2149610]

Coordinators: G. Lanza

Part of the modules: Global Production and Logistics (p. 99)[WI4INGMB31]

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

Learning Control / Examinations

See German version.

Conditions

None

Recommendations

Combination with Global Production and Logistics – Part 2

Learning Outcomes

The students ...

- can explain the general conditions and influencing factors of global production.
- are capable to apply defined procedures for site selection and to evaluate site decisions with the help of different methods.
- are able to select the adequate scope of design for site-appropriate production and product construction case-specifically.
- can state the central elements in the planning process of establishing a new production site.
- are capable to make use of the methods to design and scale global production networks for company-individual problems.
- are able to show up the challenges and potentials of the departments sales, procurement as well as research and development on global basis.

Content

Target of the lecture is to depict the challenges and fields of action of global operating companies and to give an overview of central aspects in global production networks as well as establishing a deepening knowledge of established methods and procedures for design and scale. Within the course methods for site selection, procedures for site specific adjustment of product construction and product technology as well as planning approaches to establish a new production site are imparted. The course is rounded off by showing the characteristics of the departments sale, procurement as well as research and development under global aspects.

The topics are:

- Basic conditions and influencing factors of global production (historical development, targets, chances and threats)
- Global sales
- Site selection
- Site specific production adjustment
- Establishing of new production sites
- Global procurement
- Design and management of global production networks
- Global research and development

Media

Lecture notes will be provided in ilias (<https://ilias.studium.kit.edu/>).

Literature

Lecture Notes

recommended secondary literature:

Abele, E. et al: Global Production – A Handbook for Strategy and Implementation, Springer 2008 (english)

Remarks

None

Course: Global Production and Logistics - Part 2: Global Logistics [2149600]

Coordinators: K. Furmans
Part of the modules: Global Production and Logistics (p. 99)[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

Students are able to:

- assign basic problems of planning and operation of global supply chains and plan them with appropriate methods,
- describe requirements and characteristics of global trade and transport, and
- evaluate characteristics of the design from logistic chains regarding their suitability.

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

presentations, black board

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

none

Course: Graph Theory and Advanced Location Models [2550484]

Coordinators: S. Nickel

Part of the modules: Mathematical Programming (p. 76)[WI4OR6]

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

Learning Control / Examinations

The assessment is a 120 minutes written examination (according to §4(2), 1 of the examination regulation). The examination is held in the term of the lecture and the following lecture.

Conditions

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

Learning Outcomes

The 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, 2nd edition, Springer, 2005
- Diestel: Graph Theory, 3rd edition, Springer, 2006
- Bondy, Murt: Graph Theory, Springer, 2008
- Nickel, Puerto: Location Theory, Springer, 2005
- Drezner: Facility Location – Applications and Theory, 2nd edition, Springer, 2005

Remarks

The lecture is planned to be held in the winter term 2014/2015. The planned lectures and courses for the next three years are announced online.

Course: Fundamentals of Waste Water Treatment [22618]

Coordinators: S. Lackner

Part of the modules: Water Chemistry and Water Technology II (p. 135)[WI4INGCV7]

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

Learning Control / Examinations

See module description.

Conditions

None.

Learning Outcomes

Main focus of this lecture is the basic understanding of wastewater treatment plants their functionality and the main design criteria, including procedural plant configurations and design/operating factors and processes

Content

Historical background, types of wastewater and wastewater composition, wastewater definition and legal aspects, wastewater analytics and characterization, mechanical wastewater treatment (description and design of grids, sieves, and sedimentation tanks), introduction of biological principles, biological wastewater treatment (the activated sludge process, concepts, design of C,N and P elimination processes, aeration units), biofilm technology (introduction to biofilms, process description and design of trickling filters, moving bed biofilm systems, and so on), special treatment processes (membrane systems, and other), anaerobic processes (treatment and disposal of sewage sludge), industrial applications.

Literature

Elective literature:

- Wastewater Engineering. Treatment and Reuse, Taschenbuch, 1830 Seiten, Mcgraw-Hill Higher Education; 4. Aufl. (2002); ISBN-10: 0071122508

Course: Automotive Engineering I [2113805]

Coordinators: F. Gauterin, H. Unrau

Part of the modules: Automotive Engineering (p. 80)[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.

Recommendations

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 and alternative drives, the necessary transmission between engine and drive wheels and the power distribution. They have an overview of the components necessary for the drive and have the basic knowledge, to analyze, to judge and to develop the complex system "vehicle".

Content

1. Driving mechanics: driving resistances and driving performances, mechanics of the longitudinal and transverse forces, collision mechanics
2. Engines: combustion engine, alternative drives (e.g. electric motor, fuel cell)
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

1. Mitschke, M./ Wallentowitz, H.: Dynamik der Kraftfahrzeuge, Springer-Verlag, Berlin, 2004
2. Braes, H.-H.; Seiffert, U.: Handbuch Kraftfahrzeugtechnik, Vieweg&Sohn Verlag, 2005
3. Gnadler, R.: Script to the lecture 'Automotive Engineering I'

Course: Automotive Engineering II [2114835]

Coordinators: F. Gauterin, H. Unrau

Part of the modules: Automotive Engineering (p. 80)[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

None.

Recommendations

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 develop the appropriate components correctly. They are ready to analyze, to judge and to optimize the complex relationship of the different components under consideration of boundary conditions.

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

1. Heiing, B./Ersoy, M.: Fahrwerkhandbuch: Grundlagen, Fahrdynamik, Komponenten, Systeme, Mechatronik, Perspektiven, Vieweg-Verlag, Wiesbaden, 2011
2. Breuer, B./Bill, K.-H.: Bremsenhandbuch: Grundlagen - Komponenten - Systeme - Fahrdynamik, Vieweg-Verlag, Wiesbaden, 2012
3. Gnadler, R.: Script to the lecture 'Automotive Engineering II'

Course: River Engineering and Ecology I [8048]**Coordinators:** E. Dister**Part of the modules:** Understanding and Prediction of Disasters 2 (p. 137)[WI4INGINTER8], Understanding and Prediction of Disasters 1 (p. 136)[WI4INGINTER7]

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 and <http://www.ifgg.kit.edu/1828.php>

Course: Grundlagen der Herstellungsverfahren der Keramik und Pulvermetallurgie [2193010]

Coordinators: R. Oberacker

Part of the modules: Specific Topics in Materials Science (p. 101)[W14INGMB33]

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

None.

Recommendations

Basic knowledge of experimental physics and chemistry is recommended.

Learning Outcomes

The students know the basics of characterization of powders, pastes and suspensions. They have a fundamental understanding of the process technology for shaping of particulate systems. They are able to use these fundamentals to design selected wet- and dry forming processes.

Content

The course covers fundamentals of the process technology for shaping of ceramic or metal particle systems. Important shaping methods are reviewed. The focus is on characterization and properties of particulate systems, and, in particular, on process technology for shaping of powders, pastes, and suspensions.

Literature

- R.J.Brook: Processing of Ceramics I+II, VCH Weinheim, 1996
- M.N. Rahaman: Ceramic Processing and Sintering, 2nd Ed., Marcel Dekker, 2003
- 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. Thümmel, R. Oberacker. "Introduction to Powder Metallurgy", Institute of Materials, 1993

Course: Principles of Bioengineering [19058]

Coordinators: J. Winter

Part of the modules: Environmental Management (p. 118)[WI4INGBGU14]

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: Fundamentals of catalytic exhaust gas aftertreatment [2134138]

Coordinators: E. Lox

Part of the modules: Combustion Engines II (p. 85)[WI4INGMB19], Combustion Engines II (p. 87)[WI4INGMB35]

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 / Combustion Engines I* has to be completed beforehand.

Recommendations

None.

Learning Outcomes

The students can name and explain the scientific fundamentals of the catalytic exhaust gas aftertreatment, as well as the technical, political and economical parameters of its application in engines for passenger cars and HD vehicles.

The students are able to point out and explain which emissions are formed in combustion engines, why these emissions are health-related critical and which measures the legislator has established to reduce the emissions.

Content

1. kind and source of emissions
2. emission legislation
3. principal of catalytic exhaust gas aftertreatment (EGA)
4. EGA at stoichiometric gasoline engines
5. EGA at gasoline engines with lean mixtures
6. EGA at diesel engines
7. economical basic conditions for catalytic EGA

Literature

Lecture notes available in the lectures

1. "Environmental Catalysis" Edited by G.Ertl, H. Knötzinger, J. Weitkamp Wiley-VCH Verlag GmbH, Weinheim, 1999 ISBN 3-527-29827-4
2. "Cleaner Cars- the history and technology of emission control since the 1960s" J. R. Mondt Society of Automotive Engineers, Inc., USA, 2000 Publication R-226, ISBN 0-7680-0222-2
3. "Catalytic Air Pollution Control - commercial technology" R. M. Heck, R. J. Farrauto John Wiley & Sons, Inc., USA, 1995 ISBN 0-471-28614-1
4. "Automobiles and Pollution" P. Degobert Editions Technic, Paris, 1995 ISBN 2-7108-0676-2
5. "Reduced Emissions and Fuel Consumption in Automobile Engines" F. Schaefer, R. van Basshuysen, Springer Verlag Wien New York, 1995 ISBN 3-211-82718-8
6. "Autoabgaskatalysatoren : Grundlagen - Herstellung - Entwicklung - Recycling - Ökologie" Ch. Hagelüken und 11 Mitautoren, Expert Verlag, Renningen, 2001 ISBN 3-8169-1932-4

Course: Fundamentals of Food Chemistry [6602]**Coordinators:** Loske**Part of the modules:** Specialization in Food Process Engineering (p. 133)[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: Fundamental Mechanics of Construction Equipment [6241703]

Coordinators: S. Gentes, Mitarbeiter

Part of the modules: Mechanical Process Engineering in Construction (p. 121)[WI4INGBGU17]

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

Learning Control / Examinations

The assesement consists of a written exam (30 minutes) (following §4(2), 1 of the examination regulation).

Conditions

None.

Learning Outcomes

Students

- gain fundamental knowledge about modes of operation of several drive technologies with a focus on construction equipment
- understand foundations of hydraulic systems in construction equipment
- gain the ability to determine and size transmission elements of construction equipment and machinery.

Content

The lecture comprises

- drive technology (basics, performance improvement, energy utilization)
- transmission elements (coupler, rope, chain, axle, gear technology, automatic gear box)
- Basics of hydraulic systems

Media

Lecture slides.

Course: Introduction to Microsystem Technology I [2141861]

Coordinators: A. Guber

Part of the modules: Microsystem Technology (p. 109)[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

The lecture gives an introduction into the basics of microsystems technology. In analogy to processes employed in fabrication of microelectronics circuits the core technologies as well as materials for producing microstructures and components are presented. Finally, various techniques for Silicon micromachining are explained and illustrated with examples for micro-components and micro-systems.

Content

- Introduction in Nano- and Microtechnologies
- Silicon and processes for fabricating microelectronics circuits
- Basic physics background and crystal structure
- Materials for micromachining
- Processing technologies for microfabrication
- Silicon micromachining
- Examples

Literature

Fundamentals of Microfabrication, M. Madou, CRC Press, Boca Raton 1997.

Course: Introduction to Microsystem Technology II [2142874]

Coordinators: A. Guber

Part of the modules: Microsystem Technology (p. 109)[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

The lecture gives an introduction into the basics of microsystems technology. In the first part, methods for lithographic pattern transfer are summarized. Then specific techniques such as the LIGA process, micro-machining, and laser-patterning are explained and examples are given. Finally assembly and packaging methods are presented leading into a discussion of entire microsystems.

Content

- Introduction in Nano- and Microtechnologies
- Lithography
- LIGA-technique
- Mechanical microfabrication
- Patterning with lasers
- Assembly and packaging
- Microsystems

Literature

Fundamentals of Microfabrication, M. Madou, CRC Press, Boca Raton 1997.

Course: Fundamentals of X-ray optics [2142007]

Coordinators: A. Last

Part of the modules: Microfabrication (p. 106)[WI4INGMBIMT2], Microoptics (p. 107)[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 [2142007]

Coordinators: A. Last
Part of the modules: Microoptics (p. 107)[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, Madzharov

Part of the modules: Technical Logistics (p. 95)[WI4INGMB27], Introduction to Logistics (p. 88)[WI4INGMB20]

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

Students are able to:

- Describe processes and machines of technical logistics,
- Model the fundamental structures and the impacts of material handling machines with mathematical models,
- Refer to industrially used machines and
- Model real machines applying knowledge from lessons and calculate their dimensions.

Content

Bases effect model of conveyor machines made for the change of position and orientation; conveyor processes; identification systems; drives; mechanical behaviour of conveyors; structure and function of conveyor machines; elements of intralogistics sample applications and calculations in addition to the lectures inside practical lectures

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. [132](#))[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. [132](#))[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: Combustion Engines I [2133103]

Coordinators: H. Kubach, T. Koch
Part of the modules: Combustion Engines I (p. 86)[W14INGMB34]

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

Learning Control / Examinations

oral examination, Duration: 40 min., no auxiliary means

Conditions

None.

Recommendations

None.

Learning Outcomes

The student can name and explain the working principle of combustion engines. He is able to analyse and evaluate the combustion process. He is able to evaluate influences of gas exchange, mixture formation, fuels and exhaust gas aftertreatment on the combustion performance. He can solve basic research problems in the field of engine development.

Content

Introduction, History, Concepts
 Working Principle and Thermodynamics
 Characteristic Parameters
 Air Path
 Fuel Path
 Energy Conversion
 Fuels
 Emissions
 Exhaust Gas Aftertreatment

Literature

Lecturer notes available in the 'Studentenhaus'

Course: Combustion Engines II [2134131]

Coordinators: H. Kubach, T. Koch
Part of the modules: Combustion Engines II (p. 87)[WI4INGMB35]

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

Learning Control / Examinations

oral examination, Duration: 0,5 hours, no auxiliary means

Conditions

None.

Recommendations

Combustion Engines A helpful

Learning Outcomes

The students deepen and complement their knowledge from the lecture combustion engines A. they can name and explain construction elements, development tools and latest development trends. They are able to analyse and evaluate powertrain concepts which are subject of the lecture.

Content

Emissions
 Fuels
 Drive Train Dynamics
 Engine Parts
 Boosting
 Alternative Powertrain Concepts

Special Engine Concepts

Power Transmission

Literature

Lecture notes available in the 'Studentenhaus'

Remarks

This lecture is not offered anymore. Students who attended the lecture in earlier semesters can still choose an oral exam in this subject.

Course: Basics and Methods for Integration of Tires and Vehicles [2114843]

Coordinators: G. Leister
Part of the modules: Vehicle Development (p. 82)[WI4INGMB14]

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

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

None.

Recommendations

Knowledge of automobile technology is recommended.

Learning Outcomes

The students are informed about the interactions of tires, chassis and road. They have an overview of the processes regarding the tire development. They have knowledge of the physical relationships. They are ready to analyze and to judge the mentioned interactions. They are able to participate competently in the chassis development.

Content

1. The role of the tire in a vehicle
2. Tire geometry, Package and load capacity, Book of requirement
3. Mobility strategy, Minispare, runflat systems and repair kit.
4. Project management: Costs, weight, planning, documentation
5. Tire testing and tire properties: Forces and Moments
6. Tire modes and sound
7. Tire pressure: Indirect and direct measuring systems
8. Tire testing subjective and objective

Literature

Manuscript to the lecture

Course: Fundamentals for Design of Motor-Vehicles Bodies I [2113814]

Coordinators: H. Bardehle
Part of the modules: Automotive Engineering (p. 80)[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.

Recommendations

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, to be able to analyze and to judge relating components as well as to develop them accordingly.

Content

1. History and design
2. Aerodynamics
3. Design methods (CAD/CAM, FEM)
4. Manufacturing methods of body parts
5. Fastening technologie
6. Body in white / body production, body surface

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-Vehicles Bodies II [2114840]

Coordinators: H. Bardehle
Part of the modules: Automotive Engineering (p. 80)[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

None.

Recommendations

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. Based on this they are ready to analyze and to judge the relation of these single components. They are also able to contribute competently to complex development tasks by imparted knowledge in project management.

Content

1. Body properties/testing procedures
2. External body-parts
3. Interior trim
4. Compartment air conditioning
5. Electric and electronic features
6. Crash tests
7. Project management aspects, future prospects

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: J. Zürn

Part of the modules: Mobile Machines (p. 83)[WI4INGMB15], Vehicle Development (p. 82)[WI4INGMB14]

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.

Recommendations

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 cab concepts, the interior and the interior design process. Consequently they are ready to analyze and to judge concepts of commercial vehicles as well as to participate competently in the commercial vehicle development.

Content

1. Introduction, definitions, history
2. Development tools
3. Complete vehicle
4. Cab, bodyshell work
5. Cab, interior fitting
6. Alternative drive systems
7. Drive train
8. Drive system diesel engine
9. Intercooled diesel engines

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: Mobile Machines (p. 83)[WI4INGMB15], Vehicle Development (p. 82)[WI4INGMB14]

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 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 are known. Consequently the student are able to analyze and to judge the general concepts as well as to adjust them precisely with the area of application.

Content

1. Gear boxes of commercial vehicles
2. Intermediate elements of the drive train
3. Axle systems
4. Front axles and driving dynamics
5. Chassis and axle suspension
6. Braking System
7. Systems
8. Excursion

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 of Automobile Development I [2113810]

Coordinators: R. Frech
Part of the modules: Vehicle Development (p. 82)[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.

Recommendations

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. They are ready to judge goal conflicts in the field of automobile development and to work out approaches to solving a problem.

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

Literature

The scriptum will be provided during the first lessons

Course: Fundamentals of Automobile Development II [2114842]

Coordinators: R. Frech
Part of the modules: Vehicle Development (p. 82)[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

None.

Recommendations

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. They are ready to participate competently in the development process of the complete vehicle.

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

Literature

The scriptum will be provided during the first lessons.

Course: Groundwater Quality [6221811]

Coordinators: U. Mohrlök

Part of the modules: Environmental Management (p. 118)[WI4INGBGU14]

ECTS Credits	Hours per week	Term	Instruction language
1,5	1/0	Summer term	de

Learning Control / Examinations

The assessment consists of an oral exam (30 minutes) (following §4(2), 2 of the examination regulation) and a non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Recommendations

Attendance to the course *Siedlungswasserwirtschaft* [0170603] is recommended.

Learning Outcomes

In this course, the theoretical background for a quality assessment of ground waters will be examined.

The students will gain knowledge in regard to sampling methods, measurement parameters and assessment criteria.

Content

Quality assessment of groundwater:

- Sampling
- Measurement of Parameters

Groundwater pollution:

- Geogenic sources: water-rock interactions, chemical characterization of groundwater
- Anthropogenic pollution: pollutants/ nutrients (diffuse – point discharges), time scales, the Federal Soil Protection Act

Media

Course and lecture notes

Course: Principles of Information Engineering and Management [2540450]

Coordinators: H. Gimpel, W. Michalk
Part of the modules: Information Engineering (p. 38)[WI4BWLISM7]

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

Learning Control / Examinations

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation). By successful completion of the exercises (according to §4(2), 3 of the examination regulation) up to 6 bonus points can be obtained. The bonus points only apply to the first and second exam of the semester in which they were obtained.

Conditions

None.

Learning Outcomes

The students should be able to understand and analyze the central role of information as an economic good, a production factor, and a competitive factor in today's societies. Students are supposed to be able to identify, evaluate, price, and market information goods with the help of the concepts and methods taught in the lecture. Furthermore, students learn basic aspects about information systems and information flows within and between organizations, as well as their design parameters.

Content

Information plays a central role in today's society. The resulting structures and processes cannot be explained intuitively with traditional approaches of economic theory. Formerly, information has only been implicitly treated as a production factor; its role as a competitive factor used to be neglected. In order to deal with the central role of information we developed the concept of the "information lifecycle" that systematizes all phases from information generation to information distribution. The single phases of that cycle,

- extraction/generation,
- storage,
- transformation,
- evaluation,
- marketing
- and usage of information

are analyzed from the business administration perspective and the microeconomic perspective. The state of the art of economic theory is presented across this information lifecycle within the lectures. The content of the lecture is deepened in accompanying lecture courses.

Media

- PowerPoint
- E-learning platform ILIAS

Literature

- Shapiro, C., Varian, H., Information Rules: A Strategic Guide to the Network Economy. Harvard Business School Press 1999.
- Stahlknecht, P., Hasenkamp, U., Einführung in die Wirtschaftsinformatik. Springer Verlag 7. Auflage, 1999.
- Wirth, H., Electronic Business. Gabler Verlag 2001.

Course: Freight Transport [6232808]**Coordinators:** B. Chlond**Part of the modules:** Transportation Modelling and Traffic Management (p. 120)[WI4INGBGU16], Guided Transport Systems / Engineering (p. 125)[WI4INGBGU20], Fundamentals of Transportation (p. 119)[WI4INGBGU15]

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

Learning Control / Examinations*The assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation.***Conditions***See module description.***Learning Outcomes****Content**

Course: Quantum Functional Devices and Semiconductor Technology [23476]

Coordinators: M. Walther

Part of the modules: Nanotechnology (p. 110)[WI4INGMBIMT5], Optoelectronics and Optical Communication (p. 111)[WI4INGMBIMT6]

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: Z. (ZAR), O. Knöfel
Part of the modules: Commercial Law (p. 139)[WI4JURA2]

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

Learning Control / Examinations

The assesment ist explained in the module description

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: R. Badent

Part of the modules: Generation and transmission of renewable power (p. 131)[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: R. Badent
Part of the modules: High-Voltage Technology (p. 130)[WI4INGETIT6]

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

Learning Control / Examinations

See German version.

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: R. Badent
Part of the modules: High-Voltage Technology (p. 130)[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 nonselfsustained 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: Real Estate Economics and Sustainability Part 1: Basics and Valuation [2586407/2586408]

Coordinators: D. Lorenz

Part of the modules: Real Estate Economics and Sustainability (p. 50)[WI4BWLÖÖW1]

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

Learning Control / Examinations

The examination for the courses generally consist of a 60 minute written exam. A 20 minute oral exam is only offered after the second failure of the written exam. The exams for the respective parts (Part 1: Basics and Valuation and Part 2: Reporting and Rating) happen in the same semester in which the lectures take place.

Therefore, Part I currently only takes place in the winter semester and Part II takes place in the summer semester. In each semester there are two alternative dates for the exam and exams can be re-sat at any regular exam date.

Conditions

None.

Recommendations

A combination with courses in the area of

- Finance
- Insurance
- Civil engineering and architecture

is recommended.

Particularly recommended is the successful completion of the following Bachelor-Modules:

- Real Estate Management I and II
- Design, Construction and Assessment of Green Buildings I and II

Learning Outcomes

The student

- possesses an overview of key interrelationships within the real estate industry concerning macro- and microeconomic questions as well as the interaction of the industry's key players;
- is aware of the basics concerning the sustainable development debate and knows about the possible contribution of buildings and the real estate industry to a more sustainable development;
- knows the basics, key methods and tools of property valuation and is able to apply them;
- is aware of the key influencing factors of a building's market value and is able to factor in sustainability considerations into market value estimates;

Content

This course is concerned with the implementation of sustainable development principles within the real estate industry. The focus lies on the role of property valuation and of property professionals.

The basics, key methods and tools of property valuation are explained in detail and are discussed within the context of the sustainable development debate.

The tutorial provides examples in order to practice the application of theoretical knowledge to practical problems; i.e. valuation assignments.

Media

Presentation slides and supplementary material is provided partly as printout, partly online for download.

Course: Real Estate Economics and Sustainability Part 2: Reporting and Rating [2585406/2585407]

Coordinators: D. Lorenz

Part of the modules: Real Estate Economics and Sustainability (p. 50)[WI4BWLÖÖW1]

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

Learning Control / Examinations

The examination for the courses generally consist of a 60 minute written exam. A 20 minute oral exam is only offered after the second failure of the written exam. The exams for the respective parts (Part 1: Basics and Valuation and Part 2: Reporting and Rating) happen in the same semester in which the lectures take place.

Therefore, Part I currently only takes place in the winter semester and Part II takes place in the summer semester. In each semester there are two alternative dates for the exam and exams can be re-sat at any regular exam date.

Conditions

None.

Recommendations

A combination with courses in the area of

- Finance
- Insurance
- Civil engineering and architecture

is recommended.

Particularly recommended is the successful completion of the following Bachelor-Modules:

- Real Estate Management I and II
- Design, Construction and Assessment of Green Buildings I and II

Learning Outcomes

The student

- possesses an overview of important methods and processes which are applied within the real estate industry to assess property related risks (e.g. property ratings);
- is aware of key instruments to communicate property performance towards third parties (e.g. sustainability assessment of buildings and sustainability reporting of companies).

Content

This course is concerned with the implementation of sustainable development principles within the real estate industry.

The course explains important methods and procedures – besides property valuation – which are applied within the industry in order to assess property related risks (e.g. property rating) and discusses them within the context of the sustainable development debate. Further topics in this regard are:

- sustainability assessment of buildings,
- sustainability reporting of companies,
- sustainable property investment products,
- assessment of real estate funds and investment vehicles, and
- sustainability and real estate lending.

The tutorial provides examples in order to practice the application of theoretical knowledge to practical real estate related problems.

Media

Presentation slides and supplementary material is provided partly as printout, partly online for download.

Course: Industrial Services [2595505]**Coordinators:** H. Fromm, P. Korevaar**Part of the modules:** Service Management (p. 37)[WI4BWLISM6], Service Analytics (p. 48)[WI4BWLKSR1]

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

Learning Control / Examinations

A final written exam will be conducted

Conditions

None.

Learning Outcomes

Participants understand the interrelation between Front-Office (Customer view, e.g. material availability, technician skills, maintenance quality, repair time) and Back-Office (Provider view, e.g. distribution planning, inventory optimization, technician work schedule, call center). They learn about forecasting algorithms for sporadic demands, which are typical in spare part supply, and they apply common inventory optimization models for stock planning. They also become familiar with full-cost service contracts, as well as with the latest product related services that have been enabled only in recent years by modern IT and mobile technology.

Content

Services are becoming ever more important in business. Today, the gross income share of services in Germany exceeds 70%. Following this trend, many companies that previously focused solely on the sale of goods, strive to an extension of their business model: In order to realize new competitive advantages in domestic and international markets, they enrich their material goods with customer-specific services. This transformation to a provider of integrated solutions is called "Servitization" (Neely 2009). For this reason, so-called industrial services to companies of increasing importance. They benefit from the increasingly detailed data collected (on "Big Data"), e.g. concerning user profiles, failure statistics, usage history, accrued expenses, etc. Only these data allow in principle to end products and spare parts are delivered faster, cheaper and more targeted and technicians can be used more efficiently with the correct skills. This requires, however, also suitable methods of optimization, prognosis or predictive modeling. When used properly, such methods can minimize logistics costs, increase availability, prevent potential failures and improve repair planning. This is also enabled by latest "Technology Enabled Services" along with corresponding data transfer and analysis ("Internet of Things", automatic error detection, remote diagnostics, centralized collection of consumption data, etc.). The change from goods manufacturer to a provider of integrated solutions requires new services, transformation of business models as well as intelligent new contract types, which are addressed in the course as well.

More specifically, the lessons of this lecture will include:

- Servitization – The Manufacturer's Transformation to Integrated Solution Provider
- Service Levels – Definitions, Agreements, Measurements and Service Level Engineering
- The "Services Supply Chain"
- Spare Parts Planning – Forecasting, Assortment Planning, Order Quantities and Safety Stocks
- Distribution Network Planning – Network Types, Models, Optimization
- Service Technician Planning
- Condition Monitoring, Predictive Maintenance, Diagnose Systems
- Call Center Services
- Full Service Contracts
- IT-enabled Value-Add Services – Industrial Service Innovation

Course: Information Systems in Logistics and Supply Chain Management [2118094]

Coordinators: C. Kilger

Part of the modules: Global Production and Logistics (p. 99)[WI4INGMB31], Introduction to Logistics (p. 88)[WI4INGMB20], Logistics in Value Chain Networks (p. 96)[WI4INGMB28]

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.

Recommendations

It is recommended to attend the lecture *Logistics - Organisation, Design, and Control of Logistic Systems*.

Learning Outcomes

Students are able to:

- Describe requirements of logistical processes regarding IT systems,
- Choose information systems to support logistical processes and use them according to the requirements of a supply chain.

Content

- 1) Overview of logistics systems and processes
- 2) Basic concepts of information systems and information technology
- 3) Introduction to IS in logistics: Overview and applications
- 4) Detailed discussion of selected SAP modules for logistics support

Media

presentations

Literature

Stadler, Kilger: Supply Chain Management and Advanced Planning, Springer, 4. Auflage 2008

Remarks

none

Course: Information Technology and Business Information [2571162]

Coordinators: B. Neibecker

Part of the modules: Strategy, Communication, and Data Analysis (p. 45)[W14BWLMAR7]

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: Infrastructure Equipment of Railway Tracks [6234808]

Coordinators: E. Hohnecker, Mitarbeiter

Part of the modules: Guided Transport Systems / Engineering (p. 125)[WI4INGBGU20]

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 (10 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

See German version.

Content

electrical infrastructure; signalling and telecommunication equipment, track systems

Remarks

See German version.

Course: Infrastructure Dimensioning and Railway Traffic [6234806]**Coordinators:** E. Hohnecker**Part of the modules:** Guided Transport Systems / Engineering (p. 125)[WI4INGBGU20]

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

Learning Control / Examinations

See German version.

Conditions

See module description.

Learning Outcomes

See German version.

Content

calculation of Zimmermann; wheelset-running, graph theory, Max-Plus Algebra

Remarks

See German version.

Course: Geophysical Engineering [2600211/212]**Coordinators:** Wenzel, A. Barth**Part of the modules:** Understanding and Prediction of Disasters 2 (p. 137)[WI4INGINTER8], Understanding and Prediction of Disasters 1 (p. 136)[WI4INGINTER7]

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

Learning Control / Examinations

The assessment consists of an oral exam taking place in the recess period (according to §4(2), 2 of the examination regulation).

Conditions

None.

Recommendations

None.

Learning Outcomes

see German version

Content

see German version

Course: Seminar in Engineering Science [SemING]**Coordinators:** Fachvertreter ingenieurwissenschaftlicher Fakultäten**Part of the modules:** Seminar Module (p. 145)[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: Innovation Management [2545015]

Coordinators: M. Weissenberger-Eibl
Part of the modules: Entrepreneurship (EnTechnon) (p. 46)[WI4BWLENT1], Innovation Management (p. 47)[WI4BWLENT2]

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

Learning Control / Examinations

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None.

Learning Outcomes

The aim of the course Innovation Management is for students to develop an understanding of the different phases and concepts of the innovation process. On this basis, different strategies and methods are taught which are particularly significant in this context. Ideally, after successful completion of the course, students have acquired key competences in innovation management.

Content

The course 'Innovation Management' offers scientific concepts which facilitate the understanding of the different phases of the innovation process and resulting strategies and appropriate methodologies suitable for application.

The concepts refer to the entire innovation process so that an integrated perspective is made possible. This is the basis for the teaching of strategies and methods which fulfil the diverse demands of the complex innovation process. The course focuses particularly on the creation of interfaces between departments and between various actors in a company's environment and the organisation of a company's internal procedures. In this context a basic understanding of knowledge and communication is taught in addition to the specific characteristics of the respective actors. Subsequently methods are shown which are suitable for the profitable and innovation-led implementation of integrated knowledge.

Media

Script.

Course: Innovationtheory and -policy [2560236]

Coordinators: I. Ott

Part of the modules: Economic Policy II (p. 53)[WI4VWL3], Agglomeration and Innovation (p. 62)[WI4VWL13], Innovation and growth (p. 67)[WI4VWLIWW1]

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

Learning Control / Examinations

The assessment consists of a written exam (60 min) according to 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 5 to 4,5.

Course: Insurance Marketing [2530323]

Coordinators: E. Schwake

Part of the modules: Insurance Management I (p. 26)[WI4BWLFBV6], Insurance Management II (p. 27)[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

Course: Insurance Production [2530324]**Coordinators:** U. Werner**Part of the modules:** Insurance Management I (p. 26)[WI4BWLFBV6], Insurance Management II (p. 27)[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>

Course: Insurance Risk Management [2530335]

Coordinators: H. Maser

Part of the modules: Insurance Management II (p. 27)[WI4BWLFBV7], Insurance Management I (p. 26)[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
- V. Bieta, W. Siebe. Strategisches Risikomanagement in Versicherungen. in: ZVersWiss 2002 S. 203-221.
- A. Schäfer. Subprime-Krise, in: VW2008, S. 167-169.
- B. Rudolph. Lehren aus den Ursachen und dem Verlauf der internationalen Finanzkrise, in: zfbf 2008, S. 713-741.

Remarks

Block course. For organizational reasons, please register with the secretary of the chair: thomas.mueller3@kit.edu.

Course: Integrative Strategies in Production and Development of High Performance Cars [2150601]

Coordinators: K. Schlichtenmayer

Part of the modules: Global Production and Logistics (p. 99)[WI4INGMB31]

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

Learning Control / Examinations

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

Conditions

None

Learning Outcomes

The students ...

- are capable to specify the current technological and social challenges in automotive industry.
- are qualified to identify interlinkages between development processes and production systems.
- are able to explain challenges and solutions of global markets and global production of premium products.
- are able to explain modern methods to identify key competencies of producing companies.

Content

The lecture deals with the technical and organizational aspects of integrated development and production of sports cars on the example of Porsche AG. The lecture begins with an introduction and discussion of social trends. The deepening of standardized development processes in the automotive practice and current development strategies follow. The management of complex development projects is a first focus of the lecture. The complex interlinkage between development, production and purchasing are a second focus. Methods of analysis of technological core competencies complement the lecture. The course is strongly oriented towards the practice and is provided with many current examples.

The main topics are:

- Introduction to social trends towards high performance cars
- Automotive Production Processes
- Integrative R&D strategies and holistic capacity management
- Management of complex projects
- Interlinkage between R&D, production and purchasing
- The modern role of manufacturing from a R&D perspective
- Global R&D and production
- Methods to identify core competencies

Media

Lecture slides will be provided printed.

Literature

Lecture Slides

Course: Integrated production planning [2150660]

Coordinators: G. Lanza

Part of the modules: Integrated Production Planning (p. 92)[WI4INGMB24]

ECTS Credits	Hours per week	Term	Instruction language
9	4/2	Summer term	de

Learning Control / Examinations

The assessment is carried out as a written exam according §4(2), 1 SPO. The examination is offered every semester. Reexaminations are offered at every ordinary examination date.

Conditions

None

Recommendations

Attendance of the lecture 'Manufacturing Engineering' [21657] prior to attending this lecture is recommended.

Learning Outcomes

The students . . .

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

Content

As part of this lecture further engineering aspects of production technology are taught. This includes content from the manufacturing technology, machine tools and handling techniques as well as the organization and planning.

Planning factories within the context of value networks and integrated production systems (Toyota etc.) requires an integrated perspective for the consideration of all functions included in the "factory" system. This includes the planning of manufacturing systems including the product, the value network and factory production, and the examination of SOPs, the running of a factory and maintenance. Content and theory covered by this lecture are completed with many examples from industry and exercises based on real-life situations and conditions.

Main topics covered by the lecture:

- The basic principles of production planning
- Links between product planning and production planning
- Integrating a production site into a production network
- Steps and methods of factory planning
- Approach to the integrated planning of manufacturing and assembly plants
- Layout of production sites
- Maintenance
- Material flow
- Digital factory
- Process simulation for material flow optimisation
- Start-up

Media

Lecture notes will be provided in ilias (<https://ilias.studium.kit.edu/>).

Literature

Lecture Notes

Remarks

None

Course: Intelligent Systems in Finance [2511402]

Coordinators: D. Seese

Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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 genetic algorithms, neural networks, support vector machines, fuzzy-logic, expert systems and intelligent hybrid systems. The presented applications focus on the finance area.

Media

Slides.

Literature

see 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 Production [2581956]

Coordinators: H. Sasse
Part of the modules: Industrial Production II (p. 39)[WI4BWLIIIP2]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Winter term	en

Learning Control / Examinations

The examination will be in form of a written exam acc. to §4(2), 1 ER. Exams are offered in every semester and can be re-examined at every ordinary examination date.

Conditions

None.

Learning Outcomes

Students are taught advanced knowledge in the field of international production and the internationalization strategies of manufacturing companies. They acquire a basic understanding of international production companies and learn about the relevant business and economic models and schools of thought on the subject. Different approaches of the design of internationalization strategies and production networks are presented and relevant location factors for their particular design are investigated. Students learn about the risks of internationalization and methods of risk minimization. Issues of supply chain management are discussed in the context of different approaches to the discrete manufacturing and the process industry. The course concludes with selected case studies from the process and discrete manufacturing industry.

Content

- Fundamentals of international business
- Forms of international cooperation and value creation
- Site selection
- Cost driven internationalization and site selection
- Sales and customer driven internationalization and site selection
- Challenges, risks and risk mitigation
- Management of international production sites
- Types and case studies of international production

Media

Media will be provided on the e-learning platform.

Literature

Will be announced in the course.

Course: International Risk Transfer [2530353]

Coordinators: W. Schwehr

Part of the modules: Insurance Management I (p. 26)[WI4BWLFBV6], Insurance Management II (p. 27)[WI4BWLFBV7]

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

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.
- Finanzinnovationan 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, Dr. Walter

Part of the modules: Finance 3 (p. 28)[WI4BWLFBV11], Finance 2 (p. 25)[WI4BWLFBV2]

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

Learning Control / Examinations

Conditions

None.

Learning Outcomes

The objective of this course is to become familiar with the basics of investment decisions on international markets and to manage foreign exchange risks.

Content

The main aspects of this course are the chances and the risks which are associated with international transactions. We carry out our analysis from two distinct perspectives: First the point of view of an international investor second that, of an international corporation. Several alternatives to the management of foreign exchange risks are shown. Due to the importance of foreign exchange risks, the first part of the course deals with currency markets. Furthermore current exchange rate theories are discussed.

Literature

Elective literature:

-
- Eiteman, D. et al., Multinational Business Finance, 13. edition, 2012.
- Solnik, B. and D. McLeavey, Global Investments, 6. edition, 2008.

Course: International Economic Policy [2560254]

Coordinators: J. Kowalski

Part of the modules: Economic Policy II (p. 53)[WI4VWL3], Growth and Agglomeration (p. 61)[WI4VWL12]

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 (60min) according to Setion 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
- Rodrik, D.: "The Globalization Paradox". London 2011.

Remarks

The credits have been changed to 4,5.

Course: Cost and Management Accounting [2530210]

Coordinators: T. Lüdecke

Part of the modules: Finance 3 (p. 28)[WI4BWLFBV11], Finance 2 (p. 25)[WI4BWLFBV2]

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 [24354]

Coordinators: T. Dreier
Part of the modules: Intellectual Property Law (p. 140)[WI4JURA4]

ECTS Credits	Hours per week	Term	Instruction language
3	2/0	Winter 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: Technical Logistics (p. 95)[WI4INGMB27], Introduction to Logistics (p. 88)[WI4INGMB20]

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.

Recommendations

None.

Learning Outcomes

Students are able to:

- Describe and classify automation technologies for material flow and the information technology necessary,
- Names and uses measures to handle risks of failure, and
- Transfer his knowledge to practical implementations.

Content

This lecture, with exercises, treats automation technology in material flow as well as the information technology that has a direct relationship with it. In the first few chapters, an overview is given of the motors and conveying technology elements used in materials handling, and the sensors required for the purpose are explained. The target control types as well as the topic of coding techniques (barcodes etc) are treated in detail. Material flow controls are defined based on these chapters. Among other things, the functions of a stored-memory controller are explained in this section. Hierarchically classified control structures and their integration in network structures are considered in detail. The principles of communications systems (bus systems etc.) are supplemented with information on the use of the Internet as well as data warehousing strategies. An overview of modern logistics systems, especially in stores administration, illustrates new problem solution strategies in the area of information technology for logistics systems. After an analysis of the causes for system failures, measures are worked out for reducing the risks of failure. Furthermore, the objectives, task areas as well as various scheduling strategies in the area of transport management and control are presented. Worthwhile information on Europe-wide logistics concepts round off this practice-oriented lecture series. The presentation of the lectures will be multimedia-based. Exercises repeat and extend the knowledge principles imparted in the lectures and illustrate the subject with practical examples.

- Electrical drives (DC, AC asynchronous, EC, linear motors)
- Contact-less proximity switches (inductive, capacitive, optical, acoustic)
- Coding technology (target controllers, codes, laser, CCD sensors, reading techniques, mobile data media)
- Material flow control (stored-program controllers, material flow controllers, flexible information systems)
- Communications systems (principles, bus systems, Internet, Data Warehouse)
- Material flow control and administration systems (stores administration, failure safety and data storage)
- Transport management (objectives, components, tasks, task areas, scheduling strategies, stacking management systems)
- Euro-logistics

Literature

Detailed script available from Script Sales, updated and enhanced annually.
CD-ROM with PowerPoint presentation of the lectures and exercises at the end of the semester available from the lecturer, updated and enhanced annually.

Remarks

none

Course: Introduction to Ceramics [2125757]

Coordinators: M. Hoffmann

Part of the modules: Specific Topics in Materials Science (p. 101)[W14INGMB33]

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

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

The students know the most relevant crystal structures and defects of non metallic inorganic materials, are able to read binary and ternary phase diagrams and are familiar with powder technological shaping techniques, sintering and grain growth. They know the basics of the linear elastic fracture mechanics, are familiar with Weibull statistics, K-concept, subcritical crack growth, creep and the opportunities for microstructural reinforcement of ceramics. The students are able to explain the correlation among chemical bonding, crystal and defect structures and the electrical properties of ceramics.

Content

After a short introduction to interatomic bonding, fundamental concepts of crystallography, the stereographic projection and the most important symmetry elements will be given. Different types of crystal structures are explained and the relevance of imperfections are analysed with respect to the mechanical and electrical properties of ceramics. Then, the impact of surfaces, interfaces and grain boundaries for the preparation, microstructural evolution and the resulting properties is discussed. Finally, an introduction is given to ternary phase diagrams.

The second part of the course covers structure, preparation and application aspects of nonmetallic inorganic glasses, followed by an introduction to the properties and processing methods of fine-grained technical powders. The most relevant shaping methods, such as pressing, slip casting, injection moulding and extrusion are introduced. Subsequently, the basics of science of sintering and the mechanisms for normal and abnormal grain growth are discussed. Mechanical properties of ceramics are analysed using basic principles of linear elastic fracture mechanics, Weibull statistics, concepts for subcritical crack growth and creep models to explain the behaviour at elevated temperatures. Furthermore it is demonstrated that mechanical properties can be significantly enhanced by various types of microstructural toughening mechanisms. The electronic and ionic conductivity of ceramic materials are explained based on defect-chemical considerations and band structure models. Finally, the characteristics of a dielectric, pyroelectric, and piezoelectric behaviour is discussed.

Media

Slides for the lecture:

available under <http://www.iam.kit.edu/km>

Literature

- H. Salmang, H. Scholze, "Keramik", Springer
- Kingery, Bowen, Uhlmann, "Introduction To Ceramics", Wiley
- Y.-M. Chiang, D. Birnie III and W.D. Kingery, "Physical Ceramics", Wiley
- S.J.L. Kang, "Sintering, Densification, Grain Growth & Microstructure", Elsevier

Course: Ceramics Processing [2126730]

Coordinators: J. Binder

Part of the modules: Specific Topics in Materials Science (p. 101)[W14INGMB33]

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

Basic knowledge of experimental physics and chemistry is recommended.

It is recommended to attend the course *Ceramics-Introduction* [2125757].

Learning Outcomes

The students are able to name the major ceramic process technologies and explain their specifics in detail. Additionally, they are capable of illustrating the correlations between the individual processes and their importance for the production of engineering ceramics. The students are able to relate processing effects to material properties. Furthermore the students can apply the basics to concrete tasks. They are able to comprehend and assess information in professional articles.

Content

The course imparts technological basics for processing of engineering ceramics. The course is arranged in the following units:

- Synthesis methods
- Powder conditioning and mixing methods
- Forming of ceramics
- Sintering
- Finishing processes
- Ceramic films and multi-layer systems
- Effects of processing on properties

Media

Slides for the lecture available under <http://www.iam.kit.edu/km>

Literature

Elective literature:

W. Kollenberg: Technische Keramik, Vulkan Verlag 2010.

M. N. Rahaman: Ceramic Processing, CRC Taylor & Francis, 2007.

D.W. Richerson: Modern ceramic engineering, CRC Taylor & Francis, 2006.

A. G. King: Ceramic Technology and Processing, William Andrew, 2002.

Course: [19241]**Coordinators:** J. Winter**Part of the modules:** Environmental Management (p. 118)[WI4INGBGU14]

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: Electives in Informatics (p. 72)[WI4INFO3], Informatics (p. 68)[WI4INFO1], Emphasis in Informatics (p. 70)[WI4INFO2]

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: Convex Analysis [2550120]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 76)[WI4OR6]

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

Learning Control / Examinations

The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation.

The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

Conditions

None.

Recommendations

It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Learning Outcomes

The student

- knows and understands the fundamentals of convex analysis,
- is able to choose, design and apply modern techniques of convex analysis in practice.

Content

Convex Analysis deals with properties of convex functions and convex sets, in particular with respect to the minimization of convex functions over convex sets. That the involved functions are not necessarily assumed to be differentiable allows a number of applications which are not covered by techniques from smooth optimization, e.g. approximation problems with respect to the Manhattan or maximum norms, classification problems or the theory of statistical estimates. The lecture develops along another, geometrically simple example, where a nonsmooth obstacle set is to be described by a single smooth convex constraint such that minimal and maximal distances to the obstacle can be computed. The lecture is structured as follows:

- Introductory examples and terminology
- Convex subdifferential, Lipschitz continuity and the safety margin
- Normal cones, error bounds and the maximal distance

Media

Lecture notes.

Literature**Elective literature:**

- J. Borwein, A. Lewis, Convex Analysis and Nonlinear Optimization: Theory and Examples (2 ed.), Springer, 2006.
- S. Boyd, L. Vandenberghe, Convex Optimization, Cambridge University Press, 2004.
- O. Güler, Foundations of Optimization, Springer, 2010.
- J.-B. Hiriart-Urruty, C. Lemarechal, Fundamentals of Convex Analysis, Springer, 2001.
- R.T. Rockafellar, Convex Analysis, Princeton University Press, 1970.
- R.T. Rockafellar, R.J.B. Wets, Variational Analysis, Springer, Berlin, 1998.

Remarks

The lecture is offered irregularly. The curriculum of the next three years is available online (www.ior.kit.edu).

Course: Hospital Management [2550493]

Coordinators: S. Nickel, Hansis

Part of the modules: Operations Research in Supply Chain Management and Health Care Management (p. 74)[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

See German version.

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.

Course: Credit Risk [2530565]**Coordinators:** M. Uhrig-Homburg**Part of the modules:** Finance 3 (p. 28)[WI4BWLFBV11], Finance 2 (p. 25)[WI4BWLFBV2]

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, 2nd Edition, Chapman & Hall, CRC Financial Mathematics Series, (2010).
- Duffie, D., Singleton, K.J., Credit Risk: Pricing, Measurement and Management, Princeton Series of Finance, Prentice Hall, (2003).

Course: Warehousing and distribution systems [2118097]

Coordinators: M. Schwab, J. Weiblen

Part of the modules: Material Flow in Logistic Systems (p. 93)[WI4INGMB25], Logistics in Value Chain Networks (p. 96)[WI4INGMB28], Introduction to Logistics (p. 88)[WI4INGMB20], Material Flow in Networked Logistic Systems (p. 94)[WI4INGMB26], Technical Logistics (p. 95)[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.

Recommendations

None.

Learning Outcomes

Students are able to:

- Describe the areas of typical warehouse and distribution systems with the respective processes and can illustrate it with sketches,
- Use and choose strategies of warehouse and distribution systems according to requirements,
- Classify typical systems using criteria discussed in the lecture, and
- Reson about the choice of appropriate technical solutions.

Content

- Introduction
- Yard management
- Receiving
- Storage and picking
- Workshop on cycle times
- Consolidation and packing
- Shipping
- Added Value
- Overhead
- Case Study: DCRM
- Planning of warehouses
- Case study: Planning of warehouses
- Distribution networks
- Lean Warehousing

Media

presentations, black board

Literature

ARNOLD, Dieter, FURMANS, Kai (2005)

Materialfluss in Logistiksystemen, 5. Auflage, Berlin: Springer-Verlag

ARNOLD, Dieter (Hrsg.) et al. (2008)

Handbuch Logistik, 3. Auflage, Berlin: Springer-Verlag

BARTHOLDI III, John J., HACKMAN, Steven T. (2008)

Warehouse Science

GUDEHUS, Timm (2005)

Logistik, 3. Auflage, Berlin: Springer-Verlag

FRAZELLE, Edward (2002)

World-class warehousing and material handling, McGraw-Hill

MARTIN, Heinrich (1999)

Praxiswissen Materialflußplanung: Transport, Hanshaben, Lagern, Kommissionieren, Braunschweig, Wiesbaden: Vieweg

WISSER, Jens (2009)

Der Prozess Lagern und Kommissionieren im Rahmen des Distribution Center Reference Model (DCRM); Karlsruhe : Universitätsverlag

A comprehensive overview of scientific papers can be found at:

ROODBERGEN, Kees Jan (2007)

Warehouse Literature

Remarks

none

Course: Laser Physics [23840]

Coordinators: M. Eichhorn

Part of the modules: Microoptics (p. 107)[WI4INGMBIMT3], Optoelectronics and Optical Communication (p. 111)[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 Nd³⁺-Laser
 - 5.2.2 The Tm³⁺-Laser
 - 5.2.3 The Ti³⁺:Al₂O₃ 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 & 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 in automotive engineering [2182642]**Coordinators:** J. Schneider**Part of the modules:** Specific Topics in Materials Science (p. 101)[W14INGMB33]

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]

Recommendations

None.

Learning Outcomes

The student

-
- can explain the principles of light generation, the conditions for light amplification as well as the basic structure and function of Nd:YAG-, CO₂- and high power diode-laser sources.
- can describe the most important methods of laser-based processing in automotive engineering and illustrate the influence of laser, material and process parameters
- can analyse manufacturing problems and is able to choose a suitable laser source and process parameters.
- can explain the requirements for safe handling of laser radiation and for the design of safe laser systems.

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. Furthermore the application of laser light in metrology and safety aspects will be addressed.

-
- physical basics of laser technology
- laser beam sources (Nd:YAG-, CO₂-, high power diode-laser)
- beam properties, guiding and shaping
- basics of materials processing with lasers
- laser applications in automotive engineering
- economical aspects
- safety aspects

Media

lecture notes via ILIAS

Literature

W. M. Steen: Laser Material Processing, 2010, Springer

W. T. Silfvast: Laser Fundamentals, 2008, Cambridge University Press

Remarks

It is allowed to select only one of the lectures "Laser in automotive engineering" (2182642) or "Physical basics of laser technology" (2181612) during the Bachelor and Master studies.

Course: Food Science and Functionality [22207]**Coordinators:** Watzl**Part of the modules:** Principles of Food Process Engineering (p. 132)[WI4INGCV3], Specialization in Food Process Engineering (p. 133)[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. 96)[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

Students are able to:

- Describe logistical tasks,
- Design logistical systems suitable to the respective task,
- Dimension stocastical stock models,
- Determine essential influencing parameters on the bullwhip effect and
- Use optimizing solution methods.

Content

multistage logistic process chains
 transport chain in logistic networks
 distribution processes
 distribution centers
 logistics of production systems
 dependencies between production and road traffic
 information flow
 cooperative strategies (like kanban, just-in-time, supply chain management)

Media

presentations, black board

Literature

None.

Remarks

none

Course: Automotive Logistics [2118085]

Coordinators: K. Furmans

Part of the modules: Global Production and Logistics (p. 99)[WI4INGMB31], Logistics in Value Chain Networks (p. 96)[WI4INGMB28], Material Flow in Networked Logistic Systems (p. 94)[WI4INGMB26], Introduction to Logistics (p. 88)[WI4INGMB20], Material Flow in Logistic Systems (p. 93)[WI4INGMB25]

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.

Recommendations

None.

Learning Outcomes

Students are able to:

- Describe essential logistic questions, in a complex production network. As an example the automobile industry is used.
- Choose and apply solution possibilities for logistic problems in this area.

Content

- Logistic questions within the automobile industry
- basic model of automobile production and distribution
- relation with the suppliers
- Disposition and physical execution
- Vehicle production in the interaction of shell, paint shop and assembly
- Sequence planning
- Assembly supply
- vehicle distribution and linkage with selling processes
- Physical execution, planning and control

Media

presentations, black board

Literature

None.

Remarks

none

Course: Airport logistics [2117056]

Coordinators: A. Richter

Part of the modules: Material Flow in Logistic Systems (p. 93)[WI4INGMB25], Logistics in Value Chain Networks (p. 96)[WI4INGMB28], Introduction to Logistics (p. 88)[WI4INGMB20], Material Flow in Networked Logistic Systems (p. 94)[WI4INGMB26]

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

None.

Learning Outcomes

Students are able to:

- Describe material handling and informations technology activities on airports,
- Evaluate processes and systems on airports as the law stands, and
- Choose appropriate processes and material handling systems for airports.

Content

Introduction
 airport installations
 luggage transport
 passenger transport
 security on the airport
 legal bases of the air traffic
 freight on the airport

Media

presentations

Literature

None.

Remarks

none

Course: Markets and Organizations: Principles [2540502]

Coordinators: A. Geyer-Schulz
Part of the modules: Electronic Markets (p. 33)[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 10) from exercise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	95
1.3	90
1.7	85
2.0	80
2.3	75
2.7	70
3.0	65
3.3	60
3.7	55
4.0	50
5.0	0

Conditions

None.

Learning Outcomes

The student

- has an overview about the different organizational form and their efficiency,
- names 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 markets develop? The first part of the lecture treats the selection of the type of organization as an optimization of transaction costs. The second part includes the efficiency of markets (price, information and allocation efficiency) as well as reasons for market failure.

Besides a centralistic approach, markets can be used for decentral coordination of plans and activities. Hereby, optimality can be 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 Revolutionized an Industry. Harper Collins Publisher, London, 1999.

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.

Friedrich A. Hayek. The use of knowledge in society. The American Economic Review, 35(4):519 – 530, Sep 1945.

Norbert Hochheimer. Das kleine QM-Lexikon. Wiley-UCH, Weinheim, 2002.

Adam Smith. An Inquiry into the Nature and Causes of the Wealth of Nations, volume II. 1976.

Remarks

The former name of the lecture was *Electronic Markets (Foundations)*.

As of winter term 2014/15 this lecture is hold in alternation with "2540531 - Business Dynamics". The current schedule can be seen on the chair's website (<http://www.em.uni-karlsruhe.de>).

Course: Management Accounting 1 [2579900]

Coordinators: M. Wouters
Part of the modules: Management Accounting (p. 31)[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) at the end of each semester.

Conditions

The examination "Business Administration: Finance and Accounting" 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 and activity-based costing.

We will use international material written in English.

We will approach these topics primarily from the perspective of the users of financial information (not so much from the controller who prepares the information).

The course builds on an introductory level of understanding of accounting concepts from Business Administration courses in the core program. The course is intended for students in Industrial Engineering.

Media

The recorded lectures and the teaching materials are available on Ilias during the current and next semester.

Literature

-
- Marc Wouters, Frank H. Selto, Ronald W. Hilton, Michael W. Maher: Cost Management – Strategies for Business Decisions, 2012, Publisher: McGraw-Hill Higher Education (ISBN-13 9780077132392 / ISBN-10 0077132394)
- In addition, several papers that will be available on ILIAS.

Course: Management Accounting 2 [2579902]

Coordinators: M. Wouters
Part of the modules: Management Accounting (p. 31)[WI4BWLIBU1]

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

Learning Control / Examinations

The assessment consists of a written exam (90 minutes) (following §4(2), 1 of the examination regulation) at the end of each semester.

Conditions

The examination "Business Administration: Finance and Accounting" 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 and customer value propositions.

We will use international material written in English.

We will approach these topics primarily from the perspective of the users of financial information (not so much from the controller who prepares the information).

The course builds on an introductory level of understanding of accounting concepts from Business Administration courses in the core program. The course is intended for students in Industrial Engineering.

Media

The recorded lectures and the teaching materials are available on ILIAS during the current and next semester.

Literature

-
- Marc Wouters, Frank H. Selto, Ronald W. Hilton, Michael W. Maher: Cost Management – Strategies for Business Decisions, 2012, Publisher: McGraw-Hill Higher Education (ISBN-13 9780077132392 / ISBN-10 0077132394)
- In addition, several papers that will be available on ILIAS.

Course: Management in Public Transport [6234805]

Coordinators: E. Hohnacker

Part of the modules: Public Transportation Operations (p. 124)[WI4INGBGU19], Logistics and Management of Guided Transport Systems (p. 126)[WI4INGBGU21]

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

See German version.

Content

See German version.

Remarks

See German version.

Course: Managing New Technologies [2545003]

Coordinators: T. Reiß

Part of the modules: Entrepreneurship (EnTechnon) (p. 46)[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: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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 infrastructure
- 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: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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

Learning Control / Examinations

see German version.

Conditions

see German version.

Learning Outcomes

see German version.

Content

see German version

Literature

Elective literature:

Will be announced in the lecture.

Course: Trademark and Unfair Competition Law [24136 / 24609]

Coordinators: Y. Matz

Part of the modules: Intellectual Property Law (p. 140)[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. 33)[WI4BWLISM2], Information Engineering (p. 38)[WI4BWLISM7], Market Engineering (p. 34)[WI4BWLISM3], Communications & Markets (p. 36)[WI4BWLISM5], Applied Strategic Decisions (p. 52)[WI4VWL2]

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

Learning Control / Examinations

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation). By successful completion of the exercises (according to §4(2), 3 of the examination regulation) up to 6 bonus points can be obtained. The bonus points only apply to the first and second exam of the semester in which they were obtained.

Conditions

None.

Learning Outcomes

The students

- understand the role of an economist as an engineer to design markets,
- compare different markets and market mechanisms to evaluate their efficiency,
- apply game theoretic modelling and mechanism design as well as auction theory for interdisciplinary evaluation.

Content

The ongoing advancements in information technology have revolutionized traditional business processes and given rise to electronic marketplaces. In contrast to physical marketplaces, electronic markets do not just evolve, but must be carefully designed, implemented and monitored and evaluated. Moreover electronic markets demand open and flexible platforms as well as adequate standards and information services. Future Market Engineers must therefore be able to consider the economic, legal and technological dimension of markets simultaneously. The lecture focuses on the discussion of (1) Microstructure, (2) IT infrastructure, and (3) Business Structure of electronic markets. Hence, students will be taught the economic incentives that a market can impose on market participants, development models for implementing markets, and business models for the application of markets.

Media

- PowerPoint
- E-learning platform ILIAS

Literature

- Roth, A., The Economist as Engineer: Game Theory, Experimental Economics and Computation as Tools for Design Economics. *Econometrica* 70(4): 1341-1378, 2002.
- Weinhardt, C., Holtmann, C., Neumann, D., Market Engineering. *Wirtschaftsinformatik*, 2003.
- Wolfstetter, E., Topics in Microeconomics - Industrial Organization, Auctions, and Incentives. Cambridge, Cambridge University Press, 1999.
- Smith, V. „Theory, Experiments and Economics“, *The Journal of Economic Perspectives*, Vol. 3, No. 1, 151-69 1989

Course: Marketing Strategy Business Game [2571176]**Coordinators:** M. Klarmann, Mitarbeiter**Part of the modules:** Marketing Management (p. 43)[W14BWLMAR5]

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

Learning Control / Examinations**Conditions**

None.

Learning Outcomes**Content**

Using Markstrat, a marketing strategy business game, students work in groups representing a company that competes on a simulated market against the other groups' companies.

Remarks

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

Course: Market Research [2571150]**Coordinators:** M. Klarmann**Part of the modules:** Sales Management (p. 44)[WI4BWL MAR6], Marketing Management (p. 43)[WI4BWL MAR5]

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

Learning Control / Examinations**Conditions**

Please note that this course has to be completed successfully by students interested in seminar or master thesis positions at the chair of marketing.

Learning Outcomes**Content**

Topics addressed in this course are for example:

- Theoretical foundations of market research
- Statistical foundations of market research
- Measuring customer attitudes
- Understanding customer reactions
- Strategical decision making

Remarks

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

Course: Market Microstructure [2530240]

Coordinators: T. Lüdecke

Part of the modules: Finance 3 (p. 28)[WI4BWLFBV11], Finance 2 (p. 25)[WI4BWLFBV2]

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.

Course: Master Seminar in Information Engineering and Management [2540510]

Coordinators: A. Geyer-Schulz
Part of the modules: Seminar Module (p. 145)[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 commit to a topic (pr.n., in teamwork); this may include technical conceptual work and implementation.
- to write his seminar thesis of 15-20 pages in a structured scientific manner.
- to communicate his results in a presentation with discussion afterwards.

Content

The seminar 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. 93)[WI4INGMB25], Introduction to Logistics (p. 88)[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.

Recommendations

None.

Learning Outcomes

Students are able to:

- describe material flow processes qualitativ and quantitativ,
- assign possibilities of technical solutions to a open operational task,
- plan material flow systems, illustrate them in simple models and analyse them regarding their performance,
- use methods to determine performance indicators like throughput, utilization, etc., and
- evaluate material flow systems regarding performance and availability.

Content

- elements of material flow systems (conveyor elements, fork, join elements)
- models of material flow networks using graph theory and matrices
- queueing theory, calculation of waiting time, utilization
- warehouseing and order-picking
- shuttle systems
- sorting systems
- simulation
- calculation of availability and reliability
- value stream analysis

Media

presentations, black board, book

Literature

Arnold, Dieter; Furmans, Kai : Materialfluss in Logistiksystemen; Springer-Verlag Berlin Heidelberg, 2009

Remarks

none

Course: Materials and Processes in Automotive Lightweight Construction [2149669]

Coordinators: S. Kienzle, D. Steegmüller

Part of the modules: Specialization in Production Engineering (p. 90)[WI4INGMB22]

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

Learning Control / Examinations

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

Conditions

None.

Learning Outcomes

The students

- are able to name the various lightweight approaches and identify possible areas of application
- are able to identify the different production processes for manufacturing lightweight structures and explain their functions
- are able to perform a process selection based on the methods and their characteristics
- are able to evaluate the different methods against lightweight applications on the basis of technical and economic aspects

Content

The objective of the lecture is to build up an overview of the relevant materials and processes for the production of a lightweight body. This includes both the actual production and the joining for the body. The lecture covers the different lightweight approaches and possible fields of application in the automotive industry. The methods are discussed with practical examples from the automotive industry.

The following topics will be covered:

- lightweight designs
- aluminum and steel for lightweight construction
- fibre-reinforced plastics by the RTM and SMC process
- joining of steel and aluminum (clinching, riveting, welding)
- bonding
- coating
- finishing
- quality assurance
- virtual factory

Media

Lecture notes will be provided in ilias (<https://ilias.studium.kit.edu/>).

Course: Mathematical Theory of Democracy [25539]

Coordinators: A. Melik-Tangyan

Part of the modules: Social Choice Theory (p. 58)[WI4VWL9], Collective Decision Making (p. 65)[WI4VWL16]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter 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. 145)[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: Methods in Analyzing Internal Combustion [21134]**Coordinators:** U. Wagner**Part of the modules:** Combustion Engines II (p. 85)[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: Analysis tools for combustion diagnostics [2134134]

Coordinators: U. Wagner
Part of the modules: Combustion Engines II (p. 87)[WI4INGMB35]

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.

Conditions

The course *Combustion Engines A / Combustion Engines I* has to be completed beforehand.

Recommendations

None.

Learning Outcomes

The students can name and explain state-of-the-art methods to analyse the process in combustion as well as special measuring techniques such as optical and laser analysis. They are able to thermodynamically model, analyse and evaluate the engine process.

Content

energy balance at the engine
 energy conversion in the combustion chamber
 thermodynamics of the combustion process

flow velocities

flame propagation

special measurement techniques

Literature

Lecture notes available in the lectures

Course: Microoptics and Lithography [2142884]

Coordinators: T. Mappes
Part of the modules: Microoptics (p. 107)[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.

Recommendations

See German version.

Learning Outcomes

The course serves as an introduction for master students in optics and photonics to micro and nano components and systems including their fabrication. Microoptical devices are indispensable for a variety of applications ranging from data handling, transmission and processing of light to optical detection and analysis. Lithography is a key technology for semiconductor manufacturing but also for patterning of any small structure by UV-light, X-rays and electron or ion beams.

Content

- - Concepts in micro and nano fabrication and applications in optics and photonics
- - Electron lithography
- - Optical lithography
- - X-ray lithography
- - EUV-, immersion and interference lithography
- - Microoptical devices and systems

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

Course: Microactuators [21881]**Coordinators:** M. Kohl**Part of the modules:** Sensor Technology I (p. 128)[WI4INGETIT3], Sensor Technology II (p. 129)[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

None.

Recommendations

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: Microactuators [2142881]

Coordinators: M. Kohl

Part of the modules: Microsystem Technology (p. 109)[WI4INGMBIMT4], BioMEMS (p. 104)[WI4INGMBIMT1], Microoptics (p. 107)[WI4INGMBIMT3]

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

Learning Control / Examinations

The assessment will consist of an oral exam (20 min) (following §4 (2), 2 of the examination regulation).

Conditions

None.

Recommendations

It is recommended to attend the lecture "Novel Actuators and Sensors" [2141865].

Learning Outcomes

The student

- knows the basics of the actuation principles
- has the required knowledge on the design, fabrication and operation of microactuators
- is familiar with important microactuators in use and their application areas
- knows typical specifications, advantages and disadvantages of the different microactuators

Content

- Microrobotics: linear actuators, micromotors
- Medical and Life Sciences: Mikrovalves, Micropumps, microfluidic Systems
- Information technology: Optical Switches, mirror systems, read/write heads
- Microelectromechanical systems: Microrelais

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: Microbiology of Food [22209]**Coordinators:** Franz**Part of the modules:** Specialization in Food Process Engineering (p. 133)[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 [2114073]

Coordinators: M. Geimer
Part of the modules: Mobile Machines (p. 83)[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 is required.

Recommendations

It is recommended to attend the course *Fluid Power Systems* [2114093] beforehand.

Learning Outcomes

After completion of the course the students have knowledge of:

- a wide range of mobile machines
- operation modes and working cycles of important mobile machines
- selected subsystems and components

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: Model based Application Methods [2134139]

Coordinators: F. Kirschbaum
Part of the modules: Combustion Engines II (p. 87)[WI4INGMB35]

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

Learning Control / Examinations

take-home exam, short presentation with oral examination

Conditions

none

Recommendations

Basics of combustion engines, vehicular systems, control theory and statistics.

Learning Outcomes

The student can name the most important methods for model-based calibration of powertrain ECUs. Particularly he can choose and apply the correct approach for empirical modeling for a given powertrain calibration task (fuel consumption, emissions, air path, driveability, etc.) and type of plant (linear-nonlinear, static-dynamic, etc.). He is capable to solve typical Problems of a calibration engineer of automotive OEMs or suppliers.

Content

The efforts for the calibration of automotive powertrain ECUs are increasing due to new engine or powertrain technologies and tightening emission laws. From a present view only model based calibration methods are capable to handle this situation. The lecture presents a selection of practice-proven model-based calibration methods.

Media

Lecture notes, blackboard, presentations and live demonstrations via projector

Course: Modeling Strategic Decision Making [2577908]

Coordinators: H. Lindstädt

Part of the modules: Strategic Corporate Management and Organization (p. 29)[WI4BWL01], Strategic Decision Making and Organization Theory (p. 30)[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. 68)[WI4INFO1], Emphasis in Informatics (p. 70)[WI4INFO2], Electives in Informatics (p. 72)[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: Modelling, Measuring and Managing of Extreme Risks [2530355]

Coordinators: U. Werner, S. Hochrainer

Part of the modules: Insurance Management I (p. 26)[WI4BWLFBV6], Insurance Management II (p. 27)[WI4BWLFBV7]

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

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Recommendations

None.

Learning Outcomes

See German version.

Content

- Risk preferences under uncertainty, risk management strategies using utility functions, risk aversion, premium calculations, insurance principle, exceptions, Arrow Lind theorem. Probability and statistics introduction, distributions, Lebesgue integration.
- Introduction to Extreme value theory, Catastrophe models: Introduction to extreme value theory, asymptotic models, extremal types theorem, Generalized extreme value distributions, max-stability, domain of attraction inference for the GEV distribution, model generalization: order statistics. Catastrophemodelapproaches, simulationof extremes.
- Threshold models, generalized pareto distribution, threshold selection, parameter estimation, point process characterization, estimation under maximum domain: Pickands's estimator, Hill's estimator, Deckers-Einmahl-de Haan estimator.
- Catastrophe model approaches, simulation of earthquakes, hurricanes, and floods, vulnerability functions, loss estimation. Indirectvsdirecteffects.
- Introduction to financial risk management against rare events. Basic risk measures: VaR, CVar, CEL and current approaches. Risk management measures against extreme risk for different risk bearers: Insurance principle, loading factors, credits, reserve accumulation, risk aversion.
- Risk preferences in decision making processes. Utility theory, certainty equivalent, Arrow Lind proof for risk neutrality, exceptions in risk neutrality assumptions.
- The Fiscal Risk Matrix, Fiscal Hedge Matrix, Dealing with Risk in Fiscal Analysis and Fiscal Management (macroeconomic context, specific fiscal risks, institutional framework). Reducing Government Risk Exposure (Risk mitigation with private sector, Risk transfer and risk-sharing mechanisms, Managing residual risk).
- Approaches to Managing Fiscal Risk (Reporting on financial statements, Cost-based budgeting, Rules for talking fiscal risk, Market-type arrangements). Case: Analyzing Government Fiscal Risk Exposure in China (Krumm/Wong), The Fiscal Risk of Floods: Lessons of Argentina (AlciraKreimer).
- Case study presentations: Household level index based insurance systems (India, Ethiopia, SriLanka, China), insurance back-up systems coupled with public private partnerships (France, US), Reinsurance approaches (Munich Re, Swiss Re, Allianz).
- Climate Change topics: IPCC report, global and climate change.

Literature

- Woo G (2011) Calculating Catastrophe. Imperial College Press, London, U.K.
- Grossi P and Kunreuther H (eds.) (2005) Catastrophe Modeling: A New Approach to Managing Risk. New York, Springer.
- Embrechts P, Klüppelberg C, Mikosch, T (2003) ModellingExtremal Events for Insurance and Finance. Springer, New York (corr. 4th printing, 1st ed. 1997).
- Wolke, T. (2008). Risikomanagement. Oldenbourg, Muenchen.
- Klugman, A.S, Panjer, H.H, and Willmot, G.E. (2008) Loss Models: From Data to Decisions. 3rd edition. Wiley, New York.
- Slavadori G, Michele CD, Kottegoda NT and Rosso R (2007) Extremes in Nature: An Approach Using Copulas. Springer, New York.
- Amendola et al. (2013) (eds.): *Integrated Catastrophe Risk Modeling. Supporting Policy Processes. Advances in Natural and Technological Hazards Research*, New York, Springer,
- Hochrainer, S. (2006). Macroeconomic Risk Management against Natural Disasters. *German University Press (DUV)*, Wiesbaden, Germany.

Course: Modern Measurement Techniques for Process Optimization [22218]**Coordinators:** Regier**Part of the modules:** Specialization in Food Process Engineering (p. 133)[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**Part of the modules:** Understanding and Prediction of Disasters 2 (p. 137)[WI4INGINTER8], Understanding and Prediction of Disasters 1 (p. 136)[WI4INGINTER7]

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

Course: Engine Measurement Technologies [2134137]

Coordinators: S. Bernhardt
Part of the modules: Combustion Engines II (p. 85)[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: Engine measurement techniques [2134137]

Coordinators: S. Bernhardt
Part of the modules: Combustion Engines II (p. 87)[WI4INGMB35]

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.

Conditions

The course *Combustion Engines A* / Combustion Engines I has to be completed beforehand.

Recommendations

None.

Learning Outcomes

The students are able to explain the principles of modern measuring devices and are able to determine the right device for a certain measuring problem. They are able to analyse and evaluate the results.

Content

Students get to know state-of-the-art measurement techniques for combustion engines. In particular basic techniques for measuring engine operating parameters such as torque, speed, power and temperature.

Possible measurement errors and aberrations are discussed.

Furthermore techniques for measuring exhaust emissions, air/fuel ratio, fuel consumption as well as pressure indication for thermodynamic analysis are covered.

Literature

Lecture notes available in the lectures or in the 'Studentenhaus'

1. Grohe, H.: Messen an Verbrennungsmotoren
2. Bosch: Handbuch Kraftfahrzeugtechnik
3. Veröffentlichungen von Firmen aus der Meßtechnik
4. Hoffmann, Handbuch der Meßtechnik
5. Klingenberg, Automobil-Meßtechnik, Band C

Course: Multivariate Methods [2520317]**Coordinators:** W. Heller**Part of the modules:** Statistical Methods in Risk Management (p. 79)[WI4STAT2]

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 Clusterbeams [2143876]

Coordinators: J. Gspann

Part of the modules: Nanotechnology (p. 110)[WI4INGMBIMT5], Microsystem Technology (p. 109)[WI4INGMBIMT4]

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

None.

Learning Outcomes

Nanotechnology is presented on the basis of a technology for nano- and microstructuring by accelerated nanoparticles (clusters), mainly in view of nanomechanics.

Content

Nanotechnology in biology

Nanosystemstechnology

Cluster beam generation, ionisation and acceleration; cluster properties

Structure generation using accelerated metal clusters

Structuring via gas cluster impact; reactive accelerated cluster erosion (RACE)

Atomic force microscopy of impact structures; nanotribology

Comparison with femtosecond laser machining (Winter term only)

Simulations; Fullerene synthesis, impact structures, visionary nanomachinery

Literature

Foil copies with short commentaries are distributed during the lectures.

Course: Nanotechnologie using Scanning Probe Methods [2142860]

Coordinators: H. Hölscher, M. Dienwiebel, S. Walheim

Part of the modules: Nanotechnology (p. 110)[W14INGMBIMT5]

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: M. Dienwiebel, H. Hölscher

Part of the modules: Microfabrication (p. 106)[WI4INGMBIMT2], Nanotechnology (p. 110)[WI4INGMBIMT5]

ECTS Credits	Hours per week	Term	Instruction language
3	2		

Learning Control / Examinations

See German version.

Conditions

None.

Recommendations

Knowledge in mechanics and physics.

Learning Outcomes

The student can

- explain the physical foundations and common models used in the field of nanotribology and nanomechanics
- describe the most important experimental methods in nanotribology
- critically evaluate scientific papers on nanotribological issues with respect to their substantial quality

Content

Part 1: Basics:

- Nanotechnology
- Forces at nanometer scale
- contact mechanics models (Hertz, JKR, DMT)
- Experimental methods (SFA, QCM, FFM)
- Prandtl-Tomlinson model
- Superlubricity
- Atomic-Scale Wear

Part 2: Topical papers

Literature

Lecture notes, slides and copies of articles

Course: Nature-inspired Optimisation Methods [2511106]

Coordinators: S. Mostaghim, P. Shukla

Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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

Learning Control / Examinations

The assessment consists of a written exam (60 min) (according to Section 4(2), 1 of the examination regulation) and an additional written examination called "bonus exam", 60 min (according Section 4(2), 3 of the examination regulation) or a selection of 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: G. Abbt-Braun

Part of the modules: Water Chemistry and Water Technology II (p. 135)[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: Microsystem Technology (p. 109)[WI4INGMBIMT4], Optoelectronics and Optical Communication (p. 111)[WI4INGMBIMT6], Nanotechnology (p. 110)[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 (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. 76)[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 50% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

The examination can also be combined with the examination of *Nonlinear Optimization II* [2550113]. In this case, the duration of the written examination takes 120 minutes.

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.

Media

Lecture notes.

Literature

Elective literature:

- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993
- O. Güler, Foundations of Optimization, Springer, 2010
- H.Th. Jongen, K. Meer, E. Triesch, Optimization Theory, Kluwer, 2004
- J. Nocedal, S. Wright, Numerical Optimization, Springer, 2000

Remarks

Part I and II of the lecture are held consecutively in the *same* semester.

Course: Nonlinear Optimization II [2550113]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 76)[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 50% 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.

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.

Media

Lecture notes.

Literature

Elective literature:

- W. Alt, Nichtlineare Optimierung, Vieweg, 2002
- M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming, Wiley, 1993
- O. Güler, Foundations of Optimization, Springer, 2010
- H.Th. Jongen, K. Meer, E. Triesch, Optimization Theory, Kluwer, 2004
- J. Nocedal, S. Wright, Numerical Optimization, Springer, 2000

Remarks

Part I and II of the lecture are held consecutively in the *same* semester.

Course: Public Media Law [24082]

Coordinators: C. Kirchberg
Part of the modules: Public Business Law (p. 142)[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. 74)[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. 74)[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 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. 111)[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. 107)[WI4INGMBIMT3], Optoelectronics and Optical Communication (p. 111)[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. 107)[WI4INGMBIMT3], Optoelectronics and Optical Communication (p. 111)[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. 77)[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 Section 4(2), 1 of the examination regulation. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.6 (according to Section 4(2), 3 of the examination regulation).

Conditions

None.

Learning Outcomes

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: Optoelectronic Components [23486 / 23487]

Coordinators: W. Freude
Part of the modules: Microsystem Technology (p. 109)[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. 77)[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. 68)[WI4INFO1], Emphasis in Informatics (p. 70)[WI4INFO2], Electives in Informatics (p. 72)[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 resources 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. 29)[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. 29)[WI4BWL01], Strategic Decision Making and Organization Theory (p. 30)[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 and Desinfection Processes [22612]**Coordinators:** H. Horn**Part of the modules:** Water Chemistry and Water Technology II (p. 135)[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 (Cl_2 / HOCl , ClO_2), UV-irradiation, silver (Ag^+), ozone (O_3)
2. Oxidation with Ozone O_3 , potassium permanganate KMnO_4 , hydrogen peroxide H_2O_2 , combined oxidation methods UV/ H_2O_2 , UV/ O_3 , H_2O_2 / O_3 , oxygen O_2
3. Detection reactions of oxidants (O_3 , H_2O_2 , Cl_2)
4. Water constituents and their interaction in the treatment steps: THM- and AOX-formation, AOC
5. Special problems: CKW, nitrate, Br^- / 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: P&C Insurance Simulation Game [INSGAME]**Coordinators:** U. Werner**Part of the modules:** Insurance Management I (p. 26)[WI4BWLFBV6], Insurance Management II (p. 27)[WI4BWLFBV7]

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

Learning Control / Examinations**Conditions**

None.

Learning Outcomes**Content**

Course: Parametric Optimization [2550115]

Coordinators: O. Stein
Part of the modules: Mathematical Programming (p. 76)[WI4OR6]

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

Learning Control / Examinations

The assessment of the lecture is a written examination (60 minutes) according to §4(2), 1 of the examination regulation.

The examination is held in the semester of the lecture and in the following semester.

Prerequisite for admission to the written examination is attaining at least 30% of the exercise points. Therefore the online-registration for the written examination is subject to fulfilling the prerequisite.

Conditions

None.

Recommendations

It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Learning Outcomes

The student

- knows and understands the fundamentals of parametric optimization,
- is able to choose, design and apply modern techniques of parametric optimization in practice.

Content

Parametric Optimization deals with the impact of parameter changes on the solution of optimization problems. In practical applications this is of fundamental importance, for example, to assess the quality of a numerically computed solution or to derive quantitative statements about its parameter dependence. Moreover, many optimization algorithms are controlled by varying parameters, and applications may be found in noncooperative game theory, geometric optimization and robust optimization. The lecture provides a mathematically sound introduction to these topics and is structured as follows:

- Introductory examples and terminology
- Stability and regularity conditions
- Sensitivity
- Applications: semi-infinite optimization and Nash games

Media

Lecture notes.

Literature

Elective literature:

- J.F. Bonnans, A. Shapiro, Perturbation Analysis of Optimization Problems, Springer, New York, 2000.
- W. Dinkelbach, Sensitivitätsanalysen und parametrische Programmierung, Springer, Berlin, 1969.
- J. Guddat, F. Guerra Vasquez, H.Th. Jongen, Parametric Optimization: Singularities, Pathfollowing and Jumps, Wiley, Chichester, and Teubner, Stuttgart, 1990.
- R.T. Rockafellar, R.J.B. Wets, Variational Analysis, Springer, Berlin, 1998.

Remarks

The lecture is offered irregularly. The curriculum of the next three years is available online (www.ior.kit.edu).

Course: Patent Law [24656]

Coordinators: P. Bittner
Part of the modules: Intellectual Property Law (p. 140)[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: Personalization and Services [2540533]**Coordinators:** A. Sonnenbichler**Part of the modules:** Advanced CRM (p. 32)[WI4BWLISM1], Business & Service Engineering (p. 35)[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 10) from exercise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	95
1.3	90
1.7	85
2.0	80
2.3	75
2.7	70
3.0	65
3.3	60
3.7	55
4.0	50
5.0	0

Conditions

None.

Learning Outcomes

The student

- knows the options and opportunities of personalization especially in the area of Internet based services
- knows important methods for authentication, authorization, and accounting
- can use these methods practically in internet-based services.

Content**Media**

Slides.

Remarks

As of summer term 2014 this lecture is hold in alternation with the lecture "2540506 - Recommendersystems". The current schedule can be seen on the chair's website (<http://www.em.uni-karlsruhe.de>).

Course: Photovoltaic Systems Technology [23380]

Coordinators: Schmidt
Part of the modules: Generation and transmission of renewable power (p. 131)[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: Microfabrication (p. 106)[WI4INGMBIMT2], Microsystem Technology (p. 109)[WI4INGMBIMT4]

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: J. Schneider

Part of the modules: Specific Topics in Materials Science (p. 101)[W14INGMB33]

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

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* [2182642]

Recommendations

None.

Learning Outcomes

The student

-
- can explain the principles of light generation, the conditions for light amplification as well as the basic structure and function of different laser sources.
- can describe the influence of laser, material and process parameters for the most important methods of laser-based materials processing and choose laser sources suitable for specific applications.
- can illustrate the possible applications of laser sources in measurement and medicine technology
- can explain the requirements for safe handling of laser radiation and for the design of safe laser systems.

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 focuses 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 Applied Materials (IAM) will be offered.

-
- physical basics of laser technology
- laser beam sources (solid state, diode, gas, liquid and other lasers)
- beam properties, guiding and shaping
- lasers in materials processing
- lasers in measurement technology
- lasers for medical applications
- safety aspects

The lecture is complemented by a tutorial.

Media

lecture notes via ILIAS

Literature

W. T. Silfvast: *Laser Fundamentals*, 2008, Cambridge University Press

W. M. Steen: *Laser Material Processing*, 2010, Springer

Remarks

It is allowed to select only one of the lectures "Laser in automotive engineering" (2182642) or "Physical basics of laser technology" (2181612) during the Bachelor and Master studies.

Course: Simulation Game in Energy Economics [2581025]

Coordinators: W. Fichtner

Part of the modules: Energy Economics and Energy Markets (p. 40)[WI4BWLIP4]

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

Learning Control / Examinations

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

Conditions

Visiting the course "Introduction to Energy Economics"

Learning Outcomes

Understanding for market mechanisms, pricing and investment decisions in a liberalised electricity market.

Content

- Introduction
- Agents and market places in the electricity industry
- Selected planning tasks of energy service companies
- Methods of modelling in the energy sector
- Agent-based simulation: The PowerACE model
- Simulation game: Simulation in energy economics (electricity and emission trading, investment decisions)

The lecture is structured in a theoretical and a practical part. In the theoretical part, the students are taught the basics to carry out simulations themselves in the practical part which comprises amongst others the simulation of the power exchange. The participants of the simulation game take a role as a power trader in the power market. Based on various sources of information (e.g. prognosis of power prices, available power plants, fuel prices), they can launch bids in the power exchange.

Media

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

Literature

Elective literature:

Möst, D. und Genoese, M. (2009): Market power in the German wholesale electricity market. The Journal of Energy Markets (47–74). Volume 2/Number 2, Summer 2009

Course: PLM for product development in mechatronics [2122376]**Coordinators:** M. Eigner**Part of the modules:** Virtual Engineering B (p. 98)[WW4INGMB30], Virtual Engineering A (p. 97)[WW4INGMB29]

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

Learning Control / Examinations

The assessment consists of an oral exam (20 min) taking place in the recess period (according to §4 (2), 2 of the examination regulation.

Conditions

None.

Learning Outcomes**Content**

Course: Polymer Engineering I [2173590]**Coordinators:** P. Elsner**Part of the modules:** Specific Topics in Materials Science (p. 101)[W14INGMB33]

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

Learning Control / Examinations

Oral examination

Duration: 20-30 Minutes

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.

The students

- are familiar to describe and classify polymers with the fundamental synthesis processing techniques
- learns practical applications of polymer parts
- are able to apply the processing techniques, the application of polymers and polymer composites regarding to the basic principles of material science
- has knowledge about the special mechanical, chemical and electrical properties of polymers
- has knowledge about application areas and the limitation in the use of polymers

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: Polymer Engineering II [2174596]

Coordinators: P. Elsner

Part of the modules: Specific Topics in Materials Science (p. 101)[W14INGMB33]

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

Learning Control / Examinations

Oral examination

Duration: 20-30 Minutes

Conditions

Polymerengineering I

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.

The students

- are familiar with different processing techniques
mould details
- learn practical applications and processing of polymer parts
- have fundamental knowledge of polymer part design
- have knowledge about the application of polymers regarding the technical requirements
- have knowledge about how to use polymers regarding the production, economical and ecological requirements

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: Polymers in MEMS A: Chemistry, Synthesis and Applications [2141853]

Coordinators: B. Rapp
Part of the modules: Microsystem Technology (p. 109)[WI4INGMBIMT4]

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

Learning Control / Examinations

The assessment consists of an oral exam (20 min) taking place in the recess period (according to §4 (2), 2 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None.

Learning Outcomes

The aim of the lecture is providing mechanical or chemical engineers, as well as interested students from the life or material sciences the basic knowledge required for understanding what polymers are and how they are made, highlighting their importance for modern MEMS systems with a wide view to applications in everyday life.

Content

We all come in contact with numerous polymeric products in everyday life. From water bottles to packaging to the cover of the iPad, many things are made of polymers. Polymers are also important materials for modern microelectromechanical systems (MEMS) allowing cost effective mass market compatible products, e.g., in the life sciences or diagnostics. But polymers are not just cost-effective replacements for more expensive classical materials in MEMS (such as, e.g., silicon) – some polymers have intrinsic properties that make them ideal materials for sensors, actuators or templates for biology and chemistry in MEMS.

This lecture will introduce the basics of organic chemistry required for understanding what polymers are, how they are manufactured and which mechanisms are responsible for their unique properties. The lecture will highlight (in the context of MEMS but also in a wider scope) where and why polymers are applied with a strong focus on their chemical and physical properties (and on their synthesis).

Some of the topics covered are:

- What is the basic chemistry of polymers? What are monomers, what are macromolecules and how are they formed?
- How are polymers produced on industrial scale – but also on the laboratory scale? Numerous examples of how to make (commonly and lesser known) polymers will be discussed including materials such as Plexiglas.
- Why are polymers so important for biochemistry and tissue engineering?
- How do photoresists work and why do some polymers contract when exposed to light?
- What are high-performance polymers and why do they have such a wide application range, e.g., in implants?
- What polymers fuel the household 3D printing community and what materials do 3D printers such as, e.g., the RepRap work with?
- How does 3D printing and rapid prototyping work and which polymers can be employed for which techniques?
- Why does silicone always smell like vinegar and why is this material so important for modern day microfluidics? How do you build fluid-logic devices using silicone?
- How do shape memory polymers remember their shape?
- What are polymer foams and why are they not only important for heat insulation but also for organic chemistry?
- How do glues work? Why are there two-component glues, what is superglue and how can you make glue from potatoes?

The lecture will be given in German language unless non-German speaking students attend. In this case, the lecture will be given in English (with some German translations of technical vocabulary). The lecture slides are in English language and will be handed out for taking notes. Additional literature is not required.

For further details, please contact the lecturer, Dr. Ing. Bastian E. Rapp (bastian.rapp@kit.edu). Preregistration is not necessary. The examination will be held in oral form at the end of the lecture. The second lecture of the lecture series "Polymers in MEMS B – Physics, manufacturing and applications" (which is also held in winter semester) can be combined with this lecture. In summer semester, the third part of the lecture series "Polymers in MEMS C – Biopolymers, Biopolymers and applications" will be given which may be combined with lectures A and B.

Media

The lecture slides will be given out as scriptum during each lecture course.

Remarks

For further details, please contact the lecturer, Dr. Ing. Bastian E. Rapp (bastian.rapp@kit.edu). Preregistration is not necessary.

Course: Polymers in MEMS B: Physics, Microstructuring and Applications [2141854]

Coordinators: M. Worgull
Part of the modules: Microsystem Technology (p. 109)[WI4INGMBIMT4]

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

Learning Control / Examinations

The assessment consists of an oral exam (20 min) taking place in the recess period (according to §4 (2), 2 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None.

Learning Outcomes

The aim of the lecture is providing mechanical or chemical engineers, as well as interested students from the life or material sciences the basic knowledge required for understanding what polymers are and how they are made, highlighting their importance for modern MEMS systems with a wide view to applications in everyday life.

Content

We all come in contact with numerous polymeric products in everyday life. From water bottles to packaging to the cover of the iPad, many things are made of polymers. Polymers are also important materials for modern microelectromechanical systems (MEMS) allowing cost effective mass market compatible products, e.g., in the life sciences or diagnostics. But polymers are not just cost-effective replacements for more expensive classical materials in MEMS (such as, e.g., silicon) – some polymers have intrinsic properties that make them ideal materials for sensors, actuators or templates for biology and chemistry in MEMS.

This lecture will introduce the basics of physics and material science required for the understanding of the mechanical behavior seen from the engineers view. Micro and nanostructuring of polymers allows the fabrication of micro parts fulfilling their tasks in mostly invisible different applications. But also the fabrication of polymer parts with functional surfaces inspired from Bionics will be presented in this lesson. The lesson will give further an overview over the polymer based structuring processes and will underline the importance by a number of applications e.g. photonic structures or Lotus-like structures.

Some of the topics covered are:

- How can polymers described from the view of engineers?
- What are the differences between polymers and metals?
- Rheology of polymer melts – How does polymer melts flow?
- How can polymers be formed and demolded?
- Which structuring processes (replication) processes are available?
- How does stress influence molded parts (e.g. the deformation of a CD in a hot car)
- Shrinkage of polymers – which precision is achievable
- Gluing or welding – How can polymers be assembled?
- Simulation of replication processes
- Characterization of polymers – which properties can be measured?

The lecture will be given in German language unless non-German speaking students attend. In this case, the lecture will be given in English (with some German translations of technical vocabulary). The lecture slides are in English language and will be handed out for taking notes. Additional literature is not required.

For further details, please contact the lecturer, PD Dr.-Ing. Matthias Worgull (matthias.worgull@kit.edu). Preregistration is not necessary.

The examination will be held in oral form at the end of the lecture. The second lecture of the lecture series „Polymers in MEMS A – Chemistry, synthesis and applications” (which is also held in winter semester) can be combined with this lecture. In summer semester, the third part of the lecture series “Polymers in MEMS C – Biopolymers, Biopolymers and applications” will be given which may be combined with lectures A and B.

Media

The lecture slides will be given out as scriptum during each lecture course.

Remarks

For further details, please contact the lecturer, PD Dr.-Ing. Matthias Worgull (matthias.worgull@kit.edu). Preregistration is not necessary.

Course: Portfolio and Asset Liability Management [2520357/2520358]

Coordinators: W. Heller

Part of the modules: Statistical Methods in Risk Management (p. 79)[WI4STAT2], Mathematical and Empirical Finance (p. 78)[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

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 2015 on. The examination will probably be offered latest until summer term 2014.

Course: Laboratory “Laser Materials Processing” [2183640]**Coordinators:** J. Schneider, W. Pflöging**Part of the modules:** Specific Topics in Materials Science (p. 101)[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.

Recommendations

The attendance to one of the courses *Physical Basics of Laser Technology* (2181612) or *Laser Application in Automotive Engineering* (2182642) is strongly recommended.

Learning Outcomes

The student

-
- can describe the influence of laser, material and process parameters and can choose suitable parameters for the most important methods of laser-based processing in automotive engineering.
- can explain the requirements for safe handling of laser radiation and for the design of safe laser systems.

Content

The laboratory comprises 8 half-day experiments, which address the following laser processing topics of metals, ceramics and polymers:

- safety aspects
- surface hardening and remelting
- melt and reactive cutting
- surface modification by dispersing or alloying
- welding
- surface texturing
- metrology

There are used CO₂-, excimer-, Nd:YAG- and high power diode-laser sources within the laboratory.

Media

lecture notes via ILIAS

Literature

W.T. Silfvast: *Laser Fundamentals*, 2008, Cambridge University Press

W.M. Steen: *Laser Materials Processing*, 2010, Springer

Remarks

The maximum number of students is 12 per semester.

Course: Practical Course Technical Ceramics [2125751]

Coordinators: R. Oberacker

Part of the modules: Specific Topics in Materials Science (p. 101)[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.

Recommendations

None.

Learning Outcomes

The students are able to understand and to apply a number of basic laboratory methods used in processing and characterization of ceramic materials. They are qualified to apply new methods on the basis of standards and descriptions of experiments.

Content

Based on alumina as a model material, major test methods for the characterization of raw materials, intermediate and final products are practically applied. Topics:

-
- powder characterization
- Shaping of powder compacts
- sintering
- microstructural characterization
- mechanical testing

On the basis of short descriptions of the methods, the students prepare themselves, carry out the experiments and write a laboratory report.

Literature

Salmang, H.: Keramik, 7. Aufl., Springer Berlin Heidelberg, 2007. - Online-Ressource

Richerson, D. R.: Modern Ceramic Engineering, CRC Taylor & Francis, 2006

Course: Experimental Laboratories in Sensors and Actuators [23232]

Coordinators: W. Menesklou

Part of the modules: Sensor Technology I (p. 128)[WI4INGETIT3], Sensor Technology II (p. 129)[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. 68)[WI4INFO1], Emphasis in Informatics (p. 70)[WI4INFO2], Electives in Informatics (p. 72)[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: Lab Class Cloud Computing [25820]

Coordinators: S. Tai

Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

ECTS Credits	Hours per week	Term	Instruction language
4	3	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 provide and use cloud systems and services. Thereby, they will be enabled to develop practical cloud solutions for concrete problems.

Content

The "Praktikum (lab class) Cloud Computing" provides a practical introduction to Cloud Computing. Virtualization technology, Service-oriented Architectures and Web services provide the basis for building Cloud systems. Students will learn how to use these Cloud technologies. Based on concrete application scenarios, the class focuses on the practical development of Cloud services (applications, platforms and infrastructure). This includes the complete development lifecycle of a large-scale software project and its implementation in small project teams.

Literature

Will be announced at the kick-off event.

Course: Advanced Lab in Efficient Algorithms [25700p]

Coordinators: H. Schmeck

Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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:** Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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: Exercises in Knowledge Management [25740p]

Coordinators: R. Studer

Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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: Introduction to Microsystem Technology - Practical Course [2143875]

Coordinators: A. Last

Part of the modules: Microfabrication (p. 106)[WI4INGMBIMT2], Microsystem Technology (p. 109)[WI4INGMBIMT4], BioMEMS (p. 104)[WI4INGMBIMT1], Microoptics (p. 107)[WI4INGMBIMT3], Nanotechnology (p. 110)[WI4INGMBIMT5]

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

Learning Control / Examinations

The assessment consists of a written exam (60 minutes) (following §4(2), 1 SPO).

Conditions

None.

Recommendations

Courses Microsystem technology I [2141861] and II [2142874] are recommended.

Learning Outcomes

- Deepening of the contents of the lecture MST I resp. II
- Understanding the technological processes in the micro system technology
- Experience in lab-work at real workplaces where normally research is carried out

Content

In the practical training includes nine experiments:

1. Hot embossing of plastics micro structures
2. Micro electroforming
3. Mikro optics: „LIGA-micro spectrometer“
4. UV-lithography
5. Optical waveguides
6. Capillary electrophoresis on a chip
7. SAW gas sensor
8. Metrology
9. Atomic force microscopy

Each student takes part in only five experiments.

The experiments are carried out at real workstations at the IMT and coached by IMT-staff.

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. 74)[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: Predictive Mechanism and Market Design [2520402/ 2520403]

Coordinators: P. Reiss

Part of the modules: Applied Strategic Decisions (p. 52)[WI4VWL2], Experimental Economics (p. 66)[WI4VWL17]

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

Learning Control / Examinations

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None.

Recommendations

Basic knowledge of mathematics, statistics, and game theory is assumed.

Learning Outcomes

Students

- are provided with theoretical predictions in a variety of applications of mechanism and market design;
- learn about the robustness and usefulness of theoretical predictions in mechanism and market design;
- shall be able to design mechanisms and market for real-life problems.

Content

Frequently economic agents - individuals, firms, the government - need to define allocation mechanisms and can design the rules of market interactions. Examples include the provision of public goods (e.g., the reduction of CO₂ emissions), the solution of matching problems (e.g., the assignment in kidney exchange), resource allocation (e.g., radio spectrum usage rights), and procurement (e.g., choice of supplier and contractual terms). Theoretical predictions are derived and confronted with data from the laboratory and the field. The course focusses on the interplay of theory with evidence to learn about the accuracy and the robustness of the theoretical predictions.

Media

Slides, problem sets.

Literature

A selection of published papers is compulsory reading for the course. The course syllabus provides references and is announced at the beginning of the course.

Remarks

See German version.

Course: Pricing [2572157]**Coordinators:** M. Klarmann**Part of the modules:** Sales Management (p. 44)[WI4BWL MAR6], Strategy, Communication, and Data Analysis (p. 45)[WI4BWL MAR7]

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

Learning Control / Examinations**Conditions**

None.

Learning Outcomes

For further information please contact the chair of marketing.

Content

This course addresses central elements and peculiarities of pricing goods and services. The topics are below others:

- Price demand functions
- Concept of the price elasticity of demand
- Key concepts of behavioral pricing
- Decision-making areas in pricing

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

Course: Principles of Insurance Management [2550055]

Coordinators: U. Werner

Part of the modules: Insurance Management I (p. 26)[WI4BWLFBV6], Insurance Management II (p. 27)[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

- D. Farny. *Versicherungsbetriebslehre*. Karlsruhe 2011.
- P. Koch. *Versicherungswirtschaft - ein einführender Überblick*. 2005.
- M. Rosenbaum, F. Wagner. *Versicherungsbetriebslehre. Grundlegende Qualifikationen*. Karlsruhe 2002.
- U. Werner. *Einführung in die Versicherungsbetriebslehre*. Skript zur Vorlesung.

Elective literature:

Will be announced during the lecture.

Course: Private and Social Insurance [2530050]

Coordinators: W. Heilmann, K. Besserer

Part of the modules: Insurance Management II (p. 27)[WI4BWLFBV7], Insurance Management I (p. 26)[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

Course: Exercises in Civil Law [24017]

Coordinators: T. Dreier
Part of the modules: Commercial Law (p. 139)[WI4JURA2]

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

Learning Control / Examinations

The assesment ist explained in the module description.

Conditions

None.

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 knowlegde 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 sesssions the substantive law twhich students have been taught in the courses "Civil Law for Beginners", "Advanced Civil Law" and "Commercial and Corporation Law" will be repeated and the method for solving legal cases deepend. Moreover, 5 sessions ae reserved to written exam problems which cover the totality of what students have learned so far. Additional sessions are reserved for the subsequent in-class discussion of the exam problems.

Media

Slides

Literature

tba in the course.

Course: Problem solving, communication and leadership [2577910]

Coordinators: H. Lindstädt

Part of the modules: Strategic Corporate Management and Organization (p. 29)[WI4BWL01]

ECTS Credits	Hours per week	Term	Instruction language
2	1/0	Summer term	de

Learning Control / Examinations

The assessment consists of a written exam (30 minutes) (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None.

Recommendations

None.

Learning Outcomes

The course deals with various aspects of problem solving and communication processes and is divided into two parts. The first part of the course addresses the fundamental steps in the problem-solving process; namely, problem identification, problem structuring, problem analysis and communication of solution. Ideas for structuring problem solving processes will be discussed and the prerequisites for and principles of structured communication based on charts and presentations will be explained. The second part of the course addresses important concepts in leadership, including the context-specificity of influence, the choice of leader and the characteristics of employees. The course content reflects current issues in management and communication practice and is oriented toward the practical application of theoretical insights to these issues. In this respect, the course aims to develop interdisciplinary skills.

Content

PART A: Problem solving and communication

I Importance of problem solving and communication

II Problem identification

III Problem structuring

IV Problem analysis

V Communication and presentation: structuring and implementation

VI Management of problem solving processes: shaping the context

PART B: Leadership: classical concepts

VII Choosing a leader: Fiedler's concept

VIII Context-specificity of influence: Vroom/Yetton's normative model

IX Characteristics of employees: Hersey/Blanchard-model

Media

Slides.

Literature

The relevant excerpts and additional sources are made known during the course.

Course: Product and Innovation Marketing [2571154]

Coordinators: M. Klarmann
Part of the modules: Marketing Management (p. 43)[W14BWLMAR5]

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

Learning Control / Examinations

Conditions
None.

Learning Outcomes**Content**

This course addresses topics around the management of new as well as existing products. After the foundations of product management, especially the product choice behavior of customers, students get to know in detail different steps of the innovation process. Another section regards the management of the existing product portfolio.

Remarks

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

Course: Production and Logistics Management [2581954]

Coordinators: M. Fröhling
Part of the modules: Industrial Production III (p. 42)[WI4BWLIIIP6]

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

Learning Control / Examinations

The assessment consists of a written exam (90 minutes) (following § 4(2), 1 of the examination regulation). The exam takes place in every semester. Reexaminations are offered at every ordinary examination date.

Conditions

None.

Learning Outcomes

- Students discuss the basic tasks of an operative production and logistics management.
- Students discuss approaches to solve these tasks and shall be able to apply certain ones.
- Students explain the interdependencies between the tasks and methods to solve.
- Students discuss possible IT tools for production and logistics management.
- Students describe emerging trends in production and logistics management.

Content

This course covers central tasks and challenges of operational production and logistics management. Systems analytically, central planning tasks are discussed. Exemplary solution approaches for these tasks are presented. Further practical approaches are explained. Students get to know the set-up and mode of operation of planning systems such as PPS-, ERP- and Advanced Planning Systems to cope with the accompanying planning tasks. Alongside to MRP II, students will be introduced to integrated supply chain management approaches in Supply Chain Management.

Media

Media will be provided on the e-learning platform.

Literature

will be announced in the course

Course: Production Technology and Management in Automotive [2149001]

Coordinators: V. Stauch, S. Peters

Part of the modules: Global Production and Logistics (p. 99)[WI4INGMB31]

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

Learning Control / Examinations

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

Conditions

None

Recommendations

None

Learning Outcomes

The students ...

- are capable to specify the current challenges in automotive industry and to explain approaches to solve them.
- are able to classify the main parts of an automotive plant and its key elements (production facilities).
- are qualified to identify interlinkages between development processes and production systems (such as lean production).
- have the ability to classify modern concepts of logistics and tasks in management and design of value added networks.
- are enabled to explain the importance of an integrated quality management in product development and production as well as related methods.
- are able to characterize methodical approaches of analytical assessment and optimization of production planning tasks.

Content

The lecture deals with the technical and organizational aspects of automotive production. The course starts with an introduction to the automotive industry, current trends in vehicle technology and integrated product development. A selection of manufacturing processes are subjects of the second lecture block. Experiences of the applications of the Mercedes Production System in production, logistics and maintenance are the subject of the third event. During the last block approaches to quality management, global networks and current analytical planning methods in research are discussed. The course is strongly oriented towards the practice and is provided with many current examples. Mr. Stauch was Head of Powertrain Production Mercedes Benz Cars and plant manager Untertürkheim until 2010.

The following topics will be covered:

- Introduction to Automotive Industry and Technology
- Basics of Product Development
- Selected Automotive Manufacturing Technologies
- Automotive Production Systems
- Logistics
- Quality Assurance
- Global Networks
- Analytical Approaches of Production Planning

Media

Lecture slides will be provided printed.

Literature

Lecture Slides

Remarks

None

Course: Project Workshop: Automotive Engineering [2115817]

Coordinators: F. Gauterin

Part of the modules: Vehicle Development (p. 82)[WI4INGMB14], Automotive Engineering (p. 80)[WI4INGMB5], Handling Characteristics of Motor Vehicles (p. 81)[WI4INGMB6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3	Winter / Summer Term	de

Learning Control / Examinations

Performance is assessed on the basis of a project presentation at the end of the lecture period (according to Section 4(2), 3 of the examination regulation), the followed discussion and a final project report.

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.

Recommendations

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. They are able to analyze and to judge complex relations. They are ready to work self-dependently, to apply different development methods and to work on approaches to solve a problem, to develop practice-oriented products or processes.

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.

Literature

Steinle, Claus; Bruch, Heike; Lawa, Dieter (Hrsg.), Projektmanagement, Instrument moderner Innovation, FAZ Verlag, Frankfurt a. M., 2001, ISBN 978-3929368277

The scripts will be supplied in the start-up meeting.

Course: Projectseminar [SozSem]

Coordinators: G. Nollmann, Kunz, Haupt, Grenz, Eisewicht, Enderle, Dukat, Albrecht

Part of the modules: Sociology (p. [144](#))[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: Test Procedures in Construction [6241821]

Coordinators: H. Schneider

Part of the modules: Mechanical Process Engineering in Construction (p. 121)[WI4INGBGU17]

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

Learning Control / Examinations

The assessment consists of an oral exam (15 min.) taking place in the recess period (according to §4 (2), 2 of the examination regulation).

Conditions

None.

Learning Outcomes

Students

- Have extensive knowledge in soil examination.
- Can conduct soil examinations independently.
- Can evaluate examination results and assess their reliability.

Content

The lecture comprises

- Foundations of soil examination regarding processing of samples.
- Norms, classifications, and criteria necessary to plan the scope of examinations and sampling.
- Applied examinations at the laboratory and in the field, boundaries of examination methods.
- Possible sources of error and reliability of examination results.

Media

Lecture supplements.

Course: Public Management [2561127]

Coordinators: B. Wigger, Assistenten

Part of the modules: Collective Decision Making (p. 65)[WI4VWL16], Strategic Decision Making and Organization Theory (p. 30)[WI4BWL03]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2	Winter term	de

Learning Control / Examinations

The assessment consists of an 1h written exam following Art. 4, para. 2, clause 1 of the examination regulation. The grade for this course equals the grade of the written exam.

Conditions

Basic knowledge of Public Finance is required.

Learning Outcomes

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: Advanced powder metals [2126749]

Coordinators: R. Oberacker

Part of the modules: Specific Topics in Materials Science (p. 101)[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

- 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. Thümmel, R. Oberacker. “Introduction to Powder Metallurgy”, Institute of Materials, 1993

Course: Quality Management [2149667]

Coordinators: G. Lanza

Part of the modules: Global Production and Logistics (p. 99)[WI4INGMB31], Specialization in Production Engineering (p. 90)[WI4INGMB22]

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 (as per §4(2), 1 SPO [study and examination regulations]) during the lecture-free period. The examination will take place once every semester and can be retaken at every official examination date.

Conditions

None

Recommendations

None

Learning Outcomes

The students ...

- are capable to comment on the content covered by the lecture.
- are capable of substantially quality philosophies.
- are able to apply the QM tools and methods they have learned about in the lecture to new problems from the context of the lecture.
- are able to analyze and evaluate the suitability of the methods, procedures and techniques they have learned about in the lecture for a 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:

- The term "quality"
- Total Quality Management (TQM) and Six Sigma
- Universal methods and tools
- QM during early product stages – product definition
- QM during product development and in procurement
- QM in production – manufacturing metrology
- QM in production – statistical methods
- QM in service
- Quality management systems
- Legal aspects of QM

Media

Lecture notes will be provided in ilias (<https://ilias.studium.kit.edu/>).

Literature

Lecture Notes

Remarks

None

Course: Quality Control I [2550674]**Coordinators:** K. Waldmann**Part of the modules:** Stochastic Modelling and Optimization (p. 77)[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 Section 4(2), 1 of the examination regulation. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.6 (according to Section 4(2), 3 of the examination regulation).

Conditions

None.

Learning Outcomes

The 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. 77)[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 Section 4(2), 1 of the examination regulation. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.6 (according to Section 4(2), 3 of the examination regulation).

Conditions

None.

Learning Outcomes

The 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. 132)[WI4INGCV3], Specialization in Food Process Engineering (p. 133)[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: Logistics in Value Chain Networks (p. 96)[WI4INGMB28], Introduction to Logistics (p. 88)[WI4INGMB20]

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.

Recommendations

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 knows mathematical models and methods to control the various kinds of risks.

Content

The planning and the enterprise of logistics systems are connected in large measure 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 necessarily to deal with particular these uncertain values to avoid negative effects.

That logistics systems should be efficiently operated is obvious. But their function must also be reliably. In this lecture we concern with mathematical models and methods with which most different kinds of risks can be controled. Risk analysis, durable location planning, durable transportation networks, Multi Sourcing strategies, Capacity options, infrastructure protection and flexible production planning are parts of it. Topics of the lectures are supplemented and deepened during the exercises.

Media

presentations, black board

Literature

ILIAS-System: https://ilias.rz.uni-karlsruhe.de/goto_rz-uka_crs_7817.html

Remarks

none

Course: Computer Integrated Planning of New Products [2122387]

Coordinators: R. Kläger

Part of the modules: Virtual Engineering B (p. 98)[WW4INGMB30], Virtual Engineering A (p. 97)[WW4INGMB29]

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 corresponds to the grade of the oral exam.

Conditions

Limited number of participants, for selection procedure and registration see course homepage.

Recommendations

None.

Learning Outcomes

The students got a basic understanding of relations, procedures and structure elements of standard processes in product planning and are capable of using these as guidelines for planning of new products.

They acquired knowledge of requirements and options in choosing and applying the right methods and tools for an efficient and reasonable assistance for specific use cases.

The students are familiar with elements and methods of computer aided idea and innovation management. They acquired knowledge of simultaneous assistance to the product planning process by using the technologies of rapid prototyping during development phases.

Content

The increase in creativity and the strength of innovation for the planning and development of new products has become a key factor for the competitiveness of the industry. Shorter innovation cycles, an overwhelming flood of information and an increasing demand for information and communication makes the use of computer absolutely necessary. Against this background this lecture discusses the success factors for new products, and introduces a product innovation process in conjunction with planning of new products based on the concepts of system engineering. In the following the methodological assistance to this process is being discussed by introducing innovation management, idea management, problem solving strategies, creativity and rapid prototyping for instance.

Literature

Handouts during lecture

Course: Law Aspects of Guided Transport Systems [6234903]

Coordinators: R. Schweinsberg

Part of the modules: Public Transportation Operations (p. 124)[WI4INGBGU19], Project in Public Transportation (p. 123)[WI4INGBGU18], Guided Transport Systems / Engineering (p. 125)[WI4INGBGU20], Logistics and Management of Guided Transport Systems (p. 126)[WI4INGBGU21]

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

Learning Control / Examinations

The assessment will consist of a oral exam (10 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

See German version.

Content

Judical basics, law in european and national rail transportation, federal state law in public transport

Literature

Elective literature:

Kunz (Hrsg): Eisenbahnrecht, Nomos-Verlag, Baden-Baden

Remarks

See German version.

Course: Recommender Systems [2540506]**Coordinators:** A. Geyer-Schulz**Part of the modules:** Advanced CRM (p. 32)[WI4BWLISM1], Business & Service Engineering (p. 35)[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 10) from exercise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	95
1.3	90
1.7	85
2.0	80
2.3	75
2.7	70
3.0	65
3.3	60
3.7	55
4.0	50
5.0	0

Conditions

None.

Learning Outcomes

The student

- is proficient in different statistical, data-mining, and game theory methods of computing implicit and explicit recommendations
- evaluates recommender systems and compares these with related services

Content

At first, an overview of general aspects and concepts of recommender systems and its relevance for service providers and customers is given. Next, different categories of recommender systems are discussed. This includes explicit recommendations like customer reviews as well as implicit services based on behavioral data. Furthermore, the course gives a detailed view of the current research on recommender systems at the Chair of Information Services and Electronic Markets.

Media

Folien, Aufzeichnung der Vorlesung im Internet.

Literature

Rakesh Agrawal, Tomasz Imielinski, and Arun Swami. Mining association rules between sets of items in large databases. In Sushil Jajodia Peter Buneman, editor, Proceedings of the ACM SIGMOD International Conference on Management of Data, volume 22, Washington, D.C., USA, Jun 1993. ACM, ACM Press.

Rakesh Agrawal and Ramakrishnan Srikant. Fast algorithms for mining association rules. In Proceedings of the 20th Very Large Databases Conference, Santiago, Chile, pages 487 – 499, Sep 1994.

Asim Ansari, Skander Essegaier, and Rajeev Kohli. Internet recommendation systems. Journal of Marketing Research, 37:363 – 375, Aug 2000.

Christopher Avery, Paul Resnick, and Richard Zweckhauser. The market for evaluations. American Economic Review, 89(3):564 – 584, 1999.

Ibrahim Cingil, Asuman Dogac, and Ayca Azgin. A Broader Approach to Personalization. Communications of the ACM, 43(8):136 – 141, Aug 2000.

Richard O. Duda, Peter E. Hart, and David G. Stork. Pattern Classification. Wiley-Interscience, New York, 2 edition, 2001.

Andreas Geyer-Schulz, Michael Hahsler, and Maximilian Jahn. A customer purchase incidence model applied to recommender services. In R. Kohavi et al., editor, Proceedings of the WebKDD 2001 – Mining log data across all customer touchpoints, volume 2356 of Lecture Notes in Artificial Intelligence LNAI, pages 25–47, Berlin, 2002. ACM, Springer-Verlag.

Jon M. Kleinberg. Authoritative sources in a hyperlinked environment. JACM, 46(5):604–632, sep 1999.

Joseph Konstan, Bradley Miller, David Maltz, Jonathan Herlocker, Lee Gordon, and John Riedl. Grouplens: Applying Collaborative Filtering to 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.

Remarks

As of summer term 2014 this lecture is hold in alternation with the lecture “2540533 - Personalization and Services”. The current schedule can be seen on the chair’s website (<http://www.em.uni-karlsruhe.de>).

Course: Corporate Compliance [GRC]**Coordinators:** T. Dreier, N.N.**Part of the modules:** Governance, Risk & Compliance (p. [143](#))[WI4INGRC]

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

Learning Control / Examinations**Conditions**

None.

Learning Outcomes**Content**

Course: Control of Linear Multivariable Systems [23177]

Coordinators: M. Kluwe
Part of the modules: Control Engineering II (p. 127)[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

For this module a basic knowledge in system theory and control engineering is assumed. These subjects can be found for example in the course 23155 *System Dynamics and Control Engineering*, which is recommended to have been attended beforehand.

Learning Outcomes

The Students have acquired fundamental knowledge about the description of linear multivariable systems with both time continuous and time discrete models. They are able to analyze those systems with regard to their fundamental characteristics like stability, controllability, observability and pole/zero-constellation. The students are proficient in the basic principles of control design in state space and they are able to design state observers if necessary. Furthermore they are familiar with some advanced control methods allowing special demands like decoupling or robustness in spite of given boundary conditions like continuous disturbances or restricted measurements and actuators.

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. 54)[WI4VWL4], Energy Economics and Energy Markets (p. 40)[WI4BWLIIIP4]

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 about the history of regulation and its relation to competition policies. Then it turns to the aims, the possibilities and the practice of regulation which are presented and analyzed critically. This happens from both a theoretical (microeconomic modelling) perspective as well as from a practical perspective with the help of various examples.

Literature

Literature and lecture notes are handed out during the course.

Course: Capability maturity models for software and systems engineering [2511216]

Coordinators: R. Kneuper

Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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. 106)[WI4INGMBIMT2], BioMEMS (p. 104)[WI4INGMBIMT1]

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. 133)[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:** Insurance Management II (p. 27)[WI4BWLFBV7], Insurance Management I (p. 26)[WI4BWLFBV6]

ECTS Credits	Hours per week	Term	Instruction language
4,5	3/0	Winter / Summer Term	de

Learning Control / Examinations

The assessment consists of oral presentations (incl. papers) within the lecture (according to Section 4 (2), 3 of the examination regulation) and a final oral exam (according to Section 4 (2), 2 of the examination regulation).

The overall grade consists of the assessment of the oral presentations incl. papers (50 percent) and the assessment of the oral exam (50 percent).

Conditions

None.

Learning Outcomes

See German version.

Content

See German version.

Literature**Elective literature:**

R. Löfstedt, L. Frewer (Hrsg.). The Earthscan Reader in Risk & Modern Society. London 1998.

B.-M. Drottz-Sjöberg. Current Trends in Risk Communication - Theory and Practice. Hrsg. v. Directorate for Civil Defence and Emergency Planning. Norway 2003.

Munich Re. Risikokommunikation. Was passiert, wenn was passiert? www.munichre.com

O.-P. Obermeier. Die Kunst der Risikokommunikation - Über Risiko, Kommunikation und Themenmanagement. München 1999.

Fallstudien unter www.krisennavigator.de

Course: Risk Management in Industrial Supply Networks [2581992]

Coordinators: M. Wiens
Part of the modules: Industrial Production III (p. 42)[WI4BWLIP6]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Winter term	en

Learning Control / Examinations

The assessment consists of an oral (30 minutes) or a written (60 minutes) exam (following § 4(2), 1 of the examination regulation). The exam takes place in every semester. Reexaminations are offered at every ordinary examination date.

Conditions

None.

Learning Outcomes

Students shall learn methods and tools to manage risks in complex and dynamically evolving supply chain networks. Students learn the characteristics of modern logistics and supply chain management including trends such as globalization, lean production and e-business and learn to identify and analyze the arising risks. On the basis of this overview on supply chain management, the students gain knowledge about approaches and methods of industrial risk management. These approaches will be adapted to answer the specific questions arising in supply chain management. Key aspects include the identification of major risks, which provide the basis for the development of robust networks, and the design of strategic and tactic risk prevention and mitigation measures. In this manner, students will gain knowledge in designing and steering of robust internal and external value-creating networks.

Content

- supply chain management: introduction, aims and trends
- industrial risk management
- definition und characterization of risks: sourcing and procurement, demand, production and infrastructure
- identification of risks
- risk controlling
- risk assessment and decision support tools
- risk prevention and mitigation strategies
- robust design of supply chain networks
- supplier selection
- capacity management
- business continuity management

Media

Media will be provided on the e-learning platform.

Literature

will be announced in the course

Remarks

This lecture will be held for the first time again in winter term 2014/15.

Course: Roadmapping [2545016]

Coordinators: D. Koch
Part of the modules: Entrepreneurship (EnTechnon) (p. 46)[WI4BWLENT1], Innovation Management (p. 47)[WI4BWLENT2]

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

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Recommendations

Prior attendance of the course *Innovation Management* [2545015] is recommended.

Learning Outcomes

The "Roadmapping" seminar aims to discuss and develop different thematic aspects linked with the roadmapping method. Seminar topics are assigned at the beginning of the course. These should be presented and discussed at the end. The first seminars give impulses on roadmapping which should then be discussed to establish an understanding of the process and to ensure the targeted preparation of the seminar topics.

Content

Roadmapping is a method used to support innovation decisions in the early phase of innovation management. The roadmapping process addresses the procedure of constructing roadmaps which can then be assessed. Roadmapping provides structured and graphical visualizations of preferably future-oriented topics which have innovation potentials. The benefits of the roadmapping method lie in the structured bundling of both technology- and market-driven individual topics and the joint setting of priorities and processes to achieve predetermined corporate targets. As a rule, roadmaps represent a consensus reached by the people involved in their compilation. For this reason, roadmaps are suited to the designation and initial prioritization of emerging technologies and corresponding development projects.

Media

Slides.

Course: Sales Strategy and Control [2572180]

Coordinators: M. Artz
Part of the modules: Sales Management (p. 44)[WI4BWL MAR6]

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

Learning Control / Examinations

Conditions
None.

Learning Outcomes

After successfully attending the course, students will be able to design and run an effective salesforce from a theoretical and practical perspective. They will be aware of the several different opportunities how salesforce management can be designed and what the specific trade-offs between different opportunities are, given the underlying sales strategy of the firm. In this regard, the course complements the lecture "Vertriebsmanagement und Handelsmarketing".

Content

This course covers the management of a salesforce from a strategic perspective. The following aspects shown in the table of contents below are treated in detail. Every aspect is discussed from a theoretical and a practitioner's perspective in class. Given its importance in practice, a specific weight is given to align salespeople with firm's strategic sales targets and performance measurement and compensation systems.

Table of Contents:

1. Basics of Sales Strategy
2. Implications of sales strategy for sales force management
3. The operative personal selling process
4. Organization of the salesforce
5. Selecting, hiring, and promoting salespeople
6. Developing, delivering, and reinforcing a sales training
- 7: Motivating a sales force
- 8: Sales force performance measurement & compensation
- 9: Sales force quotas & expenses
- 10: Leadership of a sales force
- 11: Analysis of sales volume, marketing cost and profitability
- 12: Ethical and Legal Responsibilities of Sales Managers

Course: Scale up in Biology and Engineering [22417]**Coordinators:** Hausmann**Part of the modules:** Specialization in Food Process Engineering (p. 133)[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: Key qualifications ZAK [SQ ZAK1]**Coordinators:** ZAK**Part of the modules:** Seminar Module (p. 145)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
1-3	k.A.	Winter / Summer Term	de

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Learning Outcomes**Content**

Course: Welding Technology I/II [21565/21570]

Coordinators: Spies

Part of the modules: Specific Topics in Materials Science (p. 101)[W14INGMB33]

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: Working and Studying Effectively [SQ HoC1]**Coordinators:** HoC**Part of the modules:** Seminar Module (p. 145)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
2-4	meist 2	Winter / Summer Term	de

Learning Control / Examinations

See German version.

Conditions

None.

Recommendations

None.

Learning Outcomes

See German version.

Content

See German version.

Course: Oral Presentation and Communication Skills [SQ HoC2]**Coordinators:** HoC**Part of the modules:** Seminar Module (p. 145)[WW4SEM]

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

Learning Control / Examinations

See German version.

Conditions

None.

Recommendations

None.

Learning Outcomes

See German version.

Content

See German version.

Course: Scientific Writing [SQ HoC3]**Coordinators:** HoC**Part of the modules:** Seminar Module (p. 145)[WW4SEM]

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

Learning Control / Examinations

See German version.

Conditions

None.

Recommendations

None.

Learning Outcomes

See German version.

Content

See German version.

Course: Teaching and Learning Foreign Languages [SQ HoC4]**Coordinators:** HoC**Part of the modules:** Seminar Module (p. 145)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
2-3	k.A.	Winter / Summer Term	de

Learning Control / Examinations

See German version.

Conditions

None.

Recommendations

None.

Learning Outcomes

See German version.

Content

See German version.

Course: Qualitative Methods [SQ HoC5]**Coordinators:** HoC**Part of the modules:** Seminar Module (p. 145)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
2-3	k.A.	Winter / Summer Term	de

Learning Control / Examinations

See German version.

Conditions

None.

Recommendations

None.

Learning Outcomes

See German version.

Content

See German version.

Course: Law and Economics [SQ HoC6]**Coordinators:** HoC**Part of the modules:** Seminar Module (p. 145)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
2-3	k.A.	Winter / Summer Term	de

Learning Control / Examinations

See German version.

Conditions

None.

Recommendations

None.

Learning Outcomes

See German version.

Content

See German version.

Course: Competencies as a Research Topic [SQ HoC7]**Coordinators:** HoC**Part of the modules:** Seminar Module (p. 145)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
2-3	k.A.	Winter / Summer Term	de

Learning Control / Examinations

See German version.

Conditions

None.

Recommendations

None.

Learning Outcomes

See German version.

Content

See German version.

Course: Transferring Knowledge in School, University and at the Workplace [SQ HoC 8]**Coordinators:** HoC**Part of the modules:** Seminar Module (p. 145)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
2-3	k.A.	Winter / Summer Term	de

Learning Control / Examinations

See German version.

Conditions

None.

Recommendations

None.

Learning Outcomes

See German version.

Content

See German version.

Course: Professional Orientation and Job Specific Competencies [SQ HoC9]

Coordinators: HoC

Part of the modules: Seminar Module (p. 145)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
2-3	k.A.	Winter / Summer Term	de

Learning Control / Examinations

See German version.

Conditions

None.

Recommendations

None.

Learning Outcomes

See German version.

Content

See German version.

Course: Semantic Web Technologies [2511310]

Coordinators: R. Studer, A. Harth

Part of the modules: Informatics (p. 68)[WI4INFO1], Emphasis in Informatics (p. 70)[WI4INFO2], Electives in Informatics (p. 72)[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.

The exam takes place every semester and can be repeated at every regular examination date.

Conditions

Lectures on Informatics of the Bachelor on Information Management (Semester 1-4) or equivalent are required.

Recommendations

None.

Learning Outcomes

The student

- understands the motivation and foundational ideas behind Semantic Web and Linked Data technologies, and is able to analyse and realise systems
- demonstrates basic competency in the areas of data and system integration on the web
- masters advanced knowledge representation scenarios involving ontologies

Content

"Semantic Web" denotes an extension of the World Wide Web with meta data and applications to make the meaning (semantics) of data on the web usable in intelligent systems, e.g. in e-commerce and internet portals.

Central concepts are the representation and processing of knowledge in form of ontologies and the access via Linked Data. This lecture provides the foundations of knowledge representation and processing for the corresponding technologies and presents example applications.

The following topics are covered:

- Resource Description Framework (RDF) and RDF Schema (RDFS)
- Web Architecture and Linked Data
- Web Ontology Language (OWL)
- Rule languages
- Applications

Media

Lecture notes.

Literature

See German version.

Remarks

The lecture supersedes the existing SWT-1 and SWT-2 lectures beginning from SS 2014. The exams SWT-1 and SWT-2 will be offered latest until winter term 2014/15.

Course: Seminar in Enterprise Information Systems [SemAIFB1]

Coordinators: R. Studer, A. Oberweis, T. Wolf, R. Kneuper

Part of the modules: Seminar Module (p. 145)[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 Efficient Algorithms [SemAIFB2]

Coordinators: H. Schmeck
Part of the modules: Seminar Module (p. 145)[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, D. Keles, R. McKenna, V. Bertsch**Part of the modules:** Seminar Module (p. 145)[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. 145)[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. 145)[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. 145)[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

See module.

Recommendations

See German version.

Learning Outcomes

Students are able to work on scientific subjects under guidance, which includes:

- the self driven outline of the inquired subject,
- investigating and arguing in the context of logistics and material handling,
- the presentation of the results in front of professionals and
- the written work.

Thereby presentation technique is used and enlarged.

Content

The topics of the seminar will be published under <http://www.ifl.kit.edu/seminare.php> one semester before. To participate it is necessary to sign in the semester before.

Course: Entrepreneurship Seminar [SemTuE1]**Coordinators:** O. Terzidis**Part of the modules:** Seminar Module (p. 145)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
3			

Learning Control / Examinations

See German version.

Conditions

None.

Learning Outcomes**Content**

Course: Seminar Innovation management [SemTuE2]

Coordinators: M. Weissenberger-Eibl
Part of the modules: Seminar Module (p. 145)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
3			

Learning Control / Examinations

See German version.

Conditions

None.

Learning Outcomes**Content**

Course: Seminar in Behavioral and Experimental Economics [n.n.]

Coordinators: P. Reiss

Part of the modules: Seminar Module (p. 145)[WW4SEM]

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

Learning Control / Examinations

Students write (according to Section 4 (2), 3 SPO) a seminar paper on an assigned topic (15-20 pages), present it in class and discuss results during seminar sessions. These three elements are graded individually. The seminar grade is the weighted average of these individual grades where the weighting is announced on the course syllabus.

Conditions

None.

Recommendations

Basic knowledge of mathematics, statistics, microeconomics, and game theory is assumed.

Learning Outcomes

Students develop basic academic writing skills by writing a seminar paper that is presented and discussed in class. For fostering academic writing skills, the grading of master students pays particular attention to a critical and deep coverage of the assigned topic.

Content

Seminar topics are announced online at <http://io.econ.kit.edu> (-> Studium und Forschung).

Media

Slides.

Literature

A selection of published papers is compulsory reading for the course.

Remarks

Language: german or english.

Course: Seminar in Finance [2530280]

Coordinators: M. Uhrig-Homburg, M. Ruckes
Part of the modules: Seminar Module (p. 145)[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 Financial Economics and Risk Management [n.n.]**Coordinators:** M. Ulrich**Part of the modules:** Seminar Module (p. 145)[WW4SEM]

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

Learning Control / Examinations

See German version.

Conditions

None.

Learning Outcomes**Content**

Course: Seminar in International Economy [SemiWW2]**Coordinators:** J. Kowalski**Part of the modules:** Seminar Module (p. 145)[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: Seminar in Marketing and Sales (Master) [SemETU2]

Coordinators: M. Klarmann
Part of the modules: Seminar Module (p. 145)[WW4SEM]

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

Learning Control / Examinations

Grading system: written seminar paper (weighting 60%), presentation of the seminar paper (weighting 30%), oral participation (weighting 10%).

Conditions

None.

Learning Outcomes

Content

Remarks

Students interested in master thesis positions at the chair of marketing should participate in the marketing seminar. For further information please contact Marketing & Sales Research Group (marketing.iism.kit.edu).

Course: Seminar in Modelling, Measuring and Managing of Extreme Risks [2530356]

Coordinators: U. Werner, S. Hochrainer

Part of the modules: Insurance Management I (p. 26)[WI4BWLFBV6], Insurance Management II (p. 27)[WI4BWLFBV7]

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

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Recommendations

None.

Learning Outcomes

See German version.

Content

- Risk preferences under uncertainty, risk management strategies using utility functions, risk aversion, premium calculations, insurance principle, exceptions, Arrow Lind theorem. Probability and statistics introduction, distributions, Lebesgue integration.
- Introduction to Extreme value theory, Catastrophe models: Introduction to extreme value theory, asymptotic models, extremal types theorem, Generalized extreme value distributions, max-stability, domain of attraction inference for the GEV distribution, model generalization: order statistics. Catastrophe model approaches, simulation of extremes.
- Threshold models, generalized pareto distribution, threshold selection, parameter estimation, point process characterization, estimation under maximum domain: Pickands's estimator, Hill's estimator, Deckers-Einmahl-de Haan estimator.
- Catastrophe model approaches, simulation of earthquakes, hurricanes, and floods, vulnerability functions, loss estimation. Indirect vs direct effects.
- Introduction to financial risk management against rare events. Basic risk measures: VaR, CVar, CEL and current approaches. Risk management measures against extreme risk for different risk bearers: Insurance principle, loading factors, credits, reserve accumulation, risk aversion.
- Risk preferences in decision making processes. Utility theory, certainty equivalent, Arrow Lind proof for risk neutrality, exceptions in risk neutrality assumptions.
- The Fiscal Risk Matrix, Fiscal Hedge Matrix, Dealing with Risk in Fiscal Analysis and Fiscal Management (macroeconomic context, specific fiscal risks, institutional framework). Reducing Government Risk Exposure (Risk mitigation with private sector, Risk transfer and risk-sharing mechanisms, Managing residual risk).
- Approaches to Managing Fiscal Risk (Reporting on financial statements, Cost-based budgeting, Rules for talking fiscal risk, Market-type arrangements). Case: Analyzing Government Fiscal Risk Exposure in China (Krumm/Wong), The Fiscal Risk of Floods: Lessons of Argentina (Alcira Kreimer).
- Case study presentations: Household level index based insurance systems (India, Ethiopia, Sri Lanka, China), insurance back-up systems coupled with public private partnerships (France, US), Reinsurance approaches (Munich Re, Swiss Re, Allianz).
- Climate Change topics: IPCC report, global and climate change.

Literature

- Woo G (2011) Calculating Catastrophe. Imperial College Press, London, U.K.
- Grossi P and Kunreuther H (eds.) (2005) Catastrophe Modeling: A New Approach to Managing Risk. New York, Springer.
- Embrechts P, Klüppelberg C, Mikosch, T (2003) Modelling Extremal Events for Insurance and Finance. Springer, New York (corr. 4th printing, 1st ed. 1997).
- Wolke, T. (2008). Risikomanagement. Oldenbourg, Muenchen.
- Klugman, A.S, Panjer, H.H, and Willmot, G.E. (2008) Loss Models: From Data to Decisions. 3rd edition. Wiley, New York.
- Slavadori G, Michele CD, Kottegoda NT and Rosso R (2007) Extremes in Nature: An Approach Using Copulas. Springer, New York.
- Amendola et al. (2013) (eds.): *Integrated Catastrophe Risk Modeling. Supporting Policy Processes. Advances in Natural and Technological Hazards Research*, New York, Springer.
- Hochrainer, S. (2006). Macroeconomic Risk Management against Natural Disasters. *German University Press (DUV)*, Wiesbaden, Germany.

Course: [SemiIWW3]**Coordinators:** I. Ott**Part of the modules:** Seminar Module (p. 145)[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)
- Technology Assessment and strategic Patent Analyses (WS 2011/2012)
- Innovation Potentials and Spatial Dimension in Cultural and Creative Industries (WS 2011/2012)
- Quantitative Methods in Economics with Mathematica (SS 2012)

Course: Seminar in Industrial Production [SemIIP2]

Coordinators: F. Schultmann, M. Fröhling
Part of the modules: Seminar Module (p. 145)[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 [SemiIW]

Coordinators: C. Weinhardt
Part of the modules: Seminar Module (p. 145)[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, a presentation of the results and the contribution to the discussion (according to §4(2), 3 of the examination regulation). The final grade is based on the evaluation of each component (seminar paper, oral presentation, and active participation).

Conditions

See corresponding module information.

Recommendations

At least one module offered by the institute should have been chosen before attending this seminar.

Learning Outcomes

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
- E-learning platform ILIAS
- Software Tools, if necessary

Literature

The student will receive the necessary literature for his research topic.

Remarks

- Students from Bachelor and Master Course can visit the seminar. The research topic as well as the evaluation of the work and the presentation will have a different focus between Bachelor and Master Course.
- All the seminars offered at the chair of Prof. Dr. Weinhardt can be chosen. The current topics of the seminars are available at the following homepage: www.iism.kit.edu/im/lehre .

Course: Seminar Complexity Management [SemAIFB3]

Coordinators: D. Seese

Part of the modules: Seminar Module (p. 145)[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 Management Accounting [2579904]

Coordinators: M. Wouters
Part of the modules: Seminar Module (p. 145)[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 "Betriebswirtschaftslehre: Finanzwirtschaft und Rechnungswesen" (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 Mobility Services [2595475]

Coordinators: W. Michalk, B. Chlond, U. Leyn, H. Fromm

Part of the modules: Fundamentals of Transportation (p. 119)[WI4INGBGU15], Seminar Module (p. 145)[WW4SEM], Transportation Modelling and Traffic Management (p. 120)[WI4INGBGU16]

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

Learning Control / Examinations

A final written exam will be conducted.

Conditions

See module description.

Learning Outcomes

The student should be able to do a literature review based on a predefined topic in the context of mobility services. The approach comprises the identification of relevant literature according to the topic and an analysis as well as an evaluation of the methods presented in the literature. The student learns to present his results in a paper and in front of an audience on an academic level.

Content

The seminar gives an insight in different aspects of services in the context of mobility. Changes in business models in the mobility sector as well as the adaptation of new demand patterns for mobility play a crucial role in this context. These shifts are accompanied by a technological evolution including new mobile devices that enable dynamic and flexible access to information. In the seminar, the student should learn to apply the research methods to predefined research questions; in this context, e.g. literature reviews, structured interviews, and the comparison of business models are employed.

Course: Seminar on Morals and Social Behavior [n.n.]

Coordinators: N. Szech

Part of the modules: Seminar Module (p. 145)[WW4SEM]

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

Learning Control / Examinations

Students write a seminar paper on an assigned topic (10 – 15 pages), present it in class and discuss results during seminar sessions. These three elements are graded individually. The seminar grade is the weighted average of these individual grades where the weighting is announced on the course syllabus.

Conditions

None.

Recommendations

None.

Learning Outcomes

The student

- develops an own idea for an economic experiment in this research direction.

Content

Seminar topics are announced online at <http://polit.econ.kit.edu>.

Literature

A selection of published papers and books.

Course: Seminar Service Science, Management & Engineering [2595470]

Coordinators: C. Weinhardt, R. Studer, S. Nickel, H. Fromm, W. Fichtner

Part of the modules: Seminar Module (p. 145)[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* [2595466] 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: 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. 145)[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. 145)[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 in Transportation [6232903]

Coordinators: P. Vortisch, B. Chlond

Part of the modules: Fundamentals of Transportation (p. 119)[WI4INGBGU15], Transportation Modelling and Traffic Management (p. 120)[WI4INGBGU16]

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

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

See module description.

Learning Outcomes

Content

Course: Seminar Knowledge Management [SemAIFB4]

Coordinators: R. Studer
Part of the modules: Seminar Module (p. 145)[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. 145)[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

Course: Seminar in strategic and behavioral marketing [2572197]

Coordinators: B. Neibecker
Part of the modules: Seminar Module (p. 145)[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. 145)[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 35-40 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 30 %, presentation 60%, handout 10%).

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: N. N.

Part of the modules: Seminar Module (p. 145)[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/).

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. 145)[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. 145)[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.

Remarks

for details see German version.

Course: Seminar on Network Economics [2560263]

Coordinators: K. Mitusch

Part of the modules: Seminar Module (p. 145)[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: Seminar Transport Economics [2561209]**Coordinators:****Part of the modules:** Seminar Module (p. 145)[WW4SEM]

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

Learning Control / Examinations**Conditions**

None.

Learning Outcomes**Content**

Course: Seminar: Legal Studies [RECHT]**Coordinators:** Inst. ZAR**Part of the modules:** Seminar Module (p. 145)[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. 128)[WI4INGETIT3], Sensor Technology II (p. 129)[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 Industrial Engineering and Management. 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. 145)[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, G. Lanza, J. Fleischer
Part of the modules: Seminar Module (p. 145)[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

The students are able to

- find appropriate data sources, evaluate and extract information.
- apply a predetermined citation style correctly.
- summarize information and results shortly and concisely in a written form.
- to design visual preparations of scientific problems or results and to make an oral presentation.
- to work in task-oriented cooperation as a team.

Content

Students independently deal with production engineering related problems from the fields of manufacturing engineering, machine tools and handling technology and organisation, planning and logistics with tutorial assistance. The results are aggregated in the form of a seminar paper and are then illustrated in the form of a presentation.

Media

Lecture notes of the Institute of Production Science.

Course: Practical Seminar Knowledge Discovery [25810]

Coordinators: R. Studer

Part of the modules: Informatics (p. 68)[WI4INFO1], Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2]

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, M. Kohler, H. Fromm, N. Feldmann

Part of the modules: Business & Service Engineering (p. 35)[WI4BWLISM4], Seminar Module (p. 145)[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. 128)[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: W. Wersing

Part of the modules: Sensor Technology I (p. 128)[WI4INGETIT3], Sensor Technology II (p. 129)[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

None.

Recommendations

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: Service Management (p. 37)[WI4BWLISM6], Service Analytics (p. 48)[WI4BWLKSR1], Advanced CRM (p. 32)[WI4BWLISM1]

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

Learning Control / Examinations

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulation). By successful completion of the exercises (according to §4(2), 3 of the examination regulation) a bonus can be obtained. If the grade of the written exam is at least 4.0 and at most 1.3, the bonus will improve it by one grade level (i.e. by 0.3 or 0.4). The bonus only applies to the first and second exam of the semester in which it was obtained.

Conditions

None.

Recommendations

The lecture is 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

- PowerPoint
- E-learning platform ILIAS

Literature

- Business Forecasting, Wilson, J. H., Keating, B., McGraw-Hill, 2002
- Multivariate Data Analysis, Hair, J. F., Black, B., Babin, B., Anderson, R. E., 2008
- Analytics at Work, Davenport, T. H., Harris, J. G., Morion, R., 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 Design Thinking [2595600]

Coordinators: C. Weinhardt

Part of the modules: Service Design Thinking (p. 49)[WI4BWLKSR2]

ECTS Credits	Hours per week	Term	Instruction language
9	6	Winter / Summer Term	en

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

The course is compulsory and must be examined.

Learning Outcomes

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

Content

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

Remarks

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

Course: Service Innovation [2595468]**Coordinators:** G. Satzger, M. Kohler, N. Feldmann**Part of the modules:** Service Management (p. 37)[WI4BWLISM6], Business & Service Engineering (p. 35)[WI4BWLISM4]

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*, Vo. 17, No. 3, pp. 432-455

Elective literature:

- Benkler, Yochai (2006) *The Wealth of Networks: How Social Production Transforms Markets and Freedom*. Yale University Press. (Online: <http://www.benkler.org>)
- Christensen, Clayton M. (2003) *The Innovator's Dilemma*, Harper Collins.
- Kanerva, M.; Hollanders, H. & Arundel, A. (2006) *TrendChart Report: Can we Measure and Compare Innovation in Services?*
- von Hippel, Erich (2005) *Democratizing Innovation*. The MIT Press, Cambridge, MA. (Online: <http://web.mit.edu/evhippel/www/books/>)
- 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 Oriented Computing 1 [2511500]

Coordinators: S. Tai

Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[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 following §4, Abs. 2, 1 of the examination regulation or of an oral exam (20 min) following §4, Abs. 2, 2 of the examination regulation.

Conditions

None.

Recommendations

It is recommended to attend the course *Service-oriented Computing 1* [2511500] beforehand.

Learning Outcomes

Students will extend their knowledge and proficiency in the area of modern service-oriented technologies. Thereby, they acquire the capability to understand, apply and assess concepts and methods that are of innovative and scientific nature.

Content

Building upon basic Web service technologies the lecture introduces select topics of advanced service computing and service engineering. In particular, focus will be placed on new Web-based architectures and applications leveraging Web 2.0, Cloud Computing, Semantic Web and other emerging technologies.

Literature

Literature will be announced in the lecture.

Course: Safety Management in Highway Engineering [6233906]**Coordinators:** M. Zimmermann**Part of the modules:** Safety, Computing and Law in Highway Engineering (p. 116)[WI4INGBGU9]

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****Remarks**For further information, see <http://www.ise.uni-karlsruhe.de/16.php>

Course: Safety engineering [2117061]**Coordinators:** H. Kany**Part of the modules:** Technical Logistics (p. 95)[WI4INGMB27], Introduction to Logistics (p. 88)[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.

Recommendations

None.

Learning Outcomes

Students are able to:

- Name and describe relevant safety concepts of safety engineering,
- Discuss basics of health at work and labour protection in Germany,
- Evaluate the basics for the safe methods of design of machinery with the national and european safety regulations and
- Realize these objectives by using examples in the field of storage and material handling systems.

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.

Media

presentations

Literature

Defren/Wickert: Sicherheit für den Maschinen- und Anlagenbau, Druckerei und Verlag: H. von Ameln, Ratingen, ISBN: 3-926069-06-6

Remarks

none

Course: Simulation of Coupled Systems [2114095]

Coordinators: M. Geimer

Part of the modules: Vehicle Development (p. 82)[WI4INGMB14], Mobile Machines (p. 83)[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

None.

Recommendations

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

After completion of the course, students are able to:

- building a coupled simulation
- parameterize models
- Perform simulations
- do Troubleshooting
- check results for plausibility

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 result 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. 77)[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 Section 4(2), 1 of the examination regulation. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.6 (according to Section 4(2), 3 of the examination regulation).

Conditions

None.

Learning Outcomes

The 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 (2012), 2. edition

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. 77)[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 Section 4(2), 1 of the examination regulation. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.6 (according to Section 4(2), 3 of the examination regulation).

Conditions

Foundations in the field of *Simulation I*[2550662] are desired.

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 oftentimes 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 (2012), 2. edition

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:** C. Baumgarten**Part of the modules:** Combustion Engines II (p. 85)[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: Traffic Flow Simulation [6232804]**Coordinators:** P. Vortisch**Part of the modules:** Transportation Modelling and Traffic Management (p. [120](#))[WI4INGBGU16]

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

Learning Control / Examinations

The assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation.

Conditions

See module description.

Learning Outcomes**Content**

Course: Social Choice Theory [n.n.]**Coordinators:** C. Puppe**Part of the modules:** Collective Decision Making (p. 65)[WI4VWL16], Microeconomic Theory (p. 64)[WI4VWL15]

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

Learning Control / Examinations

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None.

Recommendations

None.

Learning Outcomes**Content**

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. 74)[WI4OR5]

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

Learning Control / Examinations

The assessment is a 120 minutes examination, including a written and a practical part (according to §4(2), 1 of the examination regulation).

The examination is held in the term of the software laboratory and the following term.

Conditions

Successful completion of the course *Software Laboratory: OR-Models I* [2550490].

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

Learning Outcomes

The 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 ILOG CPLEX Optimization Studio and the corresponding modeling language OPL. In addition, issues of nonlinear optimization, e.g. quadratic optimization, are addressed. As an important part of the software laboratory, students get the possibility to model combinatorial and nonlinear problems and implement solution approaches in the software system.

The software laboratory also introduces some of the most frequently used modelling and programming languages that are used in practice to solve optimization problems.

Remarks

Due to capacity restrictions, registration before course start is required. For further information see the webpage of the course. The 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: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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. 32)[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 10) from exercise work will be added. The grades of this lecture are assigned following the table below:

Grade	Minimum points
1.0	95
1.3	90
1.7	85
2.0	80
2.3	75
2.7	70
3.0	65
3.3	60
3.7	55
4.0	50
5.0	0

Conditions

None.

Learning Outcomes

The 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 can 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 viral 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. Internet structure: For information services, such as e.g. search engines, the identification of relevant nodes and clusters is a 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, Chichester, 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 [2561260 / 2561261]

Coordinators: I. Ott

Part of the modules: Growth and Agglomeration (p. 61)[WI4VWL12], Agglomeration and Innovation (p. 62)[WI4VWL13], Transport infrastructure policy and regional development (p. 60)[WI4VWL11]

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

Learning Control / Examinations

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

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. The attendance of the course Introduction to economic policy [2560280] is recommended.

Learning Outcomes

The student

- analyses how spatial distribution of economic activity is determined
- uses quantitative methods within the context of economic models
- has basic knowledge of formal-analytic methods
- understands the link between economic theory and its empirical applications
- understands to what extent concentration processes result from agglomeration and dispersion forces
- is able to determine theory based policy recommendations

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

Media

Slides

Exercises

Internet

Literature

Steven Brakman, Harry Garretsen, Charles van Marrewijk (2009), The New Introduction to Geographical Economics

Further literature recommendations will be announced in the course of the lecture.

Course: Special Topics in Management Accounting [2579905]

Coordinators: M. Wouters, S. Morales, M. Kirchberger

Part of the modules: Seminar Module (p. 145)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
3	2		en

Learning Control / Examinations

The final grade of the course is the grade awarded to the paper.

Conditions

The LV "Betriebswirtschaftslehre: Finanzwirtschaft und Rechnungswesen" (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. Topics are selectively prediscibed. 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: Special Topics in Information Engineering & Management [2540498]

Coordinators: C. Weinhardt

Part of the modules: Information Engineering (p. 38)[WI4BWLISM7], Business & Service Engineering (p. 35)[WI4BWLISM4], Communications & Markets (p. 36)[WI4BWLISM5], Service Analytics (p. 48)[WI4BWLKSR1]

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 bachelor, 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 an interdisciplinary examination. Experiments, case studies or software development can be part of the practical work that offers the students an opportunity to get a deeper insight into the field of Information Engineering and Management. The course also encompasses a documentation of the implemented work.

Media

- PowerPoint
- E-learning platform ILIAS
- Software tools for development, if needed

Literature

The basic literature will be made available to the student according to the 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

The Special Topics Information Engineering and Management is equivalent to the practical seminar, as it was only offered for the major in "Information Management and Engineering" so far. With this course students majoring in "Industrial Engineering and Management" and "Economics Engineering" also have the chance of getting practical experience and enhance their scientific capabilities.

The Special Topics Information Engineering and 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: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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

Learning Control / Examinations

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

Conditions

None.

Learning Outcomes

Students 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: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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

Learning Control / Examinations

The assessment consists of assignments or of a bonus exam (wrt §4 (2), 3 SPO), and a written exam (60 min.) in the week after the end of the lecturing periodwrt (§4 (2), 1 SPO). The exam will be offered in every semester and can be repeated on regular examination dates.

If the mark obtained in the written exam is in between 1.3 and 4.0, a successful completion of the assignments or the bonus exam will improve the mark by one level (i.e. by 0.3 or 0.4).

Conditions

None.

Learning Outcomes

The student will learn how to use methods and concepts of efficient algorithms and how to demonstrate adequate innovative capabilities with respect to the used methods.

This course emphasizes the teaching of advanced concepts in relation to their applicability in the real world. Based on a fundamental understanding of the covered concepts and methods, students should know how to select appropriate concepts and methods for problem settings in their professional life, and, if necessary, to extend and apply them in an adequate form. The students should be enabled to find adequate arguments for justifying their chosen problem solutions.

Content

This course emphasizes the new topics in the area of algorithms, data structures, and computer infrastructures. The exact topics can vary according to the audiences and the time it is held.

Literature

Elective literature:

Will be announced in the lecture.

Remarks

This course can be particularly used for recognising the external courses with the topics in the area of algorithms, data-structures and computer infrastructures but are not associated in other courses in this subject area.

Course: Special Topics of Complexity Management [KompMansp]

Coordinators: D. Seese

Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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

Learning Control / Examinations

Assesment is provided by a written exam of 60 minutes or an oral exam during the first few weeks after the lecturing period (acc. to §4(2), 1 or 2 SPO). The exam is offered each semester and may be repeated at the regular examination day.

Conditions

The lecture *Angewandte Informatik I - Modellierung* [2511030] is a prerequisite.

Learning Outcomes

The lecture serves as placeholder for course achievements abroad.

The students acquire the skills, methods and tools in one specialized topic of “knowledge management” to demonstrate their mastery and innovativeness.

The lecture aims at providing principles and methods in the context of the practical application of KM. On the basis of a fundamental understanding of concepts, methods, and tools, students will be able to work on advanced problems. The students will be able to find and argue for solutions of KM problems.

Content

The lecture serves as placeholder for course achievements abroad.

The lecture deals with special topics in the area of knowledge management (incl. Knowledge Discovery and Semantic Web).

The lecture deepens one of the following topics:

- Dynamic and Interoperable Systems in Knowledge Management
- Personal and Process-oriented Knowledge Management
- Formal Concept Analysis
- Semantic Search and Text Mining
- Combination of Social Software and Semantic Web

Literature

Elective literature:

Depends on the actual content.

Course: Special Topics in Optimization I [2550128]

Coordinators: O. Stein

Part of the modules: Mathematical Programming (p. 76)[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.

Conditions

None.

Recommendations

It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Learning Outcomes

The student knows and understands 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).

Course: Special Topics in Optimization II [2550126]

Coordinators: O. Stein

Part of the modules: Mathematical Programming (p. 76)[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.

Conditions

None.

Recommendations

It is strongly recommended to visit at least one lecture from the Bachelor program of this chair before attending this course.

Learning Outcomes

The student knows and understands 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).

Course: Special Sociology [spezSoz]

Coordinators: G. Nollmann, Pfadenhauer, Haupt, Grenz, Eisewicht, Kunz, Dukat, Albrecht, Enderle

Part of the modules: Sociology (p. [144](#))[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: Track Guided Transport Systems - Technical Design and Components [6234701]**Coordinators:** E. Hohnecker**Part of the modules:** Logistics and Management of Guided Transport Systems (p. 126)[WI4INGBGU21]

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

Learning Control / Examinations

See German version.

Conditions

See module description.

Learning Outcomes

See German Version.

Content

Law and Organisation of track guided transport systems, basics of driving dynamics, dimensioning and construction of railway tracks, basics of railway facilities, basics of signalling

Literature

Zilch, Diederichs, Katzenbach, Beckmann (Hrsg): Handbuch für Bauingenieure, Springer-Verlag 2012

Course: Standard Valuation in Public Transport. Using an Example [6234904]

Coordinators: E. Hohnacker

Part of the modules: Project in Public Transportation (p. 123)[WI4INGBGU18]

ECTS Credits	Hours per week	Term	Instruction language
1,5	0/1	Winter term	de

Learning Control / Examinations

The assessment of the lecture "*Standard Valuation*" in public transport using an example [6234904] consists of a non-exam assessment (an oral presentation following §4(2), 3 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.

The lecture is obligatory in the module *Project in Public Transportation*.

Recommendations

See module description.

Learning Outcomes

See German version.

Content

practise: urban traffic project: economic evaluation

Remarks

See German version.

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. 74)[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 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: Statistical Methods in Financial Risk Management [2521353]

Coordinators: A. Nazemi

Part of the modules: Statistical Methods in Risk Management (p. 79)[W14STAT2]

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

Learning Control / Examinations

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

Conditions

None.

Learning Outcomes

Introduction of statistical methods, topics commonly covered by courses on advanced statistics and econometrics supplemented by the latest scientific results in this area

Content

Part 1: Financial Risk Management: Risk Indicators at Instrumental Level; (Single Fixed Flow, Fixed Rate Bond, FRA, Interest Rate Futures, Interest Rate Swaps, FX Spot, FX Forward, Plain Vanilla Options), Credit Risk, Risk Indicators at the Portfolio Level (Pricing Environment, Interest Rate Factors, FX Factors), Value-at-Risk (VAR) and Asset-Liability Management, Risk Metrics - Market Risk in a Single Position, Measures of Market Risk: (Linear and Non-linear Positions), Market Risk Limits, Calibrating Valuation and Risk Models Performance Evaluation, Probability Distributions and Statistical Assumptions Forecasting Volatilities and Correlations (Basic Design, Ex-post Estimation, Ex-ante Estimation - Forecasting, Defining the Optimal Decay Factor), Assessing Performance (Univariate and Multivariate Tail Probabilities), Mathematics of Structures Monte Carlo (Generating Statistics, Properties of the Correlation Matrix), Mapping Algorithms (Fixed Income, Foreign Exchange, Commodities, Options). Models for Credit Risk. Introduction to Operational Risk

Part 2: Optimal portfolio management: portfolio construction, long/short investing, transaction costs and turnover, performance analysis, asset allocation, benchmark timing. Integrating the equity portfolio management process, active versus passive portfolio management, tracking error (backward-looking versus forward looking tracking error, the impact of portfolio size, benchmark volatility and portfolio betas on tracking error), equity style management (types of equity styles, style classification system), passive strategies (constructing an index portfolio, index tracking and cointegration), active investing (top-down and bottom-up approaches to active investing, fundamental law of active management, strategies based on technical analysis, technical analysis and statistical pattern recognition, market-neutral strategies and statistical arbitrage), Application of Multifactor Risk Models (Risk Decomposition, Portfolio construction and Risk Control, Assessing the exposure of a portfolio, Risk control against a stock-market index, Tilting a portfolio).

Media

transparencies, exercises.

Literature

- Fat-Tailed and Skewed Asset Return Distributions: Implications for Risk Management, Portfolio selection, and Option Pricing, Rachev, S., Menn C. and Fabozzi F. , John Wiley, Finance, 2005
- Financial Optimization, by Stavros A. Zenios, 1993, Cambridge University Press.
- The Mathematics of Financial Modeling and Investment Management, by Sergio Focardi and Frank Fabozzi, 2004, Wiley

Remarks

URL: <http://statistik.econ.kit.edu/>

The course Statistical Methods in Financial Risk Management [2521353] will not be offered any more from winter term 2014/2015 on. The examination will be offered latest until winter term 2013/2014.

Course: Statistics and Econometrics in Business and Economics [2521325/2521326]**Coordinators:** W. Heller**Part of the modules:** Statistical Methods in Risk Management (p. 79)[W14STAT2]

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

Learning Control / Examinations**Conditions**

Basic knowledge in statistics is required.

Learning Outcomes

statistically accurate use of financial market data, particularly time series analysis
 Evaluation of various time series models and their applicability

Content

In Part 1 we will provide a thorough description of the quantitative part of investment theory paying attention to the mathematical, probabilistic and statistical methods now widely used in financial practice.

In Part 2 we shall study the methods of construction, identification and verification of the time-series models, which are among most powerful instruments of the financial econometrics. The emphasis will be on the financial and economic indicators forecasting the financial time-series.

Media

transparencies lecture

Literature

e.g.

- Franke/Härdle/Hafner : Einführung in die Statistik der Finanzmärkte.
- Ruppert: Statistics and Finance
- Cochran J.H. : Time Series for Macroeconomics and Finance

Elective literature:

See reading list

Course: Tax Law I [24168]**Coordinators:** D. Dietrich**Part of the modules:** Private Business Law (p. 141)[WI4JURA5], Governance, Risk & Compliance (p. 143)[WI4INGRC]

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. 141)[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: Control Technology [2150683]

Coordinators: C. Gönzheimer

Part of the modules: Specialization in Production Engineering (p. 90)[WI4INGMB22]

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

Learning Control / Examinations

The assessment consists of an oral exam taking place during the recess period (according to Section 4(2), 2) of the examination regulation).

The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None

Recommendations

None

Learning Outcomes

The students ...

- are able to name the electrical controls which occur in the industrial environment and explain their function.
- can explain fundamental methods of signal processing. This involves in particular several coding methods, error protection methods and analog to digital conversion.
- are able to choose and to dimension control components, including sensors and actors, for an industrial application, particularly in the field of plant engineering and machine tools. Thereby, they can consider both, technical and economical issues.
- can describe the approach for projecting and writing software programs for a programmable logic control named Simatic S7 from Siemens. Thereby they can name several programming languages of the IEC 1131.

Content

The lecture control technology gives an integral overview of available control components within the field of industrial production systems. The first part of the lecture deals with the fundamentals of signal processing and with control peripherals in the form of sensors and actors which are used in production systems for the detection and manipulation of process states. The second part handles with the function of electric control systems in the production environment. The main focus in this chapter is laid on programmable logic controls, computerized numerical controls and robot controls. Finally the course ends with the topic of cross-linking and decentralization with the help of bus systems.

The lecture is very practice-oriented and illustrated with numerous examples from different branches.

The following topics will be covered

- Signal processing
- Control peripherals
- Programmable logic controls
- Numerical controls
- Controls for industrial robots
- Process control systems
- Field bus
- Trends in the area of control technology

Media

Lecture notes will be provided in ilias (<https://ilias.studium.kit.edu/>).

Literature

Lecture Notes

Remarks

None

Course: Stochastic and Econometric Models in Credit Risk Management [2520337]**Coordinators:** Y. Kim**Part of the modules:** Statistical Methods in Risk Management (p. 79)[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 no longer be offered . The examination will be offered latest until summer term 2014.

Course: Stochastic Calculus and Finance [2521331]

Coordinators: W. Heller

Part of the modules: Mathematical and Empirical Finance (p. 78)[WI4STAT1]

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

Learning Control / Examinations

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

Conditions

None.

Learning Outcomes

After successful completion of the course students will be familiar with many common methods of pricing and portfolio models in finance. Emphasis will be put on both finance and the theory behind it.

Content

The course will provide rigorous yet focused training in stochastic calculus and finance. The program will cover modern approaches in stochastic calculus and mathematical finance. Topics to be covered:

1. Stochastic Calculus. Stochastic Processes, Brownian Motion and Martingales, Stopping Times, Local martingales, Doob-Meyer Decomposition, Quadratic Variation, Stochastic Integration, Ito Formula, Girsanov Theorem, Jump-diffusion Processes. Stable and tempered stable processes. Levy processes.
2. Mathematical Finance: Pricing Models. The Black-Scholes Model, State prices and Equivalent Martingale Measure, Complete Markets and Redundant Security Prices, Arbitrage Pricing with Dividends, Term-Structure Models (One Factor Models, Cox-Ingersoll-Ross Model, Affine Models), Term-Structure Derivatives and Hedging, Mortgage-Backed Securities, Derivative Assets (Forward Prices, Future Contracts, American Options, Look-back Options), Option pricing with tempered stable and Levy-Processes and volatility clustering, Optimal Portfolio and Consumption Choice (Stochastic Control and Merton continuous time optimization problem), Equilibrium models, Consumption-Based CAPM, Numerical Methods.

Media

transparencies, exercises.

Literature

To be announced in lecture.

Elective literature:

- Dynamic Asset Pricing Theory, Third Edition. by Darrell Duffie, Princeton University Press, 1996
- Stochastic Calculus for Finance II: Continuous-Time Models, by Steven E. Shreve, Springer, 2003
- An Introduction to Stochastic Integration (Probability and its Applications) by Kai L. Chung, Ruth J. Williams, Birkhauser,
- Methods of Mathematical Finance by Ioannis Karatzas, Steven E. Shreve, Springer 1998
- Kim Y.S., Rachev S.T., Bianchi M-L, Fabozzi F. Financial market models with Levy processes and time-varying volatility, Journal of Banking and Finance, 32/7, 1363-1378, 2008.
- Hull, J., Options, Futures, & Other Derivatives, Prentice Hall, Sixth Edition, (2005).

Remarks

The course Stochastic Calculus and Finance [2521331] will not be offered any more from winter term 2014/2015 on. The examination will be offered latest until winter term 2013/2014.

Course: Markov Decision Models I [2550679]**Coordinators:** K. Waldmann**Part of the modules:** Stochastic Modelling and Optimization (p. 77)[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 0.6 (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. (2012): Stochastische Modelle - eine anwendungsorientierte Einführung; Springer, 2. edition

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. 77)[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 Section 4(2), 1 of the examination regulation. Credit from the voluntary computer lab is accounted for in the overall grade raising the exam grade by 0.6 (according to Section 4(2), 3 of the examination regulation).

Conditions

Foundations in the field of the Markov Decision Models I [2550679] are desired.

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

Waldmann, K.H. , Stocker, U.M. (2012): Stochastische Modelle - eine anwendungsorientierte Einführung; Springer, 2. edition

Elective literature:

Puterman, M.L. (1994): Markov Decision Processes: Discrete Stochastic Dynamic Programming; John Wiley

Remarks

The lecture is offered irregularly. The curriculum of the next two years is available online.

Course: Mass Fluxes [6223701]**Coordinators:** S. Fuchs**Part of the modules:** Environmental Management (p. 118)[WI4INGBGU14]

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

Attendance to the course *Siedlungswasserwirtschaft* [0170603] is recommended.

Learning Outcomes

The course:

- provides a deep understanding of mass fluxes in natural and man-made (technical) systems
- examines the needs for management and details efficient measures and technologies

Content

Introduction to the principles of mass fluxes and system analysis:

- definition and classification of systems
- Mass balance equation as a basic tool for system description
- Introduction of ideal reactors and mathematical models to represent complex processes
- Examples

Media

Lecture notes

Literature

Imboden, D. & Koch, S. (2003): *Systemanalyse – Einführung in die mathematische Modellierung natürlicher Systeme*. 2. Auflage, Springer-Verlag.

Bossel, H. (1994): *Modellbildung und Simulation - Konzepte, Verfahren und Modelle zum Verhalten dynamischer Systeme*. 2. Auflage, Vieweg Verlag.

Richtlinie 2008/105/EG des Europäischen Parlaments und des Rates vom 16. Dezember 2008 über Umweltqualitätsnormen im Bereich der Wasserpolitik

Course: Material Flow Analysis and Life Cycle Assessment [2581995]

Coordinators: L. Schebek
Part of the modules: Industrial Production II (p. 39)[WI4BWLIIIP2]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Winter term	de

Learning Control / Examinations

The assessment consists of an oral (30 minutes) or a written (60 minutes) exam (following § 4(2), 1 of the examination regulation). The exam takes place in every semester. Reexaminations are offered 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: Traffic Engineering [6232703]**Coordinators:** P. Vortisch**Part of the modules:** Transportation Modelling and Traffic Management (p. [120](#))[WI4INGBGU16]

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

Learning Control / Examinations

The assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation.

Conditions

See module description.

Learning Outcomes**Content**

Course: Strategic Brand Management [2571185]**Coordinators:** M. Klarmann, J. Blickhäuser**Part of the modules:** Marketing Management (p. 43)[W14BWLMAR5]

ECTS Credits	Hours per week	Term	Instruction language
1,5	1/0	Summer term	de

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Learning Outcomes

See German version.

Content

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	de

Learning Control / Examinations

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

Conditions

None.

Learning Outcomes

Students

- have in-depth knowledge of current and future technologies for power generation,
- know methods and approaches regarding short- to long-term electricity system planning and market modeling - in particular the cost of generating electricity.

Content

- 1) Energy supply
 - 1.1 Basic concepts
 - 1.2 Global supply & demand (oil, coal, gas, electricity)
- 2) Power plant types
 - 2.1 Thermal power plants
 - 2.2 Renewables
- 3) Cost of electricity generation
 - 3.1 Cost depending on the investment (CAPEX)
 - 3.2 Operational fixed cost (OPEX)
 - 3.3 Variable cost
 - 3.4 Full cost of power generation
- 4) Electricity markets
 - 4.1 Development of power markets
- 5) Energy system planning
 - 5.1 basic concepts
 - 5.2 Drivers
 - 5.3 Stages of power planning
 - 5.4 Short-term optimization: dispatch decisions
 - 5.5 Mid-term optimization: fuel procurement and overhaul planning
 - 5.6 Long-term optimization: additions & Retirements
 - 5.7 Mathematical tools for system planning and market modeling

Literature

Will be announced in the lecture.

Course: Strategic and Innovative Decision Making in Marketing [2571165]

Coordinators: B. Neibecker

Part of the modules: Strategy, Communication, and Data Analysis (p. 45)[WI4BWL MAR7], Marketing Management (p. 43)[WI4BWL MAR5]

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: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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 Ceramics [2126775]

Coordinators: M. Hoffmann
Part of the modules: Specific Topics in Materials Science (p. 101)[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

Basic knowledge of experimental physics and chemistry is recommended.
 It is recommended to attend the course *Ceramics-Introduction* [2125757].

Learning Outcomes

The students know the most relevant structural ceramics (silicon carbide, silicon nitride, alumina, boron nitride, zirconia, fibre-reinforced ceramics) and their applications. They are familiar with the microstructural features, fabrication methods, and mechanical properties.

Content

The lecture gives an overview on structure and properties of the technical relevant structural ceramics silicon nitride, silicon carbide, alumina, zirconia, boron nitride and fibre-reinforced ceramics. All types of structural ceramics will be discussed in detail in terms of preparation methods of the raw materials, shaping techniques, densification, microstructural development, mechanical properties and application fields.

Media

Slides for the lecture:
 available under <http://www.iam.kit.edu/km>

Literature

W.D. Kingery, H.K. Bowen, D.R. Uhlmann, "Introduction to Ceramics", John Wiley & Sons, New York, (1976)

E. Dörre, H. Hübner, "Alumina", Springer Verlag Berlin, (1984)

M. Barsoum, "Fundamentals of Ceramics", McGraw-Hill Series in Material Science and Engineering (2003)

Remarks

The course will not take place every year.

Course: Superhard Thin Film Materials [2177618]

Coordinators: S. Ulrich
Part of the modules: Specific Topics in Materials Science (p. 101)[W14INGMB33]

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* [W13INGMB9] should be completed successfully beforehand.

Learning Outcomes

Superhard materials are solids with a hardness higher than 4000 HV 0,05. The main topics of this lecture are modelling, deposition, characterization and application of superhard thin film materials.

Content

Introduction

Basics

Plasma diagnostics

Particle flux analysis

Sputtering and ion implantation

Computer simulations

Properties of materials, thin film deposition technology, thin film analysis and modelling of superhard materials

Amorphous hydrogenated carbon

Diamond like carbon

Diamond

Cubic Boronnitride

Materials of the system metall-boron-carbon-nitrogen-silicon

Literature

G. Kienel (Ed.): Vakuumbeschichtung 1 - 5, VDI Verlag, Düsseldorf, 1994

Copies with figures and tables will be distributed

Course: Supply chain management [2117062]

Coordinators: K. Alicke

Part of the modules: Logistics in Value Chain Networks (p. 96)[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.

Recommendations

None.

Learning Outcomes

Students are able to:

- Discuss the requirements on modern supply chains,
- Use the basic concepts of demand forecast, stock optimization and supply in practical exercises,
- Analyse the typical questions of dimensioning a supply chain and evaluate a supply chain with the results.

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

Media

presentations

Literature

Alicke, K.: Planung und Betrieb von Logistiknetzwerken

Simchi-Levi, D., Kaminsky, P.: Designing and Managing the Supply Chain

Goldratt, E., Cox, J.: The Goal

Remarks

this course is a block course

Course: Supply Chain Management in the automotive industry [2581957]

Coordinators: T. Heupel, H. Lang
Part of the modules: Industrial Production III (p. 42)[WI4BWLIP6]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2/0	Winter term	de

Learning Control / Examinations

The examination will be in form of a written exam acc. to §4(2), 1 ER. Exams are offered in every semester and can be re-examined at every ordinary examination date.

Conditions

None.

Recommendations

None.

Learning Outcomes

Students are taught knowledge, methods and tools in the field of automotive supply chain management. With the help of concrete examples of a global automotive company, they acquire a basic understanding of challenges in the implementation of those solutions. Students learn about theoretic concepts and their transfer to practice in designing value-added structures, procurement logistics, risk management, quality engineering, cost engineering, and purchasing. They are able to identify, analyze and assess problems and to design adequate solutions within those aspects. In the end of the lecture, students can integrate the aspects into the general context of automotive supply chain management and development process.

Content

- Automotive industry significance
- The automotive supply chain
- Adding value structures of the automotive supply chain and mastering of the production systems as factors of success in the SCM
- Strategic procurement logistics
- Risk management
- Quality engineering and management in the automotive supply chain
- Cost engineering and management in the automotive supply chain
- Purchasing (Supplier selection, contract management)
- Performance measurement of the supply chain / organization

Media

Media will be provided on the e-learning platform.

Literature

Will be announced in the course.

Remarks

None.

Course: Supply Chain Management in the Process Industry [2550494]

Coordinators: S. Nickel

Part of the modules: Operations Research in Supply Chain Management and Health Care Management (p. 74)[WI4OR5]

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

Learning Control / Examinations

The assessment is a 60 minutes written examination (according to §4(2), 1 of the examination regulation) (individual grading), case study presentation by student teams (team grading) and classroom participation (individual grading). The examination is held in the term of the lecture.

Conditions

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

Recommendations

Advanced knowledge of Operations Research (e.g., as conveyed in the lectures Facility Location and Strategic SCM, Tactical and operational SCM) is recommended.

Learning Outcomes

This course will focus on state-of-the art approaches for designing, planning and managing global supply chains in the process industry. Students will learn about examples of excellent supply chains, based on which they will be able to identify and study important building blocks, repeating patterns and concepts crucial to supply chain strategy, design and planning. The course covers specific challenges and approaches towards supply chain operations within the process industry with regards to transportation and warehousing. The course will show the interdisciplinary linkage of SCM with information systems, performance management, project management, risk management and sustainability management. A strong focus will be placed on identifying drivers for successful SCM and the transferability of gained knowledge into practice by using case studies and real life project documentations. Discussions, student presentations and classroom interaction will lead to a thorough understanding of the topic.

Content

The course "Supply Chain Management in the Process Industry" covers fundamental concepts in the field of supply chain management with special focus on process industry. Strategic, planning and operational topics within the end-to-end supply chain are examined, covering relevant approaches in design, processes and performance measurement. Additional focus within the course is on showing the interdisciplinary linkages SCM has with information systems, performance management, project management, risk management and sustainability management. The course is enriched by various insights from the world's leading chemical company BASF, provided by executive management as real life examples and cases.

Literature

- Chopra, S./Meindl, P.: Supply Chain Management – Strategy, Planning, & Operations, 4th edition, Upper Saddle River, 2009.
- Various case studies, which will be provided during the course

Remarks

The number of participants is restricted due to the execution of interactive case studies and the resulting examination effort. Due to these capacity restrictions, registration before course start is required (FCFS). For further information see the webpage of the course. The course is planned to be held every winter term. The planned lectures and courses for the next three years are announced online.

Course: Supply Chain Management with Advanced Planning Systems [2581961]

Coordinators: M. Göbelt, C. Sürle
Part of the modules: Industrial Production III (p. 42)[WI4BWLIP6]

ECTS Credits	Hours per week	Term	Instruction language
3,5	2	Summer term	en

Learning Control / Examinations

The assessment consists of an oral (30 minutes) or a written (60 minutes) exam (following §4(2), 1 of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None.

Learning Outcomes

This lecture deals with supply chain management from a practitioner's perspective with a special emphasis on the software solution SAP SCM and the planning domain. First, the term supply chain management is defined and its scope is determined. Methods to analyze supply chains as well as indicators to measure supply chains are derived. Second, the structure of an APS (advanced planning system) is discussed in a generic way. Later in the lecture, the software solution SAP SCM is mapped to this generic structure. The individual planning tasks and software modules (demand planning, supply network planning, production planning / detailed scheduling, transportation planning / vehicle scheduling, global available-to-promise) are presented by discussing the relevant business processes, providing academic background, describing planning processes for a fictive company and showing the user interface and user-related processes in the software solution.

The lecture is supported by a self-explanatory tutorial, in which students can explore the software solution for the fictive company offline on their own.

Content

1. Introduction to Supply Chain Management

- 1.1. Supply Chain Management Fundamentals
- 1.2. Supply Chain Management Analytics

2. Structure of Advanced Planning Systems

3. SAP SCM

- 3.1. Introduction / SCM Solution Map
- 3.2. Demand Planning
- 3.3. Supply Network Planning
- 3.4. Production Planning and Detailed Scheduling
- 3.5. Deployment
- 3.6. Transportation Planning and Vehicle Scheduling
- 3.7. [Optional] Global Available to Promise

4. SAP SCM in Practice

- 4.1. Success Stories
- 4.2. SAP Implementation Methodology

Remarks

This lecture will have 3,5 Credits from summer term 2014.

Course: Systematic Product Development in Sensor Technology [23209]

Coordinators: E. Ivers-Tiffée, Riegel

Part of the modules: Sensor Technology I (p. 128)[WI4INGETIT3], Sensor Technology II (p. 129)[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

None.

Recommendations

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: J. Hoffmeister

Part of the modules: Specific Topics in Materials Science (p. 101)[WI4INGMB33]

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

Learning Control / Examinations

The assessment consists of a written exam (3h) (following §4(2), 1 of the examination regulation).

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

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: 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. 74)[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 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: Technology Assessment [2545017]

Coordinators: D. Koch
Part of the modules: Innovation Management (p. 47)[WI4BWLENT2]

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

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Recommendations

Prior attendance of the course *Innovation Management* [2545015] is recommended.

Learning Outcomes

The seminar "Technology Assessment" aims to discuss and develop different thematic aspects linked to the assessment of technology in an early phase of innovation management. Seminar topics are assigned at the beginning of the course. These will be presented and discussed at the end. In the first few seminars, impulses are given on the topic of technology assessment which should then be discussed to establish an understanding of the subject matter and ensure targeted preparation of the seminar topics.

Content

Technology Assessment can play a role at different points in the innovation process and support decisions for or against specific technology options. The seminar "Technology Assessment" focuses on the early phase or fuzzy front end of innovation management. Technology assessment is done here with a certain degree of uncertainty concerning future technology developments. Technology assessment can be connected to the use of methods such as scenario analysis or roadmapping but also to the classical generation of ideas. Different methods and approaches are discussed in the seminar, for example, market-technology portfolios etc. The early assessment of technologies is assigned particular importance given the limited resources in companies and uncertainty about future developments.

Media

Slides.

Course: Technologies for Innovation Management [2545018]

Coordinators: D. Koch
Part of the modules: Innovation Management (p. 47)[WI4BWLENT2]

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

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Recommendations

Prior attendance of the course *Innovation Management* [2545015] is recommended.

Learning Outcomes

The seminar “Technologies for Innovation Management” aims to discuss and develop different thematic aspects linked to the use of technologies in innovation management. Seminar topics are assigned at the beginning of the course. These will be presented and discussed at the end. In the first few seminars, impulses are given on the topic “Technologies in Innovation Management”, which should then be discussed to establish an understanding of the subject matter and ensure targeted preparation of the seminar topics.

Content

Technologies in innovation management can play a role at different points in the innovation process and support experts working in R&D contexts. The seminar “Technologies for Innovation Management” focuses on the early phase or fuzzy front end of innovation management. Technologies can be very important here, above all regarding the supply of information. In globally distributed R&D organizations, it is necessary to compile as much information about emerging technology developments as possible in the early phase of the innovation process. Information and communication technologies can be useful here. In this seminar, different technologies will be analyzed in terms of their usefulness for the early phase of innovation management from email through web 2.0 and social networks up to text mining and big data technologies etc.

Media

Slides.

Course: Technological Change in Energy Economics [2581000]**Coordinators:** M. Wietschel**Part of the modules:** Energy Economics and Technology (p. 41)[WI4BWLIP5]

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: Network Economics (p. 54)[WI4VWL4], Electronic Markets (p. 33)[WI4BWLISM2], Telecommunications Markets (p. 59)[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: G. Sydow
Part of the modules: Public Business Law (p. 142)[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 (approx. 60 min.) according to § 4(2), 1 SPO.

Conditions

None.

Recommendations

Parallel to the lectures tutoria are offered in which legal thinking and argumentation is practised. Their attendance is strongly recommended.

During the semester, test exams to each lecture are offered with extensive coaching. During the lecture-free time, a Q-and-A-lecture is offered. Details on the homepage of the ZAR (www.kit.edu/zar)

Learning Outcomes

Telecommunications is the technical basis of the Information Engineering and Management. In which way for example UMTS is regulated, is of relevant importance for the supply of services in the world of the mobile contents services. The central defaults of the telecommunications regulation are in the telecommunications law (TKG). This was completely amended due to community-legal defaults 2004. The lecture procures for apprehending the basics of legal framework of the information society the essential knowledge in telecommunication law.

Content

The lecture offers an overview of the new TKG. The whole range of the regulation is treated: Of the material-legal instruments of the competition-creative economic regulation (market -, entrance -, payment regulation as well as special supervision of abuse) and the non-economic regulation (customer protection; Broadcasting; Assignment of frequencies, numbers and rights of way; secrecy of telecommunications; Data security and public security) up to the institutional arrangement of the regulation. To assist in the understanding the technical and economic bases are clarified as well as community and constitutional default sat at the beginning of the lecture.

Media

extensive script with cases; content structure, further information in the lectures

Literature

Since the law material is to be partly compiled in the discourse with the studying, a current version of the TKG is to be bring along to the lecture.

Further literature will be announced in the lecture.

Elective literature:

tba

Course: Theoretical Sociology [thSoz]

Coordinators: G. Nollmann, Pfadenhauer, Haupt, Grenz, Eisewicht, Kunz, Albrecht, Enderle, Dukat

Part of the modules: Sociology (p. [144](#))[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: Theory of Business Cycles [25549]

Coordinators: M. Hillebrand

Part of the modules: Allocation and Equilibrium (p. 56)[WI4VWL7], Macroeconomic Theory (p. 57)[WI4VWL8]

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

Learning Control / Examinations

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

Exams are confined to the following dates: Beginning of the recess period (mid February) and beginning of the summer semester (early April).

Please note: There are no further examination dates for this course.

Conditions

None.

Recommendations

Basic knowledge in micro- and macroeconomics, as conveyed in the courses *Economics I: Microeconomics* [2600012] and *Economics II: Macroeconomics* [2600014], is assumed.

Participants are expected to bring a strong interest in mathematical economics and quantitative model building.

Learning Outcomes

Content

Business Cycle research strives to analyze and explain short-run fluctuations in key macroeconomic variables such as production output, income, employment, and prices. The course develops mathematical models which unveil the structural reasons for these fluctuations and the underlying economic mechanisms. Starting with the class of so-called Real Business Cycle (RBC) models, particular emphasis is placed on models of the labor market including models with labor indivisibilities, search-and matching, and home production. Based on the findings obtained, policy implications and the general scope for fiscal and monetary policy to stabilize the economy and foster production output, employment, and price stability are investigated. Numerical simulations based on realistic (calibrated) parameter choices are employed to replicate the empirically observed patterns and to quantify the effects of different policies. Participants are provided with MATLAB scripts allowing them to replicate the simulation results presented in class.

Literature

Elective literature:

McCandless, G. (2008): 'The ABCs of RBCs: An Introduction to Dynamic Macroeconomic Models'

Heer, B. & A. Maussner (2009): 'Dynamic General Equilibrium Modeling: Computational Methods and Applications'

Remarks

All classes will be held in English.

Course: Theory of Economic Growth [2520543]

Coordinators: M. Hillebrand

Part of the modules: Innovation and growth (p. 67)[WI4VWLIWW1], Macroeconomic Theory (p. 57)[WI4VWL8]

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

Learning Control / Examinations

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

Examinations are confined to the following dates: At the beginning of the recess period (mid July) and of the winter semester (early October).

Please note: There are no further examination dates for this course.

Conditions

None.

Recommendations

Basic knowledge in micro- and macroeconomics, as conveyed in the courses *Economics I: Microeconomics* [2600012] and *Economics II: Macroeconomics* [2600014], is assumed.

Participants are expected to bring a strong interest in mathematical economics and quantitative model building.

Learning Outcomes

Content

The field of economic growth strives to analyze and explain the long-run evolution of economies. The aim of this course is to develop models which offer a mathematical description of the growth process and its structural determinants. Starting with the fundamental models by Solow, Kaldor, and Pasinetti, the main focus is on so-called overlapping generations (OLG) models. For this class of models, the theory of deterministic dynamical systems offers a rich set of mathematical tools to analyze the long-run behavior of the economy. In particular, conditions under which the growth path converges, diverges, or exhibits irregular (chaotic) fluctuations can be derived. Building on the insights obtained, a second set of questions deals with how economic policy can foster and stabilize the growth process. In this regard, the impact of governmental debt and intergenerational redistribution schemes such as Social Security on economic growth and welfare are investigated.

Literature

Acemoglu, D. (2008): 'Introduction to Modern Economic Growth'

de la Croix, D. and Michel, P. (2002): 'A Theory of Economic Growth: Dynamics and Policy in Overlapping Generations'

Remarks

All classes will be held in English.

Course: Thermodynamics and Energy Conversion in Internal Combustion Engines [2133120]

Coordinators: T. Koch, H. Kubach

Part of the modules: Combustion Engines I (p. 86)[W14INGMB34]

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

Learning Control / Examinations

oral exam, 30 minutes, no auxiliary means

Conditions

None.

Recommendations

None.

Learning Outcomes

The students can name all important influences on the combustion process. They can analyse and evaluate the engine process considering efficiency, emissions and potential.

Content

reaction kinetics
 fuels
 gas exchange
 ignition
 flow field of gasoline engines
 working process
 pressure trace analysis
 thermodynamic analysis of the high pressure process
 exergy analysis and waste heat recuperation
 aspects of sustainability

Course: Operation Methods for Foundation and Marine Construction [6241911]

Coordinators: H. Schneider

Part of the modules: Mechanical Process Engineering in Construction (p. 121)[WI4INGBGU17]

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

Learning Control / Examinations

The assessment consists of an oral exam (20 min.) taking place in the recess period (according to §4 (2), 2 of the examination regulation).

Conditions

None.

Learning Outcomes

Students

- Have specialized knowledge regarding the presented construction methods and construction machinery
- Can evaluate different construction methods and construction machinery regarding the context of use.
- Can determine and combine appropriate construction methods.

Content

Students acquire knowledge regarding design choices and construction methods of temporary pit systems, foundations and harbor facilities:

- Injection,
- Underpinning,
- Pipe-jacking,
- Caisson technique
- Fast ice building technique
- Bank protection.

Media

Lecture slides.

Course: Topics in Experimental Economics [n.n.]

Coordinators: P. Reiss
Part of the modules: Experimental Economics (p. 66)[WI4VWL17]

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

Learning Control / Examinations

Conditions

None.

Recommendations

Basic knowledge of Experimental Economics is assumed. Therefore, it is strongly recommended to attend the course Experimental Economics beforehand.

Learning Outcomes

Students

- are familiar with current research in experimental economics;
- can evaluate the results of an economic experiment and are able to assess its significance in the context of relevant research;
- master advanced methodic issues regarding the experimental method.

Content

The course covers selected topics in experimental economics and deepens the understanding of the experimental method. In particular, topics of current research into experimental and behavioral economics are discussed, along with a treatment of advanced methodic issues.

Media

Slides, problem sets.

Literature

A selection of published papers is compulsory reading for the course. The course syllabus provides references and is announced at the beginning of the course.

Remarks

The course is offered in summer 2016 for the first time. The course is not offered in every academic year.

Course: Transport Economics [2560230]

Coordinators: G. Liedtke, E. Szimba

Part of the modules: Network Economics (p. 54)[WI4VWL4], Environmental Economics (p. 55)[WI4VWL5], Transport infrastructure policy and regional development (p. 60)[WI4VWL11]

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

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, Mitarbeiter

Part of the modules: Water Chemistry and Water Technology I (p. 134)[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 [19035]

Coordinators: P. Vortisch, M. Kagerbauer

Part of the modules: Fundamentals of Transportation (p. 119)[WI4INGBGU15]

ECTS Credits	Hours per week	Term	Instruction language
1,5	0/1	Summer term	de

Learning Control / Examinations

The assessment consists of the completion of three exercises during the semester (non exam assessment according to §4(2), 3 of the examination regulation).

Conditions

See module description.

Learning Outcomes

Content

Course: Metal Forming [2150681]

Coordinators: T. Herlan

Part of the modules: Specialization in Production Engineering (p. 90)[WI4INGMB22]

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

Learning Control / Examinations

The assessment consists of an oral exam taking place during the recess period (according to Section 4(2), 2) of the examination regulation).

The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None

Recommendations

None

Learning Outcomes

The students

- are able to reflect the basics, forming processes, tools, Machines and equipment of metal forming in an integrated and systematic way.
- are capable to illustrate the differences between the forming processes, tools, machines and equipment with concrete examples and are qualified to analyze and assess them in terms of their suitability for the particular application.
- are also able to transfer and apply the acquired knowledge to other metal forming problems.

Content

At the beginning of the lecture the basics of metal forming are briefly introduced. The focus of the lecture is on massive forming (forging, extrusion, rolling) and sheet forming (car body forming, deep drawing, stretch drawing). This includes the systematic treatment of the appropriate metal forming Machines and the corresponding tool technology.

Aspects of tribology, as well as basics in material science and aspects of production planning are also discussed briefly. The plastic theory is presented to the extent necessary in order to present the numerical simulation method and the FEM computation of forming processes or tool design. The lecture will be completed by product samples from the forming technology.

The topics are as follows:

- Introduction and basics
- Hot forming
- Metal forming machines
- Tools
- Metallographic fundamentals
- Plastic theory
- Tribology
- Sheet forming
- Extrusion
- Numerical simulation

Media

Lecture notes will be provided in ilias (<https://ilias.studium.kit.edu/>).

Literature

Lecture Notes

Remarks

None

Course: Environmental and Resource Policy [2560548]

Coordinators: R. Walz
Part of the modules: Environmental Economics (p. 55)[WI4VWL5]

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

Learning Control / Examinations**Conditions**

None.

Recommendations

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 Aspects of Guided Transport Systems [6234901]

Coordinators: E. Hohnecker

Part of the modules: Public Transportation Operations (p. 124)[WI4INGBGU19]

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) 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

See German version.

Content

Active and passive noise protection, determination of sound emission, environmental aspects, quality in public transport, customer satisfaction and loyalty in long distance and local rail traffic

Remarks

See German version.

Course: Environmental Chemistry [0170110]**Coordinators:** J. Winter**Part of the modules:** Water Supply and Sanitation (p. 117)[WI4INGBGU13]

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

Learning Control / Examinations

See module description.

Conditions

None.

Recommendations

See module description.

Learning Outcomes

See module description.

Content

See module description.

Course: Environment Communication [19212]

Coordinators: Kämpf

Part of the modules: Understanding and Prediction of Disasters 2 (p. 137)[WI4INGINTER8], Understanding and Prediction of Disasters 1 (p. 136)[WI4INGINTER7]

ECTS Credits	Hours per week	Term	Instruction language
4	2/1	Winter term	de

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Recommendations

None.

Learning Outcomes

See German version.

Content

See German version.

Course: Environmental Economics and Sustainability [2521547]

Coordinators: R. Walz
Part of the modules: Environmental Economics (p. 55)[WI4VWL5]

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

Learning Control / Examinations

Conditions

None.

Recommendations

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: G. Sydow

Part of the modules: Public Business Law (p. 142)[WI4JURA6], Environmental Economics (p. 55)[WI4VWL5]

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

Learning Control / Examinations

The assessment consists of an 1h written exam (approx. 60 min) following §4, Abs. 2, 1 of the SPO.

The assessment will be offered in every winter term and can be repeated at every regular examination date.

Conditions

None.

Recommendations

Knowledge of Law, esp. Public Law I or II are recommended.

Parallel to the lectures tutoria are offered in which legal thinking and argumentation is practised. Their attendance is strongly recommended.

During the semester, test exams to each lecture are offered with extensive coaching. During the lecture-free time, a Q-and-A-lecture is offered. Details on the homepage of the ZAR (www.kit.edu/zar)

Learning Outcomes

Environmental law is a field of law that influences management in many regards. Students shall develop a feeling for the many different aspects of environmental law and its instruments. Aside from so-called "classical" approaches such as law-and-order students will learn about other, economic influenced, instruments such as the gathering and the transfer of information or the market for 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. 117)[WI4INGBGU13]

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

Learning Control / Examinations

See module description.

Conditions

None.

Recommendations

See module description.

Learning Outcomes

See module description.

Content

See module description.

Course: Environmental Impact Assessment [6233804]

Coordinators: R. Roos
Part of the modules: Highway Engineering (p. 115)[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. 29)[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: Urban Water Management [6220902]

Coordinators: S. Fuchs, P. Klingel, U. Mohrlök

Part of the modules: Water Supply and Sanitation (p. 117)[WI4INGBGU13]

ECTS Credits	Hours per week	Term	Instruction language
6	2/2	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).

Conditions

None.

Recommendations

Attendance to the lectures *Siedlungswasserwirtschaft* [0170603] and *Verfahrenstechnische Anlagen der Regenwasserbehandlung* [6223801] is recommended

Learning Outcomes

The students will gain knowledge regarding an integrated water management with focus on urban areas.

Basic knowledge in water-related substances transport and fate on sealed areas, in surface water, water distribution and sewer systems and groundwater bodies will be examined

Content

- Amount and quality of different runoff components
- Indicators of pollution
- Tools for urban water management (water distribution, urban drainage, surface and ground waters, characteristics of urban surface waters)

Media

Lecture notes

Course: Copyright [24121]

Coordinators: T. Dreier
Part of the modules: Governance, Risk & Compliance (p. 143)[WI4INGRC], Intellectual Property Law (p. 140)[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 3 (p. 28)[WI4BWLFBV11], Finance 1 (p. 24)[WI4BWLFBV1], Finance 2 (p. 25)[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:** U. Spicher**Part of the modules:** Combustion Engines I (p. 84)[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

None.

Recommendations

It is recommended to have basic knowledge of thermodynamics.

Learning Outcomes**Content**

Course: Combustion Engines B [2134135]

Coordinators: U. Spicher
Part of the modules: Combustion Engines II (p. 85)[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.

Recommendations

Knowledge of thermodynamics is recommended.

Learning Outcomes**Content**

Course: Construction Methods in Environmental Engineering [6241814]

Coordinators: H. Schneider

Part of the modules: Mechanical Process Engineering in Construction (p. 121)[WI4INGBGU17]

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

Learning Control / Examinations

The assessment consists of an oral exam (20 min.) taking place in the recess period (according to §4(2), 2 of the examination regulation).

Conditions

None.

Learning Outcomes

Students have specialized knowledge in important areas of environmental protection engineering in construction. They can plan and evaluate the use of construction methods based on fundamental knowledge about environmental protection.

Content

The lecture comprises

- Introduction, Overview and legal foundations of environmental protection engineering.
- Construction methods in environmental protection engineering.
- Landfill construction, technology and remediation.
- Sewer line and pipe remediation
- Remediation of contaminated sites and soil remediation.
- Groundwater remediation (event of damage, process engineering).
- Renewable resources in facility management.

Media

Lecture prints.

Course: Process Technologies in Storm Water Treatment [6223801]

Coordinators: S. Fuchs, E. Hoffmann

Part of the modules: Water Supply and Sanitation (p. 117)[WI4INGBGU13]

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

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Recommendations

Attendance to the course *Siedlungswasserwirtschaft* [0170603] is recommended.

Learning Outcomes

The students will gain knowledge regarding planning, operation and dimensioning of different plants for storm water treatment. Design and construction requirements and limitations will be examined having a closer look at the natural and anthropogenic substances cycles

Content

- Problem-oriented and location adapted treatment concepts
- Dimensioning approaches for plants in storm water treatment

Media

Lecture notes

Course: Process Technologies in Water Supply and Wastewater Disposal [6223803]**Coordinators:** E. Hoffmann**Part of the modules:** Water Supply and Sanitation (p. 117)[WI4INGBGU13]

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

Learning Control / Examinations**Conditions**

None.

Learning Outcomes**Content**

Course: Behavioral Approaches in Marketing [2572167]

Coordinators: B. Neibecker

Part of the modules: Strategy, Communication, and Data Analysis (p. 45)[WI4BWL MAR7], Marketing Management (p. 43)[WI4BWL MAR5]

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 module description.

Learning Outcomes

Students have learned the following outcomes and competences:

- To specify the key terms in marketing and communication management
- To identify and define theoretical constructs in marketing communication, based on behavioral theory
- To 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/grounded theory).

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 [6233803]**Coordinators:** D. Hönig**Part of the modules:** Safety, Computing and Law in Highway Engineering (p. 116)[WI4INGBGU9]

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

Learning Control / Examinations

See module description.

Conditions

See corresponding module information.

Learning Outcomes**Content**

Course: Traffic Management and Transport Telematics [6232802]**Coordinators:** P. Vortisch**Part of the modules:** Transportation Modelling and Traffic Management (p. [120](#))[WI4INGBGU16]

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

Learning Control / Examinations

The assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation.

Conditions

See module description.

Learning Outcomes**Content**

Course: Fundamentals of Transportation Planning and Traffic Engineering [19027]**Coordinators:** P. Vortisch, M. Kagerbauer**Part of the modules:** Fundamentals of Transportation (p. 119)[WI4INGBGU15]

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

Learning Control / Examinations

In the module Fundamentals of Transportation [WI4INGBGU15] the assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation. For other modules and more information, see the corresponding module description.

Conditions

See module description.

Learning Outcomes**Content**

Course: Failure of Structural Materials: Fatigue and Creep [2181715]

Coordinators: O. Kraft, P. Gumbsch, P. Gruber

Part of the modules: Specific Topics in Materials Science (p. 101)[W14INGMB33]

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

Learning Control / Examinations

The assessment consists of an oral examination (30 min) according to Section 4(2), 2 of the examination regulation.

Conditions

None.

Recommendations

None.

Learning Outcomes

The student

- has the basic understanding of mechanical processes to explain the relationships between externally applied load and materials strength.
- can describe the main empirical materials models for fatigue and creep and can apply them.
- has the physical understanding to describe and explain phenomena of failure.
- can use statistical approaches for reliability predictions.
- can use its acquired skills, to select and develop materials for specific applications.

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

- Engineering Materials, M. Ashby and D.R. Jones (2nd Edition, Butterworth-Heinemann, Oxford, 1998); worth reading, relatively simple but comprehensive
- Mechanical Behavior of Materials, Thomas H. Courtney (2nd Edition, McGraw Hill, Singapur); classic on the mechanical behavior of materials, extensive and good
- Bruchvorgänge in metallischen Werkstoffen, D. Aurich (Werkstofftechnische Verlagsgesellschaft Karlsruhe), relatively simple but yet comprehensive overview of metallic materials
- Fatigue of Materials, Subra Suresh (2nd Edition, Cambridge University Press); standard work on fatigue, all classes of materials, extensive, for beginners and advanced student

Course: Failure of structural materials: deformation and fracture [2181711]

Coordinators: P. Gumbsch, O. Kraft, D. Weygand

Part of the modules: Specific Topics in Materials Science (p. 101)[WI4INGMB33]

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

Learning Control / Examinations

oral exam 30 minutes

no tools or reference materials

Conditions

compulsory preconditions: none

Recommendations

preliminary knowlegde in mathematics, mechanics and materials science

Learning Outcomes

The student

- has the basic understanding of mechanical processes to explain the relationship between externally applied load and materials strength.
- can explain the foundation of linear elastic fracture mechanics and is able to determine if this concept can be applied to a failure by fracture.
- can describe the main empirical materials models for deformation and fracture and can apply them.
- has the physical understanding to describe and explain phenomena of failure.

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
 - hypotheses for failure
 - linear elastic fracture mechanics
 - crack resistance
 - experimental measurement of fracture toughness
 - defect measurement
 - crack propagation
 - application of fracture mechanics
 - atomistics of fracture

Literature

- Engineering Materials, M. Ashby and D.R. Jones (2nd Edition, Butterworth-Heinemann, Oxford, 1998); worth reading, relatively simple but comprehensive
- Mechanical Behavior of Materials, Thomas H. Courtney (2nd Edition, McGraw Hill, Singapur); classic on the mechanical behavior of materials, extensive and good
- Bruchvorgänge in metallischen Werkstoffen, D. Aurich (Werkstofftechnische Verlagsgesellschaft Karlsruhe), relatively simple but yet comprehensive overview of metallic materials

Course: Civil Law for Advanced [24650]

Coordinators: Z. (ZAR)
Part of the modules: Private Business Law (p. 141)[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: Seminar: Governance, Risk & Compliance [GRCsem]**Coordinators:** T. Dreier, N.N.**Part of the modules:** Governance, Risk & Compliance (p. [143](#))[WI4INGRC]

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

Learning Control / Examinations**Conditions**

None.

Learning Outcomes**Content**

Course: Law of Contracts [24671]

Coordinators: Z. (ZAR)

Part of the modules: Private Business Law (p. 141)[WI4JURA5], Governance, Risk & Compliance (p. 143)[WI4INGRC]

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. 140)[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

Course: Sales Management and Retailing [2572156]

Coordinators: M. Klarmann
Part of the modules: Sales Management (p. 44)[WI4BWL MAR6]

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

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

The aim of the course "Sales Management and Retailing" is on the one hand to give insights into the challenging realization of a successful sales management and on the other hand to discuss peculiarities of retailing contexts. The contents are below others:

- Customer relationship management (word-of-mouth-analysis, key account management, loyalty programs, complain management etc.)
- Retail marketing (trends, point of sale design etc.)
- Retailer-producer relationships

Remarks

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

Course: Gear Cutting Technology [2149655]

Coordinators: M. Klaiber

Part of the modules: Specialization in Production Engineering (p. 90)[WI4INGMB22]

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

Learning Control / Examinations

The assessment consists of an oral exam taking place during the recess period (according to Section 4(2), 2) of the examination regulation).

The examination takes place every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None

Recommendations

None

Learning Outcomes

The students ...

- can describe the basic terms of gearings and are able to explain the imparted basics of the gearwheel and gearing theory.
- are able to specify the different manufacturing processes and machine technologies for producing gearings. Furthermore they are able to explain the functional principles and the dis-/advantages of these manufacturing processes.
- can apply the basics of the gearing theory and manufacturing processes on new problems.
- are able to read and interpret measuring records for gearings.
- are able to make an appropriate selection of a process based on a given application
- can describe the entire process chain for the production of toothed components and their respective influence on the resulting workpiece properties.

Content

Based on the gearing theory, manufacturing processes and machine technologies for producing gearings, the needs of modern gear manufacturing will be discussed in the lecture. For this purpose, various processes for various gear types are taught which represent the state of the art in practice today. A classification in soft and hard machining and furthermore in cutting and non-cutting technologies will be made. For comprehensive understanding the processes, machine technologies, tools and applications of the manufacturing of gearings will be introduced and the current developments presented. For assessment and classification of the applications and the performance of the technologies, the methods of mass production and manufacturing defects will be discussed. Sample parts, reports from current developments in the field of research and an excursion to a gear manufacturing company round out the lecture.

The following topics will be covered:

- Sample applications
- Basics of gearing geometry
- Need of gearboxes
- Soft machining processes
- Hardening processes
- Hard machining processes
- Bevel gear production
- Measurement and testing
- Manufacturing of gearbox components
- Special gearings

Media

Lecture slides will be provided in ilias (<https://ilias.studium.kit.edu/>).

Literature

Lecture Slides

Remarks

None

Course: Virtual Engineering for Mechatronic Products [2121370]

Coordinators: S. Rude

Part of the modules: Virtual Engineering B (p. 98)[WW4INGMB30], Virtual Engineering A (p. 97)[WW4INGMB29]

ECTS Credits	Hours per week	Term	Instruction language
4	3	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 all products changes geometry-oriented construction activities in function-oriented activities. In this context, the application of IT systems needs to be realigned. The lecture deals with the following issues from the perspective of the automobile industry:

- challenges in the construction process concerning the integration of mechatronic components in products,
- support of task clarification through requirements management,
- problem-solving on the basis of functionally networked systems,
- implementation of solutions on the basis of electronics (sensors, actuators, networked control devices),
- control of distributed software systems through software engineering and
- challenges in tests and backups, concerning the system quality that needs to be achieved.

Literature

Lecture slides

Course: Virtual Engineering I [2121352]

Coordinators: J. Ovtcharova
Part of the modules: Virtual Engineering A (p. 97)[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].

Recommendations

None.

Learning Outcomes

The students can:

- rename and explain the basic methods of virtual engineering and the typical problems in product development.
- associate the methods and problems of the corresponding phases of the product life cycle and derive the necessary interfaces.
- select the appropriate IT systems for given problems and evaluate their suitability for the support of management's approach PLM.
- apply CAD/CAX/PLM-Systems using simple exercises.

Content

The lecture presents the informational interrelationship required for understanding the virtual product development process. For this purpose, an emphasis and focus will be placed on IT-systems used in the industrial sector as support for the process chain of virtual engineering:

- Product Lifecycle Management refers to the entire lifecycle of the product, beginning with the concept phase up through disassembling and recycling.
- CAX-systems for the virtual product development allow the modeling of a digital product in regards to design, construction, manufacturing and maintenance.
- Validation Systems allow the checking of the product in regard to static, dynamics, safety and build ability.

The goal of the lecture is to clarify the relationship between construction and validation operations through the usage of virtual prototypes and VR/AR/MR visualisation techniques in connection with PDM/PLM-systems. This will be achieved through an introduction to each particular system along with praxis-oriented exercises.

Literature

Lecture slides

Course: Virtual Engineering II [2122378]

Coordinators: J. Ovtcharova
Part of the modules: Virtual Engineering B (p. 98)[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 Laboratory [2123375]

Coordinators: J. Ovtcharova

Part of the modules: Virtual Engineering B (p. 98)[WW4INGMB30], Virtual Engineering A (p. 97)[WW4INGMB29]

ECTS Credits	Hours per week	Term	Instruction language
4	3	Winter / 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.

Recommendations

None.

Learning Outcomes

The students are able to operate and use hardware and software for Virtual Reality applications in order to:

- design solutions for complex tasks in a team.
- solve subtasks within a specific work package in small groups, keeping the interfaces to other work packages in mind and
- merge this solution in the final product.

Content

The Virtual Reality lab course consists of following three overlapping parts:

- Basics: Introduction in Virtual Reality (hardware, software, applications)
- Tool Kit: Exercises in the task specific software systems
- Application: autonomous project work in the area of Virtual Reality in small groups

Soft Skills: Methodical approach to practical engineering problems, team and interdisciplinary work, time management.

Media

Stereoscopic projection in MR and VR at the Lifecycle Engineering Solutions Center (LESC), 15 computers, beamer

Literature

Presentations, Exercise documents, Tutorials, Books for individual work

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

The student gains detailed knowledge about heat generating technologies and their areas of application, in particular in the area of combined heat and power. The student is able to deal with technical and economic questions in this field.

Content

1. Introduction: Heat economy
2. CHP technologies (incl. calculation of profitability)
3. Heat systems (incl. calculation of profitability)
4. Distribution of heat
5. Demand for space heating and thermal insulation measures
6. Heat storage
7. Legal framework conditions
8. Laboratory experiment: compression heat pump

Media

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

Course: Elective „Educational development for student teachers“ [SQ PEW1]

Coordinators: Personalentwicklung
Part of the modules: Seminar Module (p. 145)[WW4SEM]

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

Learning Control / Examinations

Success is controlled according to §4(2), 3 SPO in the course of completion of different units of the tutorial program. These units consist of successful processing of online-units on Ilias platform, participating on the tutoring workshop and in at least one practice consulting, authoring a concluding work of reflection about own work of tutoring as well as writing a feedback on the work of reflection of another tutor. Participants will receive guidelines prior to writing the work of reflection and the feedback. If the participant works for two semesters as a tutor, 3 ECTS-points are credited. If the participant works for one semester as a tutor, only 2 ECTS-points are credited.

Conditions

Activity as tutor during the semester participating in the tutorial program is obligatory.

Recommendations

None.

Learning Outcomes

- Tutors are able to create their specific teaching situation based on their knowledge on didactical methods and learning processes.
- Tutors are able to analyze and control communications in teaching according to established models of communication (Watzlawick, Schulz von Thun).
- Tutors are able to explain and apply different instruments to purposefully intervene in learning and teaching situations in single or group settings.
- Tutors are able to name the rights and duties of their role as tutors and act according to them.
- Tutors are able to estimate their strengths and weaknesses as a teacher and are able to name strategies of further development.

Content

The tutoring program deals with theoretical and practical aspects of teaching behavior within the scope of a self-learning period by means of online-learning issues as well as in an classroom event lasting several days. The following topics are introduced and a thematical overview is given of:

- tutoring role and expectations, partly contrary, connected with it
- giving and receiving feedback
- basics of conversation
- aspects of learning process
- basics of planning a lecture/class
- evaluation/assessment and psychological sources of error connected with it
- intercultural communication during lecture/class
- moderation of a colloquium and moderation in teaching
- techniques of presentation with video feedback
- guiding teams and integrating group processes in the setting of teaching
- handling of difficult teaching-learning-situations
- guiding and evaluating scientific writing

Students get to know and practice the method of collegial coaching. They sit in on each other's lectures/classes and give each other feedback with the aid of a guideline. Tutors reflect in written form their own development as a teacher during the semester. Moreover they give each other a written feedback on this work of reflection.

Remarks

Please note that a maximum of 3 ECTS- points in the seminar module is distributed over Bachelor and Master.

The language of all events of the tutoring program is German.

Further information on the tutoring program is found on the homepage of Personnel Development service unit www.pew.kit.edu/387.php.

Course: Laboratory Work "Water" [22664]

Coordinators: H. Horn, G. Abbt-Braun

Part of the modules: Water Chemistry and Water Technology I (p. 134)[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:

Lime solution experiment,

Flocculation,

Adsorption,

Oxidation,

Atom absorption spectrometry,

Ion chromatography,

HPLC and

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: Water Resource Management and Engineering Hydrology [0170617]

Coordinators: Ihringer

Part of the modules: Understanding and Prediction of Disasters 2 (p. 137)[WI4INGINTER8], Understanding and Prediction of Disasters 1 (p. 136)[WI4INGINTER7]

ECTS Credits	Hours per week	Term	Instruction language
3	1/1	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).

Conditions

None.

Recommendations

None.

Learning Outcomes

see German version

Content

see German version

Course: Materials Science and Engineering III [2173553]

Coordinators: M. Heilmeier

Part of the modules: Specific Topics in Materials Science (p. 101)[W14INGMB33]

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

None.

Recommendations

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-Fe₃C; 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 and Industrial Handling [2149902]

Coordinators: J. Fleischer

Part of the modules: Machine Tools and Industrial Handling (p. 100)[WI4INGMB32]

ECTS Credits	Hours per week	Term	Instruction language
9	4/2	Winter term	de

Learning Control / Examinations

The assessment consists of a written exam (following §4(2), 1 of the examination regulation).

The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Conditions

None

Recommendations

None

Learning Outcomes

The students . . .

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

Content

The lecture provides an overview of machine tool and handling devices structures, use and application areas. Within the lecture based and industrially oriented knowledge for selection, dimensioning and evaluation is conveyed. First the components of machine tools are explained systematically. Here the distinctive features of dimensioning machine tools are deduced followed by the integral dimensioning of machine tools. Subsequently the use of machine tools is shown in exemplary application areas e.g. turning, milling, grinding, metal forming, sheet metal forming and gear cutting.

The lecture provides an inside view of industrial application and is illustrated with current examples.

The topics are as follows:

- Frame and frame components
- Main drives and main spindles
- Requirements for feed axes
- Electro-mechanical feed axis
- Fluidic feed axes
- Control technologies
- Peripheral components
- Metrological assessment
- Machine maintenance
- Process-diagnosis
- Machine tool examples

Media

Lecture notes will be provided in ilias (<https://ilias.studium.kit.edu/>).

Literature

Lecture Notes

Remarks

None

Course: Competition in Networks [26240]

Coordinators: K. Mitusch
Part of the modules: Network Economics (p. 54)[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 of 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 [6232807]**Coordinators:** W. Weißkopf**Part of the modules:** Transportation Modelling and Traffic Management (p. 120)[WI4INGBGU16], Fundamentals of Transportation (p. 119)[WI4INGBGU15], Project in Public Transportation (p. 123)[WI4INGBGU18]

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

Learning Control / Examinations

The assessment consists of an oral exam (15 minutes) according to §4(2), 2 of the examination regulation.

Conditions

See module description.

Learning Outcomes**Content**

Course: Windpower [23381]**Coordinators:** N. Lewald**Part of the modules:** Generation and transmission of renewable power (p. 131)[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. Begun 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 under www.ieh.kit.edu under "Studium und Lehre". Further book titles or relevant websites will be announced in the lecture.

Course: Economic Efficiency of Guided Transport Systems [6234902]

Coordinators: E. Hohnacker

Part of the modules: Project in Public Transportation (p. 123)[WI4INGBGU18], Logistics and Management of Guided Transport Systems (p. 126)[WI4INGBGU21]

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

Learning Control / Examinations

The assessment will consist of a oral exam (10 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.

Recommendations

See module description.

Learning Outcomes

See German version.

Content

basics of economy, accounting and finance, financing of investments, demand and offer for transportation, transportation market, transport policy

Remarks

See German version.

Course: Seminar Economic Theory [SemWIOR2]

Coordinators: C. Puppe

Part of the modules: Seminar Module (p. 145)[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.

Remarks

see German version.

Course: Knowledge Management [2511300]

Coordinators: R. Studer

Part of the modules: Electives in Informatics (p. 72)[WI4INFO3], Emphasis in Informatics (p. 70)[WI4INFO2], Informatics (p. 68)[WI4INFO1]

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: Knowledge Transfer in Innovation Management [2545020]

Coordinators: M. Weissenberger-Eibl, P. Roth
Part of the modules: Innovation Management (p. 47)[WI4BWLENT2]

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

Learning Control / Examinations

Non exam assessment (following §4(2), 3 of the examination regulation).

Conditions

None.

Recommendations

Prior attendance of the course *Innovation Management* [2545015] is recommended.

Learning Outcomes

By actively participating in this seminar, students develop a differentiated understanding of knowledge transfer processes in the innovation process which will enable them to shape this process.

Content

The flow of knowledge is decisive for innovations to occur. Innovation management therefore focuses on processes which determine the transfer of knowledge. In this course, these processes are regarded in more detail and discussed based on important scientific studies. The understanding developed in this way then forms the basis for the management of knowledge flows and thus the management of innovations.

Course: Welfare Economics [2520517]**Coordinators:** C. Puppe**Part of the modules:** Social Choice Theory (p. 58)[WI4VWL9], Allocation and Equilibrium (p. 56)[WI4VWL7]

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)

Remarks

For details see [German version](#).

Course: Workflow-Management [2511204]

Coordinators: A. Oberweis

Part of the modules: Informatics (p. 68)[WI4INFO1], Emphasis in Informatics (p. 70)[WI4INFO2], Electives in Informatics (p. 72)[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. 145)[WW4SEM]

ECTS Credits	Hours per week	Term	Instruction language
6	2	Winter / Summer Term	de

Learning Control / Examinations

Term paper (50%) and written conclusion (50%).

Conditions

None.

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.

7 Anhang: Qualifikationsziele Wirtschaftsingenieurwesen (M.Sc.)

Die Absolvent/innen des interdisziplinären Masterstudiengangs Wirtschaftsingenieurwesen verfügen über ein erweitertes und vertieftes Wissen in den Fächern Betriebswirtschaftslehre, Volkswirtschaftslehre, Informatik, Operations Research und den Ingenieurwissenschaften. Dieses ist schwerpunktmäßig auf die Betriebswirtschaftslehre und die Ingenieurwissenschaften ausgerichtet. Entsprechend den individuellen Interessen können weitere Schwerpunkte gelegt werden. Je nach Wahl können zusätzlich Kenntnisse aus dem Bereich Statistik, den Rechtswissenschaften oder der Soziologie vorliegen. Innerhalb der einzelnen Fächer besitzen die Absolvent/innen generalisierte oder spezialisierte Fachkenntnisse.

Die Absolvent/innen sind in der Lage, die Besonderheiten, Grenzen, Terminologien und Lehrmeinungen in den gewählten Themenbereichen dieser Fächer zu definieren, zu beschreiben, zu interpretieren, den aktuellen Forschungsstand wiederzugeben sowie punktuell weiterzuentwickeln. Ihr breites Wissen ermöglicht ihnen, interdisziplinär zu denken und Themen aus verschiedenen Blickwinkeln zu betrachten.

Sie können geeignete Handlungsalternativen zu forschungsrelevanten Themenkomplexen auswählen und kombinieren. Diese können sie auf spezifische Problemstellungen übertragen und anwenden. Umfangreiche Probleme sowie Informationen und aktuelle Anforderungen können sie differenziert betrachten und mit geeigneten Methoden und Konzepten analysieren, vergleichen und bewerten. Dabei schätzen sie Komplexität und Risiken ab, erkennen Verbesserungspotentiale und wählen nachhaltige Lösungsverfahren und Verbesserungsmethoden aus. Dadurch sind sie in der Lage, verantwortungsvolle und wissenschaftlich fundierte Entscheidungen zu treffen. Sie entwickeln innovative Ideen und können diese umsetzen.

Diese Vorgehensweisen können sie selbständig oder in Teams durchführen. Dabei sind sie in der Lage, ihre Entscheidungen zu erläutern und darüber zu diskutieren. Die gewonnenen Ergebnisse können sie eigenständig interpretieren, validieren und illustrieren.

Der interdisziplinäre Umgang mit dem Fachwissen erfolgt unter Berücksichtigung von gesellschaftlichen, wissenschaftlichen und ethischen Erkenntnissen.

Die Absolvent/innen können sich mit Fachvertretern auf wissenschaftlichem Niveau austauschen und herausgehobene Verantwortung auch in einem internationalen Team übernehmen. Karlsruher Wirtschaftsingenieure zeichnen sich durch ihre interdisziplinäre Denkweise sowie ihre Innovations- und Managementfähigkeit aus. Sie sind insbesondere für Tätigkeitsfelder in der Industrie, im Dienstleistungssektor oder in der öffentlichen Verwaltung sowie für eine nachgelagerte wissenschaftliche Laufbahn (Promotion) qualifiziert.

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.	Modul BWL 9	Modul ING 9	Modul Info 9	Modul Wahlpflicht 9	30
2.	Modul VWL 9	Modul ING 9	Modul OR 9		30
3.	Modul BWL 8	Modul Wahlpflicht 9	Modul Seminare + SQ 6 + 3		30
4.	Masterarbeit 30				30
					Gesamt: 120

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