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# Module Catalog

Bachelor's degree (B. Sc.)

Industrial Engineering Focusing on Mobility and Traffic (WMV)

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## List of Abbreviations

### General abbreviations:

SWS	Contact hours (45 min. each) per week
CP	Credit points according to the European Credit Transfer System (ECTS)

### Course type:

V	Lecture
Ü	Exercise course
L	Lab
P	Project assignment
S	Seminar
B	Supervision

### Forms of examination\*:

KL	Written exam with duration: KL30 = 30 min., KL60 = 60 min., KL90 = 90 min.
MP	Oral examination
RE	Paper and presentation
HA	Term paper
EA	Experimental work
ED	Creation and documentation of computer programs
PA	Project work
PR	Presentation
SA	Thesis
SP	Examination during the term
BA	Bachelor's Thesis
KO	Defense

\* A plus sign (+) indicates that all of the specified types of examinations are part of the module examination, and a slash (/) indicates that alternatively one of the specified types of examinations constitutes the module examination.

## 1. Term 1

### WMV 1 Introduction to Traffic Systems

<b>No:</b> WMV 1	<b>Mandatory module:</b> Introduction to Traffic Systems	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each fall term		<b>Term:</b> 1	
		<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60	
	<b>Prerequisites for participation:</b> none	<b>Contact hours:</b> 60 hrs.	<b>Self-study hours:</b> 90 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Introduction to Traffic Systems		Prof. Dr. Cerbe		V+Ü	3+1
This module is used for the following degree programs: WMV					
<b>Contents</b>  Introduction; basic concepts of traffic; structuring of the overall traffic system as well as of sub-traffic systems; characteristics, presentation and comparison of traffic systems, relationships between traffic and mobility; origin of traffic; history of traffic, current traffic in figures, traffic forecasts; description of movement processes; quantification of the performance of traffic systems; environmental effects of traffic systems, e.g. noise and air pollutants  Outline 1. Traffic system and mobility 2. Historical development of traffic 3. Traffic statistics and traffic forecasts 4. Requirements for traffic systems - traffic quality 5. Traffic infrastructure 6. Means of transport 7. Production (public transport) and performance of transport systems 8. Traffic and the environment					
<b>Learning objectives and competencies to be imparted</b>  Upon completion of this module, students will have an understanding of the structure of the overall traffic system and will be familiar with the similarities and differences between the sub-traffic systems. They are able to evaluate and compare traffic systems in terms of suitability, performance, resource consumption, environmental impact, etc. and to select the most advantageous system for specific applications.					
<b>Literature and teaching aids</b>  Bundesministerium für Verkehr und digitale Infrastruktur (ed.) (2018): Verkehr in Zahlen 2018/2019, DVV Media Group GmbH, Hamburg Infas, DLR, IVT and Infas 360 (2018): Mobilität in Deutschland (im Auftrag des BMVI, Bonn/Berlin Schnabel, W.; Lohse, D. (2011): Grundlagen der Straßenverkehrstechnik und der Verkehrsplanung (2 volumes), 3rd edition, Kirschbaum Verlag, Berlin					

**WMV 2 Economics and Private Business Law**

<b>No:</b> WMV 2	<b>Mandatory module:</b> Economics and Private Business Law	<b>Language:</b> German		<b>Credit points:</b> 8	
		<b>Frequency:</b> each fall term		<b>Term:</b> 1	
	<b>Prerequisites for participation:</b>	<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> KL90	
<b>Contact hours:</b> 90 hrs.		<b>Self-study hours:</b> 150 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Economics (Microeconomics and Macroeconomics)		Dipl.-Kfm Wiljes		V+Ü	3+1
Private Business Law				V	2

This module is used for the following degree programs: MPM and WMV

**Contents**Economics (Microeconomics and Macroeconomics):

- Methods of economic theory formation and economic thinking
- Division of labor, economic systems and orders
- Fundamentals of the theory of supply and demand in the presence of full competition
- Determinants and elasticities of supply and demand
- Introduction to budgetary and business theory
- Equilibrium solutions in goods markets with functioning competition
- Market regulations (state intervention and welfare)
- Market types, price formation and corporate behavior in the presence of imperfect competition
- Market failures (public goods, externalities, ...)
- Basic macroeconomic relationships (economic cycle, basic features of national accounting, distribution of income and wealth, government and public budget, public debt, business cycle and growth, ...)
- Introduction to macroeconomic theories
- Basic features of the macroeconomic goods market, the money market and the labor market
- Interaction of goods, money and labor markets
- Economic policy intervention options
- Foreign trade and international economy

Private Business Law:

- Fundamentals and concepts of law; separation of powers
- Structure of the BGB, case handling and subsumption, principle of abstraction, subjects and objects of law
- Declaration of intent; contract; defects of the legal transaction; representation (including procurator and power of attorney), condition; time limits and statute of limitations
- Concept and origin of the obligation; performance obligations, time and place; involvement of third parties; compensation for damages (types, scope and calculation); liability for vicarious agents; termination of the obligation; default in the obligation, liability for breach of contract, contract with protective effect in favor of third parties
- General terms and conditions
- Fundamentals of the law of commercial enterprises (concept of merchant and types of merchants, commercial company and register)

Economics (Microeconomics and Macroeconomics):

Students gain a basic understanding of economic relationships and master the central terminology. They learn how to use economic theories and models, but they are also able to critically question their validity in individual cases.

The central learning objective of this module is a basic understanding of how markets work. The focus is on microeconomic relationships and behavioral patterns in goods markets. Students will be able to analyze markets, assess the framework conditions and power relations, and thus estimate the consequences of individual economic measures.

Knowledge of the most important macroeconomic relationships (e.g. interaction of goods, money and labor markets) enables students to understand and assess macroeconomic developments and their effects. The central problems and the most important economic policy instruments to combat them are known. Students recognize the importance of macroeconomic developments for companies and households and can assess the extent of economic interdependencies with foreign countries.

The acquired knowledge of individual and macroeconomic contexts enables students to better classify further contents of the degree program and thus contributes to a better overall understanding.

#### Fundamentals of Private Business Law:

Knowledge of the basics of law, BGB general part, general law of obligations and commercial law as well as the concepts, knowledge, contexts and skills (especially subsumption technique/expert opinion style) to solve practical cases

#### **Literature and teaching aids**

##### Economics (Microeconomics and Macroeconomics):

Bartling, H., Luzius, F., Fichert, F. (2019): Grundzüge der Volkswirtschaftslehre. Einführung in die Wirtschaftstheorie und Wirtschaftspolitik, 18th edition, Vahlen, Munich

Blanchard, O., Illing, G. (2017): Makroökonomie, 7th edition, Pearson Studium, Munich.

Brunner, S., Kehrlé, K. (2014): Volkswirtschaftslehre, 3rd edition, Vahlen, Munich

Krugman, P., Wells, R. (2017): Volkswirtschaftslehre, 2nd edition, Schäffer-Poeschel, Stuttgart

Mankiw, G., Taylor, M.P. (2018): Grundzüge der Volkswirtschaftslehre, 7th ed. edition, Schäffer-Poeschel, Stuttgart

Samuelson, P.A., Nordhaus, W.D. (2016): Volkswirtschaftslehre. Das internationale Standardwerk der Makro- und Mikroökonomie, 5th edition, FinanzBuch-Verlag, Munich

Varian, H. (2016): Grundzüge der Mikroökonomie, 9th edition, De Gruyter Oldenbourg, Berlin, Boston.

##### Private Business Law:

Slide sets and assignment sheets.

Führich, E. R.: Wirtschaftsprivatrecht, current edition, Franz Vahlen, Munich; also available via campus license.

Klunzinger, E.: Einführung in das Bürgerliche Recht, current edition, Vahlen, Munich (subject to change of publisher); also available via campus license.

Müssig, P.: Wirtschaftsprivatrecht, current edition, C.F. Müller, Heidelberg

Oetker, H.: Handelsrecht, current edition, Springer, Berlin, Heidelberg, campus license only.

Wörten, R.; Metzler-Müller, Karin: BGB AT: mit Einführung in das Recht, current edition, Franz Vahlen, Munich.

Wörten, R.; Metzler-Müller, K.: Schuldrecht AT, current edition, Franz Vahlen, Munich.

Wörten, R.; Metzler-Müller, K.: Schuldrecht BT, current edition, Franz Vahlen, Munich.

**WMV 3 Mathematics I**

<b>No:</b> WMV 3	<b>Mandatory module:</b> Mathematics I	<b>Language:</b> German		<b>Credit points:</b> 9	
		<b>Frequency:</b> each fall term		<b>Term:</b> 1	
		<b>Workload:</b> 270 hrs.		<b>Form of examination:</b> KL90	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 90 hrs.	<b>Self-study hours:</b> 180 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Introduction to Mathematics		TBD		V+Ü	4+2
This module is used for the following degree programs: WMV					
<b>Contents</b>					
<ul style="list-style-type: none"> <li>- Complex numbers</li> <li>- Vector calculus</li> <li>- Linear systems of equations</li> <li>- Sequences and series</li> <li>- Differential and integral calculus of a real variable</li> <li>- Simple numerical methods</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
Upon completion of the module, students will have mastered the basic applications of quantitative methods in the field of traffic management.					
<b>Literature and teaching aids</b>					
Lecture notes and exercises Papula, L., Mathematik für Ingenieure und Naturwissenschaftler vol 1-2, Vieweg Braunschweig/Wiesbaden 2000 Von Mangoldt, H./ Knopp, K.: Einführung in die höhere Mathematik vol. 1-3, current edition Marsden, Weinstein, Calculus 1 - 3, Springer 1998 Erwe, F., Differential- und Integralrechnung 1 - 2, BI-Hochschultaschenbücher Mannheim, 1973 Kowalski, H-J, Einführung in die lineare Algebra Tietz, H., Lineare Geometrie, Vandenhoeck & Ruprecht Göttingen, 1973 Wörle, K./ Kratz, J./ Keil K.-A.: Infinitesimalrechnung, current edition					



**WMV 4 Introduction to Business Administration**

<b>No:</b> WMV 4	<b>Mandatory module:</b> Introduction to Business Administration	<b>Language:</b> German		<b>Credit points:</b> 6	
		<b>Frequency:</b> each fall term		<b>Term:</b> 1	
	<b>Prerequisites for participation:</b>	<b>Workload:</b> 180 hrs.		<b>Form of examination:</b> KL60	
<b>Contact hours:</b> 60 hrs.		<b>Self-study hours:</b> 120 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Introduction to Business Administration		Prof. Dr. Trost		V+Ü	3+1
This module is used for the following degree programs: MPM, WMV					
<b>Contents</b>					
<ul style="list-style-type: none"> <li>- Subject and classification of business administration</li> <li>- Basic terms, fundamental concepts and principles of business administration</li> <li>- Corporate objectives, corporate governance and management processes, human resources and personnel management</li> <li>- Business management instruments/management tools</li> <li>- Constitutive decisions: choice of legal form and location of the company, form of organization, business combinations and mergers</li> <li>- Operational service creation processes in procurement, production and marketing, overview of internal and external accounting</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
<p>The module teaches students basic interrelations in business administration. After a classification of business administration, the students know the basic terms of business administration and fundamental concepts and principles and apply them correctly in relation to constitutive decisions and service creation processes. They develop an understanding of operational decision-making processes. Furthermore, students learn and understand the basic concepts and fundamentals of corporate management and human resources management as well as functions of management and are able to assess corporate goals and target relationships. They critically examine business management concepts and their application limits. In addition, a brief overview of financial management, internal and external accounting is provided. Based on exemplary tasks, the students deal with some of the above-mentioned topics, develop solutions independently, assess the quality of the solutions, and discuss their transferability.</p>					
<b>Literature and teaching aids</b>					
<p>Extensive lecture notes (will be provided as PDF files)</p> <p>Jung, H. (2016): Allgemeine Betriebswirtschaftslehre, München, 13th edition, Berlin, Boston</p> <p>Neus, W. (2013): Einführung in die Betriebswirtschaftslehre aus institutionenökonomischer Sicht, 8th edition, Tübingen</p> <p>Schierenbeck, H., Wöhle, C. B. (2016): Grundzüge der Betriebswirtschaftslehre, 19th edition, Munich</p> <p>Schultz, V. (2014): Basiswissen Betriebswirtschaft, Management, Finanzen, Produktion, Marketing 5th edition, Munich.</p> <p>Selchert, F.W., Greinert, M. (2002): Einführung in die Betriebswirtschaftslehre, Übersichtsdarstellungen, 8th edition, Munich</p> <p>Straub, Th. (2014): Einführung in die Allgemeine Betriebswirtschaftslehre, 26th 2014 edition, Halbergmoos</p> <p>Thommen, J.-P. / Achleitner, A.-C. (2017): Allgemeine Betriebswirtschaftslehre. Umfassende Einführung aus managementorientierter Sicht, 8th ed. edition, Wiesbaden:</p> <p>Wöhe, G./ Döring, U. (2016): Einführung in die Allgemeine Betriebswirtschaftslehre, 26th edition, Munich.</p>					

## 2. Term 2

### WMV 5 Transport Industry and Mobility

<b>No:</b> WMV 5	<b>Mandatory module:</b> Transport Industry and Mobility	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each spring term		<b>Term:</b> 2	
	<b>Prerequisites for participation:</b>	<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60	
<b>Contact hours:</b> 56 hrs.		<b>Self-study hours:</b> 94 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Transport Industry and Mobility		Prof. Dr. Trost		V+Ü	3+1
This module is used for the following degree programs: LOM, LOP, LIM, MPM, WMV					
<b>Contents</b>					
<ul style="list-style-type: none"> <li>- Basics, technical terms and basic interrelationships of the transport industry, in general and with regard to the mode of transport</li> <li>- Structure, importance and development of the transport sector (statistical coverage of mobility and transport, longitudinal and cross-sectional comparisons, forecast)</li> <li>- Internal and external developments in the transport sector, background on mobility</li> <li>- Transportation policy regulatory framework, service and cost structures</li> <li>- Lines of development of national and EU transport policy</li> <li>- Markets, organizational structures and competitive conditions in the transport sector, including new mobility services</li> <li>- Basic approaches to pricing and infrastructure policy</li> <li>- Mobility recording, causes of mobility</li> <li>- Possibilities and strategies for influencing mobility and traffic</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
<p>After the course, students will know the basic facts of the transportation industry and they will be able to confidently use the terminology and apply it to similar contexts and in other subjects. Students will have a broad basic knowledge of the entire transportation and traffic sector in an inter-company perspective. Current developments can be described, causes and backgrounds identified and analyzed and applied to developments that are forecast. The framework conditions in passenger and freight transport are mastered and the current market and competitive conditions of transport companies in the various submarkets are known, both in a national and in an EU-wide/international context. After having acquired the basics of mobility recording and causes of mobility, students are able to assess and critically question possibilities for influencing mobility and traffic and to formulate independent proposals.</p>					
<b>Literature and teaching aids</b>					
<p>Extensive lecture notes (will be provided as PDF files)</p> <p>Aberle, G. (2009): Transportwirtschaft, 5th edition, Munich</p> <p>Bichler, K. et. al. (2017): Kompakt-Lexikon Logistik, 3rd edition, Wiesbaden</p> <p>Grandjot, H.-H/ Bernecker, T. (2014): Verkehrspolitik – Grundlagen, Funktionen und Perspektiven für Wissenschaft und Praxis, Hamburg</p> <p>Hölser, Th. (eds.; 2016): Lorenz 1. Leitfaden für Spediteure und Logistiker in Ausbildung und Beruf: Grundlagen der Verkehrswirtschaft, Spedition &amp; Logistik, Speditions- und ... Kombiniertes Verkehr, Lagerei &amp; Distribution, 25th edition, Hamburg</p> <p>Krampe, H; Lucke, H.-J., Schenk, M. (2012): Grundlagen der Logistik – Einführung in die Theorie und Praxis</p>					

logistischer Systeme, 4th edition, Munich

Kummer, S. (2018): Einführung in die Verkehrswirtschaft, 3rd edition, Stuttgart

Nobis, C./ Kuhnimhof, T. (2018): Mobilität in Deutschland – MiD Ergebnisbericht. Studie von infas, DLR, IVT und infas 360 im Auftrag des Bundesministers für Verkehr und digitale Infrastruktur, Bonn, Berlin. [www.mobilitaet-in-deutschland.de](http://www.mobilitaet-in-deutschland.de)

**WMV 6 Introduction to Information Systems**

<b>No:</b> WMV 6	<b>Mandatory module:</b> Introduction to Information Systems	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each spring term		<b>Term:</b> 2	
	<b>Prerequisites for participation:</b> none	<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60	
<b>Contact hours:</b> 56 hrs.		<b>Self-study hours:</b> 94 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Introduction to Information Systems		Dipl.-Ing. (FH) Apel M.Sc.Eng.		V+Ü	3+1
This module is used for the following degree programs: WMV					
<b>Contents</b>					
<ul style="list-style-type: none"> <li>- Goals and application areas of information systems</li> <li>- Computer systems structure</li> <li>- History of the computer</li> <li>- Computer architectures</li> <li>- Number systems</li> <li>- Internet</li> <li>- HTML</li> <li>- CSS</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
After successful participation in this module, students will be able to use and understand information systems. Working methods of information systems are internalized and simple web applications can be created.					
<b>Literature and teaching aids</b>					
Levi, Rembold (2002): Einführung in die Informatik für Naturwissenschaftler und Ingenieure, 4th edition, Carl Hanser Verlag Precht, Meier, Tremel (2004); Eine Einführung in Theorie und Praxis der modernen EDV, 7th edition, Addison-Wesley Publishers Jürgen Wolf (2015): HTML 5 und CSS 3, 1st edition, Rheinwerk Verlag, Bonn Kai Laborenz (2015): CSS Das umfassende Handbuch, 3rd edition, Rheinwerk Verlag, Bonn					

**WMV 7 Mathematics II**

<b>No:</b> WMV 7	<b>Mandatory module:</b> Mathematics II	<b>Language:</b> German		<b>Credit points:</b> 9	
		<b>Frequency:</b> each spring term		<b>Term:</b> 2	
		<b>Workload:</b> 270 hrs.		<b>Form of examination:</b> KL90	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 84 hrs.	<b>Self-study hours:</b> 186 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Advanced Mathematics		TBD		V+Ü	4+2
This module is used for the following degree programs: WMV					
<b>Contents</b>					
<ul style="list-style-type: none"> <li>- Differential and integral calculus for functions of several real variables</li> <li>- Differential equations</li> <li>- Laplace transformation</li> <li>- Basic concepts of descriptive statistics</li> <li>- Regression calculation</li> <li>- Probability</li> <li>- Discrete and continuous random variables</li> <li>- Special distributions</li> <li>- Confidence intervals</li> <li>- Parameter tests</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
Upon completion of this module, students will know advanced mathematical methods and be able to apply them to problems in engineering.					
<b>Literature and teaching aids</b>					
<p>Exercise materials (PDF files)</p> <p>Papula, L., Mathematik für Ingenieure und Naturwissenschaftler vol. 1 to 3, Vieweg Braunschweig/Wiesbaden 2000</p> <p>Collatz, L., Differentialgleichungen, Teubner Stuttgart</p> <p>Kamke, E., Differentialgleichungen 1 - 2, Teubner Stuttgart 1983</p> <p>Precht, M., Angewandte Statistik I, Oldenbourg München Wien 1999</p> <p>Bosch, K., Großes Lehrbuch der Statistik, Oldenbourg München Wien 1996</p> <p>Fisz, Wahrscheinlichkeitsrechnung und mathematische Statistik, Deutscher Verlag der Wissenschaften Berlin</p>					

**WMV 8 Academic and Social Skills**

<b>No:</b> WMV 8	<b>Mandatory module:</b> Academic and Social Skills	<b>Language:</b> German		<b>Credit points:</b> 6	
		<b>Frequency:</b> each fall term		<b>Term:</b> 2	
		<b>Workload:</b> 180 hrs.		<b>Form of examination:</b> PR+HA	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 56 hrs.	<b>Self-study hours:</b> 120 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Academic Skills and Methods		Dipl.-Ök. Anja Borchers		S	1
Presentation, Moderation and Communication				S	3
This module is used for the following degree programs: WMV					
<b>Contents</b>					
<p><u>Academic Skills:</u> Definition and meaning of scientific work, types of scientific work, literature research, topic identification, hypothesis formation, outline creation, structure of scientific work, content-related and formal guidelines (e.g. citation style, text design, creation of lists).</p> <p><u>Presenting:</u> Definition of the term "presentation", clarification of the presentation goal, analysis as well as consideration of the target group, selection and structuring of the contents, principles as well as possibilities of visualizations, selection and use of different media, handling of difficult situations (stage fright, questions, objections, breakdowns), organization of the presentation, execution of a presentation with subsequent discussion/reflection</p> <p><u>Communicating and Facilitating Meetings:</u> Definition, goals, tasks and areas of application of facilitation; the role of the facilitator / dual role of executive/facilitator; procedure/phases of facilitating a meeting; dealing with difficult types of participants; detailed description of the instruments or the tools of facilitating; planning the facilitation of a meeting; communication theory and models and their application; conversation techniques (I-messages, listening, questions), body language, feedback techniques, basic rules of constructive communication</p>					
<b>Learning objectives and competencies to be imparted</b>					
Students acquire important methodological and social skills for later professional and management tasks.					
<p><u>Academic Skills:</u> Students learn basic principles of scientific work. They acquire content-related and methodological knowledge of scientific work in order to be able to produce their own scientific work correctly, i.e. they are able to work on a topic or a problem according to scientific standards and principles.</p> <p><u>Presenting:</u> With the help of the acquired basic knowledge on the topic of "presenting" as well as due to the various practical exercises within the course, the students are able to prepare and give an effective presentation.</p> <p><u>Communicating and Facilitating Meetings:</u> Furthermore, the students master the facilitation methodology with its goals and possible applications. Students are also familiar with the role of the facilitator and his or her responsibilities. They can lead conversations and ensure balanced participation of all participants. They will get to know and use different facilitation methods. In addition, students will be able to plan and present facilitation procedures for a variety of settings.</p>					

Furthermore, they have strategies on how facilitators can deal with difficult participants. A great deal of emphasis is placed on students implementing the tools/methods of facilitating in practical exercises. Exercises in plenary and in small groups alternate. Active participation of students is required in the seminar. Communication is the foundation of any relationship. Not communicating is not possible. It is not only a matter of formulating messages clearly and concisely, but also of interpreting the messages of others correctly. In the area of "Communication", students learn the most important aspects of communication and conversation management and practice these by means of exercises and role plays.

### **Literature and teaching aids**

#### Academic Skills:

Esselborn-Krumbiegel, H. (2017): Richtig wissenschaftlich schreiben: Wissenschaftssprache in Regeln und Übungen, 5th edition, Paderborn: UTB GmbH

Stickel-Wolf, C. (2016): Wissenschaftliches Arbeiten und Lerntechniken: Erfolgreich studieren - gewusst wie!, 8th edition, Wiesbaden: Springer Gabler Verlag

Theisen, M. R. (2017): Academic Skills: Erfolgreich bei Bachelor- und Masterarbeit, 17th edition, Munich. Vahlen Verlag

#### Presenting:

Lecture notes

Hartmann, M./ Funk, R./ Nietmann, H. (2018): Präsentieren: Präsentationen: zielgerichtet, adressatenorientiert, nachhaltig, 10th revised edition, Weinheim, Basel: Beltz Verlag

Holzheu, H. (2010): Natürliche Rhetorik ohne Lampenfieber, München: Goldmann Verlag (TB)

Schilling, G. (2012): Angewandte Rhetorik und Präsentationstechnik: Der Praxisleitfaden für Vortrag und Präsentation, revised edition, Berlin: Gert Schilling Verlag

Schulz von Thun, F. (2016): Miteinander Reden 1 - Störungen und Klärungen, 53th edition (original edition), Reinbek bei Hamburg: Rowohlt Taschenbuch Verlag

Schulz von Thun, F./ Ruppel, J./ Stratmann, R. (2017): Miteinander Reden: Kommunikationspsychologie für Führungskräfte, 17th edition (original edition), Reinbek bei Hamburg: Rowohlt Taschenbuch Verlag

Seifert, J. W. (2015): Visualisieren - Präsentieren – Moderieren, 35th edition, Offenbach: Gabal Verlag

#### Communicating and Facilitating Meetings:

Lecture notes

Funcke, A., Havenith, E. (2017): Moderationstools, 5th edition, Bonn: managerSeminare Verlags GmbH

Graefner, G. (2013): Moderation- das Lehrbuch: Gruppensteuerung und Prozessbegleitung, 2nd edition, Augsburg: ZIEL Verlag

Groß, S. (2018): Moderationskompetenzen: Kommunikationsprozesse in Gruppen zielführend begleiten, Wiesbaden: Springer Gabler

Hartmann, M. u.a. (2012): Zielgerichtet moderieren, 6th edition, Weinheim, Basel: Beltz Verlag

Sperling, J. B./Stapelfeldt, U., Wasseveld-Reinhold, J. (2011): Moderation, Freiburg: Haufe Lexware Verlag

**WMV 9 Finance and Accountancy**

<b>No:</b> WMV 9	<b>Mandatory module:</b> Finance and Accountancy	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each spring term		<b>Term:</b> 2	
		<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 56 hrs.	<b>Self-study hours:</b> 94 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Finance and Accountancy		TBD		V+Ü	3+1
This module is used for the following degree programs: WMV					
<b>Contents</b>					
<ul style="list-style-type: none"> <li>- Basics of cost and activity accounting, financing and investment</li> <li>- Economic efficiency calculations</li> <li>- Static and dynamic investment calculation methods take into account financial mathematical principles</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
<p>After completing the module, students will know how companies can determine and influence their costs in order to derive realistic pricing scenarios. Ways to raise and spend money put students in a position to recognize initial economic business objectives such as profitability criteria. Alternative financing, such as leasing, can be examined from a profitability perspective and analyzed internationally. Students will be able to identify financial instruments and interrelationships and explain them using practical examples. In addition, students are able to decide when investments are worthwhile. They will be able to demonstrate and assess the impact of investments on companies.</p>					
<b>Literature and teaching aids</b>					
<p>Extensive lecture notes and exercises (will be provided as PDF files)</p> <p>Buchner, R.(2005): Buchführung und Jahresabschluss, 7th edition, Vahlen, München</p> <p>Däumler, K.; Grabe, J.: Kostenrechnung 1 Grundlagen, 11th edition, NWB-Verlag, Herne.</p> <p>Däumler, K.; Grabe, J.: Kostenrechnung 2 Deckungsbeitragsrechnung, 10th edition, NWB-Verlag, Herne.</p> <p>Eisele, w.; Knobloch, A. P. Technik des Betrieblichen Rechnungswesens, 9th edition, Vahlen, Munich.</p> <p>Olfert, K.: Finanzierung, 17th edition, Kiehl Verlag, Ludwigshafen 2017</p> <p>Olfert, K.: Investition, 13th edition, Kiehl Verlag, Ludwigshafen 2015</p> <p>Olfert, K.: Kompakt-Training Kostenrechnung, 6th edition, Kiehl Verlag, Ludwigshafen 2010</p> <p>Heinold, M.: Buchführung in Fallbeispielen, 12th edition, Stuttgart</p> <p>Jórasz, W.: Kosten- und Leistungsrechnung, 5th edition, Schäffer-Poeschel, Stuttgart.</p>					



### 3. Term 3

#### WMV 10 Engineering Mechanics

<b>No:</b> WMV 10	<b>Mandatory module:</b> Engineering Mechanics	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each spring term		<b>Term:</b> 3	
		<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60	
<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 60 hrs.	<b>Self-study hours:</b> 90 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Engineering Mechanics		Prof. Dr. Cerbe		V+Ü	2+2
This module is used for the following degree programs: WMV					
<b>Contents</b> <ul style="list-style-type: none"> <li>- Classification of mechanics in physics</li> <li>- Object of work and method of operation</li> <li>- Basic concepts of vector calculus</li> <li>- Statics: forces and equilibrium at the mass point, force and moment equilibrium at the rigid body</li> <li>- Introduction to elastostatics</li> <li>- Kinematics: movement description</li> <li>- Dynamics: dynamic fundamental law</li> <li>- Work, energy and power</li> <li>- Pulse and energy theorem</li> <li>- Mechanical vibrations</li> </ul>					
<b>Learning objectives and competencies to be imparted</b> <p>Students acquire the basic engineering skills in the field of engineering mechanics that are needed, among other things, to understand the operation of transportation systems and to work on design or optimization problems of subsystems or components.</p>					
<b>Literature and teaching aids</b> <p>Gross, D.; Hauger, W.; Schröder, J. ; Wall, W.A. (2016): Technische Mechanik 1 – Statik, 13th edition, Springer Gabler, Berlin/Heidelberg. Additional working materials will be provided as part of the course.</p>					

**WMV 11 Traffic Ecology**

<b>No:</b> WMV 11	<b>Mandatory module:</b> Traffic Ecology	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each fall term		<b>Term:</b> 3	
		<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60+EA / KL60+HA	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 60 hrs.	<b>Self-study hours:</b> 90 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Traffic Ecology		Hon. Prof. Strube		V+Ü	2 + 2
This module is used for the following degree programs: MPM and WMV					
<p><b>Contents</b></p> <ul style="list-style-type: none"> <li>- Introduction</li> <li>- Mobility versus environment</li> <li>- Traffic noise</li> <li>- Pollutants</li> <li>- Alternative fuels and drives</li> <li>- Environmental accounting</li> <li>- Energy consumption</li> <li>- Land use</li> <li>- External costs</li> <li>- Transport sustainability</li> </ul>					
<p><b>Learning objectives and competencies to be imparted</b></p> <p>The aim is to provide students with knowledge in the field of traffic ecology and to introduce them step by step to the necessary basics and terminology. Students will gain a holistic understanding of the interactions between the environment and traffic.</p> <p>After participation, students will have developed a sound understanding of the concepts of traffic ecology. They will have methodological and conceptual competencies regarding the cross-relationships between traffic and the environment, will be able to prepare emission balances, and will be able to apply sustainability methods in theory and practice.</p>					
<p><b>Literature and teaching aids</b></p> <p>Literature and working materials as well as competent contact persons will be presented and named during the course.</p>					

**WMV 12 Traffic Planning**

<b>No:</b> WMV 12	<b>Mandatory module:</b> Traffic Planning	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each fall term		<b>Term:</b> 3	
		<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60+PA	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 60 hrs.	<b>Self-study hours:</b> 90 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Traffic Planning		Prof. Dr.-Ing. Menzel		V+Ü	2+2
This module is used for the following degree programs: MPM, WMV					
<b>Contents</b>					
<p><u>Lecture Traffic Planning:</u> Principles and methodology of traffic planning, development and current status, planning process, steps of planning; division into traffic development planning and object planning, aspects of individual means of transport as well as group-specific aspects (e.g. accessibility) are explained theoretically and by means of practical examples</p> <p><u>Exercise Course Traffic Planning:</u> Within the semester, up to 4 traffic planning assignments and a one-day assignment with real-world and current relevance will be given, which can be completed individually or in small groups.</p>					
<b>Learning objectives and competencies to be imparted</b>					
<p>Upon successful participation, students possess methodological and conceptual competencies in all areas of traffic planning starting from the superordinate level of traffic development planning up to concrete traffic object planning. In the lecture and even more so in the exercise course, the taxonomy levels "analysis" and "synthesis" have to be achieved for the most part in order to pass with at least the grade "good" To achieve the grade 1.0 (very good), additional knowledge must be developed through independent study and in the exercise course. To pass with a "sufficient" 4.0, the "analysis" taxonomy level must be achieved in at least core aspects of traffic. Accordingly, the exam is divided into three equal parts: "collection questions", "comprehension questions" and "transfer questions". Correct answers to the "collection questions" and at least half of the "comprehension questions" correspond to reaching the taxonomy level "analysis" in core aspects. Reflection and criticism in the exercise course correspond to the taxonomy level "assessment" and can lead to an improvement of the grade in the exam (also to passing it).</p>					
<b>Literature and teaching aids</b>					
Literature and working materials as well as competent contact persons will be presented and named during the course.					

**WMV 13 Programming with Laboratory**

<b>No:</b> WMV 13	<b>Mandatory module:</b> Programming with Laboratory	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each fall term		<b>Term:</b> 3	
		<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 60 hrs.	<b>Self-study hours:</b> 90 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Programming with Laboratory		Dipl.-Ing. (FH) Apel M.Sc.Eng.		V+L	3+1
This module is used for the following degree programs: WMV					
<b>Contents</b>					
<u>Programming with Laboratory:</u> <ul style="list-style-type: none"> <li>- Fundamental data types</li> <li>- Data input and output</li> <li>- Operators</li> <li>- Keywords</li> <li>- Functions</li> <li>- Control structures</li> <li>- Algorithms and data structures</li> <li>- Fields</li> <li>- Arduino</li> <li>- Microcontroller</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
Upon completion of this module, students will be familiar with the control structures of a higher programming language as well as the program structure and can apply this to problems in the engineering sciences and subsequent modeling on the basis of selected case studies.					
<b>Literature and teaching aids</b>					
Levi, Rembold (2002): Einführung in die Informatik für Naturwissenschaftler und Ingenieure, 4th edition, Carl Hanser Verlag Precht, Meier, Tremel (2004); Eine Einführung in Theorie und Praxis der modernen EDV, 7th edition, Addison-Wesley Publishers Wolf (2009): C von A bis Z, 3rd edition, Rheinwerk Verlag Bartmann (2014): Die elektronische Welt mit Arduino entdecken, 2nd edition, O'Reilly					

**WMV 14 Business English**

<b>No:</b> WMV 14	<b>Mandatory module:</b> Business English	<b>Language:</b> English		<b>Credit points:</b> 3	
		<b>Frequency:</b> each fall term		<b>Term:</b> 3	
		<b>Workload:</b> 90 hrs.		<b>Form of examination:</b> KL60	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 30 hrs.	<b>Self-study hours:</b> 60 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Business English		Dr. Caplan		V	2
This module is used for the following degree programs: programs at the Faculty of Transport-Sports-Tourism-Media					
<b>Contents</b>					
<ul style="list-style-type: none"> <li>- Advanced grammar and communication basics</li> <li>- English vocabulary of economics and business administration</li> <li>- Strategic thinking</li> <li>- Motivation and personnel in the company</li> <li>- Personality traits</li> <li>- Team spirit and organization</li> <li>- Stakeholder theory</li> <li>- Corporate Social Responsibility (CSR)</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
Students will build a basic vocabulary of business English and gain insight into the "mind of the manager" and the relationship to the customer and to co-workers through a variety of assignments and discussions. Students will be able to understand personality development and innovation in business. This seminar deals with the role of ideals in business and the work of a manager and gives insight into the philosophical background of the term "CSR". Furthermore, the term "customer" will be deepened and discussed.					
<b>Literature and teaching aids</b>					
<p>Caplan, Th. (2015): The Distinction of Human Being, Vernon Press, Delaware.</p> <p>Duckworth, M./ Turner, R. (2012): Business Result, Upper-Intermediate, Oxford</p> <p>Dubicka, I./ O'keeffe, M. (2016): Market Leader, Advanced, 3rd ed., Pearson, London.</p> <p>Trappe, T./Tullis, G. (2016): Intelligent Business, Advanced, 5th ed., Pearson, London.</p> <p>Rosenberg, M. (2020): Business Partner, C1 Coursebook, 1st ed., Pearson, London.</p>					

**WMV 15 Electrical Engineering with Laboratory**

<b>No:</b> WMV 15	<b>Mandatory module:</b> Electrical Engineering with Laboratory	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each fall term		<b>Term:</b> 3	
	<b>Prerequisites for participation:</b>	<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60+EA	
<b>Contact hours:</b> 60 hrs.		<b>Self-study hours:</b> 90 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Electrical Engineering with Laboratory		Prof. Dr. Brey		V+L	3+1
This module is used for the following degree programs: WMV					
<b>Contents</b>					
<p>Terms such as field, potential and work and their general meaning are introduced. The properties of electrical circuits are described for both direct and alternating current. The time-dependent behavior of characteristic quantities is described for practically relevant arrangements, the generation and propagation of electromagnetic waves and their application in logistics in the use of modern communication technologies and transponders. Applications of electronics, energy storage, and energy conversion relevant to transportation are discussed. Questions of planning/the design of experiments and of the evaluation of measurement data are introduced on the basis of electrotechnical examples and the transfer to general problems is shown.</p>					
<b>Learning objectives and competencies to be imparted</b>					
<p>Students learn basic methods of static and time-dependent electrical systems. They get an overview of current developments in the fields of electronics and the use of electrical energy. They gain insight into the planning of experiments and the evaluation of measurement series.</p>					
<b>Literature and teaching aids</b>					
<p>Lecture notes  M. Alonso and E. J. Finn : Fundamental University Physics (Volume II) – Fields and Waves, Addison-Wesley  S. Altmann, D. Schlayer : Lehr- und Übungsbuch der Elektrotechnik, Hanser, München, 2001  G.E. Box, J.S. Hunter, W.G. Hunter: Statistics for Experimenters, John Wiley &amp; Sons, Hoboken, New Jersey, 2007  W. Caspary, K. Wichmann : Auswertung von Messdaten, Oldenborug, München, 2007  R. Pregla : Grundlagen der Elektrotechnik, Hüthig, Heidelberg, 2004</p>					

## 4. Term 4

### WMV 16 Database Systems

<b>No:</b> WMV 16	<b>Mandatory module:</b> Database Systems	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each spring term		<b>Term:</b> 4	
		<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60	
<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 56 hrs.	<b>Self-study hours:</b> 94 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Database Systems		Dipl.-Ing. (FH) Apel M.Sc.Eng.		V+Ü	2+2
This module is used for the following degree programs: WMV					
<b>Contents</b>					
Definitions, architecture, relational data modeling, practical applications using SQL, transaction management, databases and objects					
<b>Learning objectives and competencies to be imparted</b>					
The field of database systems is known to students after this module. In addition to basic technologies, they also have an overview of future developments. Another focus is the practical use of database systems. Using data modeling and SQL, students will have insight into the development of database applications.					
<b>Literature and teaching aids</b>					
Lecture notes Elmasri, Navathe (2009): Grundlagen von Datenbanksystemen, 3rd edition, Pearson Studium Date (2003): An introduction to database systems, Pearson Seven (2018): Oracle SQL Das umfassende Handbuch, 3rd edition, Rheinwerk Computing					

**WMV 17 Road Traffic Systems**

<b>No:</b> WMV 17	<b>Mandatory module:</b> Road Traffic Systems	<b>Language:</b> German		<b>Credit points:</b> 8	
		<b>Frequency:</b> each spring term		<b>Term:</b> 4	
		<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> KL60+EA	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 84 hrs.	<b>Self-study hours:</b> 156 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Driving Dynamics of Road Transport Vehicles with Laboratory		Prof. Dr. sc. ETH Santel		V+L	1 +1
Road Traffic Systems				V+Ü	3 +1
This module is used for the following degree programs: WMV					
<b>Contents</b>					
<u>Driving Dynamics of Road Transport Vehicles:</u> <ul style="list-style-type: none"> <li>- Fundamentals of vehicle technology, overall consideration of vehicle drives</li> <li>- Basics of driver assistance systems</li> <li>- Kinematics and dynamics as the basis for describing the longitudinal and transverse movements of vehicles and the forces that occur in the process</li> <li>- Driving resistors</li> <li>- Applications in the laboratory: experimental determination of vehicle dynamic parameters, performance determination</li> </ul>					
<u>Road Traffic Systems:</u> <ul style="list-style-type: none"> <li>- Legal framework of road traffic</li> <li>- Road functions</li> <li>- Road categories</li> <li>- Fundamentals and parameters of traffic flow on roads</li> <li>- Fundamental diagram</li> <li>- Quality of the traffic flow</li> <li>- Models of the traffic flow</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
<p>After the course, students will have knowledge of the basic driving dynamics relationships for the spatio-temporal description of vehicle movements in the operation of road vehicles as well as the forces that occur in the process. This includes knowledge of technical, organizational, legal and operational constraints as well as the correct use of technical terms. From the vehicle- and infrastructure-specific characteristics, it is possible to identify appropriate, economically and socially justifiable areas of use for the road transport system. Students know the basics of the processes of road traffic and can evaluate the traffic flow in terms of qualities. The basic competencies acquired in this module will be revisited as a basis for further consideration in various specialization modules.</p>					
<b>Literature and teaching aids</b>					
<u>Driving Dynamics of Road Transport Vehicles:</u> Assmann, B.: „Technische Mechanik, vol. 3: Kinematik und Kinetik“, ISBN 978-3-486-59751-6; Oldenbourg Verlag, München, 15th edition 2011					



Gabbert, U.; Raecke, I: „Technische Mechanik für Wirtschaftsingenieure“, ISBN 978-3-446-41409-9; Carl Hanser Verlag, München, Wien; 4th updated edition  
Haken, K.-L.: „Grundlagen der Kraftfahrzeugtechnik“, ISBN 978-3-446-43527-8; Carl Hanser Verlag, München; 3rd updated edition  
Winner, H.; Hakuli, S.; Wolf, G.; "Handbuch Fahrerassistenzsysteme"; ISBN 978-3-8348-1457-9; Vieweg+Teubner Verlag, Springer Fachmedien, Wiesbaden; 2nd edition 2012

Road Traffic Systems:

Extensive lecture notes (will be provided as PDF files)

Schnabel W. and D. Lohse: Grundlagen der Straßenverkehrstechnik und der Straßenverkehrsplanung, vol. 1: Straßenverkehrstechnik; 3rd edition 2011; Beuth Verlag, Berlin/Kirschbaum Verlag, Bonn

Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV): Handbuch für die Bemessung von Straßenverkehrsanlagen (HBS); 2015 edition; FGSV-Verlag, Köln

Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV): Hinweise zum Fundamentaldiagramm; 2005 edition; FGSV-Verlag, Köln

Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV): Richtlinien für die Anlage von Autobahnen (RAA); 2008 edition; FGSV-Verlag, Köln

Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV): Richtlinien für die Anlage von Landstraßen (RAL); 2012 edition; FGSV-Verlag, Köln

Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV): Richtlinien für die Anlage von Stadtstraßen (RASt); 2006 edition; FGSV-Verlag, Köln

**WMV 18 Rail Traffic Systems**

<b>No:</b> WMV 18	<b>Mandatory module:</b> Rail Traffic Systems	<b>Language:</b> German		<b>Credit points:</b> 8	
		<b>Frequency:</b> each spring term		<b>Term:</b> 4	
		<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> KL60+PA	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 84 hrs.	<b>Self-study hours:</b> 156 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Rail Traffic Systems		Prof. Dr. Brey		V+Ü	3+1
Driving Dynamics of Rail Vehicles with Laboratory				V+L	1+1
This module is used for the following degree programs: WMV					
<b>Contents</b>					
<p><u>Introduction to Rail Traffic Systems:</u> Development of the wheel/rail system from its beginnings to the present day, system features and system technology fundamentals, wheelset and track guidance, legal and organizational framework conditions in the national and European context, traction units, rail vehicles for freight and passenger transport and their fields of application, railroad installations, fundamentals for regulating and safeguarding train operations, production forms in freight and passenger transport, techniques and operating procedures in combined road-rail transport.</p> <p><u>Driving Dynamics of Rail Vehicles with Laboratory:</u> Definition and fields of application of driving dynamics in rail transport, traction types, typical traction units and their performance characteristics, rail brakes, line, vehicle and acceleration resistances and their causes, tractive and resistive forces, calculation examples, travel time determination procedures, instruction and implementation in computer simulations, e.g. for determining limit loads, energy consumption, travel times, etc.</p>					
<b>Learning objectives and competencies to be imparted</b>					
<p><u>Introduction to Rail Traffic Systems:</u> After the course, students will have basic knowledge of rail traffic systems. They have acquired knowledge about technical, organizational, legal and operational constraints of rail traffic as well as the correct use of technical terms. The vehicle- and infrastructure-specific characteristics can be used to derive appropriate, economically and socially justifiable areas of application for rail transport as a whole or for specific types. Particularities - especially for the classical railway transport system train - can be explained by historical developments and show the current and future need for action.</p> <p><u>Driving Dynamics of Rail Vehicles with Laboratory:</u> After successful completion of the course, students have knowledge of the basic driving dynamics relationships of the spatio-temporal description of vehicle movements in the operation of rail vehicles as well as the forces that occur.</p>					
<b>Literature and teaching aids</b>					
<p><u>Introduction to Rail Traffic Systems:</u> Extensive lecture notes (will be provided as PDF files) Lichtberger, Bernhard (2010): „Handbuch Gleis: Unterbau, Oberbau, Instandhaltung, Wirtschaftlichkeit“, Eurailpress, ISBN 978-3-7771-0400-3 Jänsch, Eberhard (Ed.) (2016): „Handbuch: Das System Bahn“, Eurailpress, ISBN 978-3-87154-511-5</p>					

Janicki, Jürgen (2016): "Systemwissen Eisenbahn", DB-Fachbuch, Bahn-Fachverlag, ISBN 978-3-943214-15-4  
Janicki, Jürgen; Reinhard, Horst (2008): „Schienenfahrzeugtechnik“, DB-Fachbuch, Bahn-Fachverlag, ISBN 978-3-9808002-5-9

Driving Dynamics of Rail Vehicles with Laboratory:

Extensive lecture notes (will be provided as PDF files)

Wende, D. (2003), „Fahrodynamik des Schienenverkehrs“, Stuttgart; ISBN 3-519-00419-4

Lehmann, H. (2012): „Fahrodynamik der Zugfahrt – Theorie und Anwendung“, Aachen , ISBN 978-3-8440-1259-0

Ihme, J. (2016): „Schienenfahrzeugtechnik“, Wiesbaden, Springer Vieweg, ISBN 978-3-658-13540-9

Breuer, B., Bill, K. (2017): „Bremsenhandbuch - Grundlagen, Komponenten, Systeme, Fahrodynamik“, Wiesbaden, Springer Vieweg, ISBN 978-3-658-15488-2

IVE, Universität Hannover (Hrsg.) (2018) „Handbuch Dynamis – Fahrodynamische Berechnungen beliebiger Zugkonfigurationen“, Version 2.1, Hannover

**WMV 19 Flight Mechanics and Aerodynamics with Laboratory**

<b>No:</b> WMV 19	<b>Mandatory module:</b> Flight Mechanics and Aerodynamics with Laboratory	<b>Language:</b> German		<b>Credit points:</b> 7	
		<b>Frequency:</b> each spring term		<b>Term:</b> 4	
	<b>Prerequisites for participation:</b>	<b>Workload:</b> 210 hrs.		<b>Form of examination:</b> KL60+EA	
<b>Contact hours:</b> 84 hrs.		<b>Self-study hours:</b> 126 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Flight Mechanics		Prof. Dr. Cerbe		V+Ü	1+1
Aerodynamics with Laboratory				V+L	2+2
This module is used for the following degree programs: WMV					
<b>Contents</b>					
<u>Flight Mechanics:</u>					
<ul style="list-style-type: none"> <li>- Definitions and designations</li> <li>- Coordinate systems</li> <li>- Differential equation system of aircraft motion</li> <li>- Aircraft longitudinal movement</li> <li>- Flight performance</li> <li>- Stationary symmetric flight conditions</li> </ul>					
<u>Aerodynamics with Laboratory:</u>					
<ul style="list-style-type: none"> <li>- Basics and fundamental equations</li> <li>- Incompressible flow around profiles</li> <li>- Incompressible wing flow</li> <li>- Compressible flow</li> <li>- Transonic flows and similarity laws</li> <li>- Frictional flows</li> </ul>					
Aerodynamics Lab: Experiments on continuity and Bernoulli equations, pressure distribution on the airfoil, lift and drag, ratio of specific heat capacities					
<b>Learning objectives and competencies to be imparted</b>					
After successful participation, students possess the basic aerodynamic knowledge required in flight mechanics for the calculation of forces and moments as well as flight performance. They also acquire the basic knowledge and selected fundamentals of flight mechanics, which are prerequisites for understanding the tasks and operation of air traffic.					
<b>Literature and teaching aids</b>					
<u>Flight Mechanics:</u>					
Brüning, G.; Hafer, X.; Sachs, G. (2005): Flugleistungen, Springer-Verlag, Berlin/Heidelberg					
Anderson, J.D. (2005): Introduction to Flight, McGraw-Hill, New York					
<u>Aerodynamics with Laboratory:</u>					
Schlichting, H.; Truckenbrodt, E. (2001) Aerodynamik des Flugzeugs, Teil I und II, Springer, Berlin/Heidelberg					
Additional working materials will be provided as part of the course.					

**WMV 20 Measurement and Control with Laboratory**

<b>No:</b> WMV 20	<b>Mandatory module:</b> Measurement and Control with Laboratory	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each spring term		<b>Term:</b> 4	
	<b>Prerequisites for participation:</b>	<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60+EA	
<b>Contact hours:</b> 56 hrs.		<b>Self-study hours:</b> 94 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Measurement and Control with Laboratory		Prof. Dr. sc. ETH Santel		V+L	2+2
This module is used for the following degree programs: WMV					
<b>Contents</b>					
<p>Typification and application of active and passive sensors from the entire field of industrial measurement technology, methods and problems of measurement signal transmission, processing and evaluation. In the laboratory "measurement", temperature measurements are carried out with different sensors (Pt100, iron-constantan, heat radiation measurement with calibration of the emission factor). With a carrier frequency bridge to be manually adjusted, the surface strain of a bending bar is measured with strain gages, compared with the calculation and an error observation is performed. The TF bridge must be calibrated for this purpose. The same arrangement is used to determine the spring constant of the steel from the vibration excitation of the steel beam. Before each experiment is conducted, students are asked questions about the topic at hand. Concerning the topic "control", the individual controller types are discussed and explained with the help of examples (P-controller 0., 1. and 2.order, I-controller 0. and 1. order). In the laboratory, a heating controller consisting of individual control loop elements is connected by the students, evaluated and discussed with different parameters of the RKGs.</p>					
<b>Learning objectives and competencies to be imparted</b>					
<p>After the course, students will have the ability to make informed decisions when sourcing sensors and designing control engineering processes. Measurement and control problems can be assessed and misbehavior diagnosed. Moreover, students are able to handle elementary methods and terms of electrical engineering and possible uses of electrical and electromagnetic processes in practical applications. Evaluations of measurement series and error propagation can also be performed.</p>					
<b>Literature and teaching aids</b>					
<p>Lecture notes, detailed descriptions of the individual laboratory experiments including theoretical principles  Geering, H.: Mess- und Regelungstechnik, Mathematische Grundlagen, Entwurfsmethoden, Beispiele, Springer  Leonhard, W.: Einführung in die Regelungstechnik, Vieweg  Mühl, T.: Einführung in die elektrische Messtechnik; 3rd edition 2012; Vieweg + Teubner Verlag, Springer Fachmedien, Wiesbaden  Lerch, R.: Elektrische Messtechnik; 6th edition 2012; Springer Vieweg, Berlin Heidelberg  Unbehauen, H. and F. Ley: Das Ingenieurwissen, Regelungs- und Steuerungstechnik; 2014; Springer Vieweg, Berlin Heidelberg  Böttle, P., G. Boy and H. Clausung: Elektrische Mess- und Regelungstechnik, Die Meisterprüfung; 11th edition 2011; Vogel-Buchverlag, Würzburg</p>					

## 5. Term 5

### WMV 21 Short-Range Mobility

<b>No:</b> WMV 21	<b>Mandatory module:</b> Short-Range Mobility	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each fall term		<b>Term:</b> 5	
		<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL90 / KL60+PA	
<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 60 hrs.	<b>Self-study hours:</b> 90 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Short-Range Mobility		Prof. Dr. sc. ETH Santel		V+Ü	3+1
This module is used for the following degree programs: WMV					
<b>Contents</b>					
<ul style="list-style-type: none"> <li>- Behavioral patterns for short distances</li> <li>- Mapping of transport demand in the local area</li> <li>- Developing the last mile</li> <li>- Strategic planning phase</li> <li>- Bicycle traffic</li> <li>- Pedestrian traffic</li> <li>- Alternative forms of mobility</li> <li>- Integration of local mobility into other planning</li> <li>- Traffic Management</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
Students analyze the importance of short-range mobility for general transportation. They develop concrete ideas of special aspects in this area. Upon successful completion, students will have comprehensive and in-depth knowledge of the subject area of short-range mobility. Students are able to handle action situations in a practical manner. They develop strategies, measures and instruments for sustainable mobility management.					
<b>Literature and teaching aids</b>					
Literature and working materials as well as competent contact persons will be presented and named during the course.					

**WMV 22 Traffic Management with Laboratory**

<b>No:</b> WMV 22	<b>Mandatory module:</b> Traffic Management with Laboratory	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each fall term		<b>Term:</b> 5	
		<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60+EA	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 60 hrs.	<b>Self-study hours:</b> 90 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Traffic Management with Laboratory		Prof. Dr. sc. ETH Santel		V+L	2+2
This module is partly used for the following degree programs: MPM and WMV					
<b>Contents</b>					
<p>Definitions and conceptualization of traffic management including new developments in the field of intelligent traffic systems, telematics technologies as the basis of traffic management, integrated intermodal traffic management, traffic and travel information systems.</p> <p>Tasks of traffic management in public transport; functionalities in traffic management: Examples of traffic management facilities of various traffic systems and their operation. Project examples and, if possible, field trip to a traffic management center</p>					
<b>Learning objectives and competencies to be imparted</b>					
<p>After successful participation in this module, students will be familiar with the history and causes of traffic management as well as with definitions of terms, goals of traffic management, instruments of traffic management, participants in traffic management, components of online traffic management, opportunities and limitations of traffic management, perspectives of traffic management.</p> <p>Through the accompanying lab, students are familiar with individual traffic management applications/tools. The topics covered will vary.</p> <p>Upon completion of the module, students will be familiar with the essential problems, scope of action, methods, procedures and instruments in the field of traffic management in different traffic systems. They can select instruments, methods and measures for specific fields of application that are appropriate considering the technical, operational, economic, ecological, etc. aspects of the project.</p>					
<b>Literature and teaching aids</b>					
<b>Extensive lecture notes (will be provided as PDF files)</b>					
<p>Schnabel W. / Lohse, D. (2011): Grundlagen der Straßenverkehrstechnik und der Straßenverkehrsplanung, vol. 1: Straßenverkehrstechnik; 3rd edition; Beuth Verlag, Berlin/Kirschbaum Verlag, Bonn</p> <p>Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV) (2015): Handbuch für die Bemessung von Straßenverkehrsanlagen (HBS); FGSV-Verlag, Köln</p> <p>Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV) (2005): Hinweise zum Fundamentaldiagramm; FGSV-Verlag, Köln</p> <p>Documents from traffic management actors (traffic service providers) and centers, e.g. VMZ Berlin, VMZ Lower Saxony/Region Hannover, Betriebszentrale DB, etc.</p> <p>Publications and Conferences "Intelligent Transport Systems - ITS"</p>					

**WMV 23 Digitization in Traffic with Laboratory**

<b>No:</b> WMV 23	<b>Mandatory module:</b> Digitization in Traffic with Laboratory	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each fall term		<b>Term:</b> 5	
		<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60+EA	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 60 hrs.	<b>Self-study hours:</b> 90 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Digitization in Traffic with Laboratory		Prof. Dr. sc. ETH Santel		V+L	2+2
This module is used for the following degree programs: WMV					
<b>Contents</b>					
<p>Introduction, digital applications and possible solutions in traffic, digital mobility management, basics of positioning, navigation and communication, structure and functionality of Intelligent Transportation Systems (ITS) or telematics systems, application fields of telematics systems</p> <p>Laboratory tests: Satellite navigation, communication, traffic data acquisition, remote data transmission, vehicle navigation, toll technologies, multimodal applications, specific requirements of individual means of transport. In the laboratory part, the theoretical contents are deepened and applied by means of examples.</p>					
<b>Learning objectives and competencies to be imparted</b>					
<p>Students analyze the significance of digitization in traffic. They develop concrete ideas for applications in this area. Students are familiar with the challenges posed by digitization and can manage them in a reflective manner. Upon successful completion, students will possess methodological, conceptual, and technical competencies in the theory and practice of ITS applications and systems. In this way, they develop strategies, measures and instruments for digitization in traffic.</p>					
<b>Literature and teaching aids</b>					
<p>Literature and working materials as well as competent contact persons will be presented and named during the course.</p>					



**WMV 24 Specialization Module I**

<b>No:</b> MPM 24	<b>Mandatory module:</b> Specialization Module I	<b>Language:</b> German		<b>Credit points:</b> 8	
		<b>Frequency:</b> each fall term		<b>Term:</b> 5	
		<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> see catalog SPM	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 90 hrs.	<b>Self-study hours:</b> 150 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Specialization Module I		See catalog SPM		See catalog SPM	6
This module is used for the following degree programs: LOM, LOP, LIM, MPM, WMV					
<b>Contents</b>					
See catalog SPM					
<b>Learning objectives and competencies to be imparted</b>					
See catalog SPM					
<b>Literature and teaching aids</b>					
See catalog SPM					

**WMV 25 Thesis**

<b>No:</b> WMV 25	<b>Mandatory module:</b> Thesis	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each spring term		<b>Term:</b> 4	
		<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> SA	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 0 hrs.	<b>Self-study hours:</b> 150 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Thesis		Supervising lecturer		B	
This module is used for the following degree programs: LOM, LOP, LIM, MPM und WMV					
<b>Contents</b>					
The specific question/task. The thesis can be linked to the course of study in a number of ways. The experiences or areas of responsibility during a voluntary internship can be documented and analyzed. The thesis can also be based on the contents of a course or on the evaluation of specialist literature.					

**Learning objectives and competencies to be imparted**

Students independently work on a problem/task from their field of study within a given period of time. The topic is determined by a supervisor/examiner in consultation with the student. The previously learned principles of scientific work are thus brought to a first practical application, which also serves as preparation for the writing of the bachelor's thesis.

**Literature and teaching aids**

Course "Academic Skills and Methods"  
Faculty guide to writing scholarly papers.  
The literature and working materials which are needed for the thesis.

**WMV 26 Electives**

<b>No:</b> MPM 26	<b>Mandatory elective module:</b> Electives	<b>Language:</b> German		<b>Credit points:</b> 2 (4)	
		<b>Frequency:</b> each fall term		<b>Term:</b> 5	
		<b>Workload:</b> 60 hrs.		<b>Form of examination:</b> see catalog WPF	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 30 hrs.	<b>Self-study hours:</b> 30 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Elective I		See catalog WPF		See catalog WPF	2
This module is used for the following degree programs: cross-curricular					
<b>Contents</b>					
See catalog WPF					
<b>Learning objectives and competencies to be imparted</b>					
See catalog WPF					
<b>Literature and teaching aids</b>					
See catalog WPF					

## 6. Term 6

### WMV 27 Flight Guidance and Air Traffic Control

<b>No:</b> WMV 27	<b>Mandatory module:</b> Flight Guidance and Air Traffic Control	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each spring term		<b>Term:</b> 6	
		<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 56 hrs.	<b>Self-study hours:</b> 94 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Flight Guidance		Prof. Dr. Cerbe		V	2
Air Traffic Control				V	2
This module is used for the following degree programs: MPM, WMV					
<b>Contents</b> <u>Flight Guidance:</u> <ul style="list-style-type: none"> <li>- General conditions and tasks for navigation and flight guidance</li> <li>- Weather and atmosphere</li> <li>- Air sata systems</li> <li>- Radio navigation systems for determining position and orbital speed</li> <li>- Position and course determination</li> <li>- Inertial navigation and integrated navigation</li> <li>- Flight guidance systems</li> <li>- Human-machine interface</li> </ul> <u>Air Traffic Control:</u> <ul style="list-style-type: none"> <li>- Aviation organization</li> <li>- System of air traffic control in Germany</li> <li>- Structure and organization of the airspace</li> <li>- Airfields and airports</li> <li>- Technical tools and infrastructure for tactical air traffic control</li> <li>- International approaches and departure procedures and routes</li> </ul>					
<b>Learning objectives and competencies to be imparted</b> <p>At the end of the module, students will have basic knowledge of flight technology and selected fundamentals of flight control, which are prerequisites for understanding the tasks and operation of air traffic control. They understand how sensors and signal processing, man-machine interface and processes influence each other. Students will know in detail and be able to understand today's navigation, flight guidance, and air traffic control systems. In flight guidance, the focus is primarily on the on-board systems and the cockpit workstation, while in air traffic control, the focus is on the ground-based systems around the controller workstation. In addition, students are familiar with basic technical and operational knowledge that is a prerequisite for the safe and efficient handling of air traffic. With this knowledge, students will later be able to plan, deploy and further develop the use of modern flight guidance and control systems together with engineers from other disciplines.</p>					
<b>Literature and teaching aids</b> <u>Flight Guidance:</u> Collinson, R.P.G. (2002): Introduction to Avionics Systems, Springer, Berlin/Heidelberg Moir, I.; Seabridge, A. (2006): Civil Avionics Systems, Wiley, Chichester					

Flühr, H. (2012) Avionik und Flugsicherungstechnik, 2nd edition, Springer, Berlin/Heidelberg

Air Traffic Control:

Mensen, H. (2014): Moderne Flugsicherung – Organisation, Verfahren, Technik, 4th edition, Springer, Berlin/Heidelberg

Additional working materials will be provided as part of the course.

**WMV 28 Traffic Control with Laboratory**

<b>No:</b> WMV 28	<b>Mandatory module:</b> Traffic Control with Laboratory	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each spring term		<b>Term:</b> 6	
	<b>Prerequisites for participation:</b>	<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> KL60+EA	
<b>Contact hours:</b> 56 hrs.		<b>Self-study hours:</b> 94 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Traffic Control with Laboratory		Prof. Dr. sc. ETH Santel		V+L	2+2
This module is used for the following degree programs: WMV					
<b>Contents</b>					
Classification of traffic control in the traffic system; problems of traffic control in road traffic; traffic flow at intersections without traffic signal control and procedures for determining performance; traffic flow at intersections with traffic signal control, theory of programming traffic signal systems, creation and testing of traffic signal programs using relevant commercial software products; topics from the field of work chosen together with the students					
<b>Learning objectives and competencies to be imparted</b>					
After completing the module, students will master technical systems of road traffic control and their application as important tools for ensuring safety, quality of service and economic efficiency in traffic under variable operating conditions.					
<b>Literature and teaching aids</b>					
Extensive lecture notes (will be provided as PDF files)					
Schnabel W. and D. Lohse: Grundlagen der Straßenverkehrstechnik und der Straßenverkehrsplanung, vol. 1: Straßenverkehrstechnik; 3rd edition 2011; Beuth Verlag, Berlin/Kirschbaum Verlag, Bonn					
Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV): Handbuch für die Bemessung von Straßenverkehrsanlagen (HBS); 2015 edition; FGSV-Verlag, Köln					
Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV): Richtlinien für Lichtsignalanlagen (RiLSA); edition 2010; FGSV-Verlag, Köln					
Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV): Richtlinien für die Anlage von Autobahnen (RAA); 2008 edition; FGSV-Verlag, Köln					
Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV): Richtlinien für die Anlage von Landstraßen (RAL); 2012 edition; FGSV-Verlag, Köln					
Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV): Richtlinien für die Anlage von Stadtstraßen (RASt); 2006 edition; FGSV-Verlag, Köln					

**WMV 29 Mobility Analyses and Traffic Models**

<b>No:</b> WMV 29	<b>Mandatory module:</b> Mobility Analyses and Traffic Models	<b>Language:</b> German		<b>Credit points:</b> 6	
		<b>Frequency:</b> each spring term		<b>Term:</b> 6	
	<b>Prerequisites for participation:</b>	<b>Workload:</b> 180 hrs.		<b>Form of examination:</b> KL60+PA / KL60+EA	
<b>Contact hours:</b> 56 hrs.		<b>Self-study hours:</b> 124 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Methods of Traffic Survey and Mobility Analyses		Prof. Dr. sc. ETH Santel		V+Ü	1+1
Traffic Models				V+Ü	1+1
This module is used for the following degree programs: MPM, WMV					
<b>Contents</b>					
<u>Methods of Traffic Survey and Mobility Analyses:</u>					
<ul style="list-style-type: none"> <li>- Mobility concept</li> <li>- Causes of mobility</li> <li>- Methods and measurement of mobility, including computerized traffic surveys</li> <li>- Mobility data analysis</li> </ul>					
<u>Traffic Models:</u>					
<ul style="list-style-type: none"> <li>- Traffic models in traffic planning and traffic engineering</li> <li>- exemplary questions</li> <li>- Model typology: aggregated / disaggregated traffic models</li> <li>- multi-level traffic models: traffic generation, traffic distribution, traffic mode choice, traffic route choice</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
<p>Upon successful completion of this module, students will be familiar with problems, scope for action, methods, procedures and instruments in the areas of mobility analyses, traffic surveys and traffic models. The methods presented and concrete case studies can be used to classify procedures and derive the appropriate areas of application for various elements or instruments. Students are able to independently prepare and conduct traffic surveys or supervise their implementation and evaluate the collected data and prepare it for traffic demand modeling.</p>					
<b>Literature and teaching aids</b>					
<p>Extensive lecture notes (will be provided as PDF files)</p> <p>Nobis, C./ Kuhnimhof, T. (2018): Mobilität in Deutschland – MiD Ergebnisbericht. Studie von infas, DLR, IVT und infas 360 im Auftrag des Bundesministers für Verkehr und digitale Infrastruktur, Bonn, Berlin. <a href="http://www.mobilitaet-in-deutschland.de">www.mobilitaet-in-deutschland.de</a></p> <p>Friedrich, M. / Schiller, C. (2009): Modellierung von Verkehrsangebot und Verkehrsnachfrage, Kursunterlagen; Dresden</p> <p>Bosserhoff, D. (2019): Programm Ver_Bau, Abschätzung des Verkehrsaufkommens durch Vorhaben der Bauleitplanung, Programm-Handbuch; Gustavsburg div. software manuals of PTV AG, Karlsruhe</p> <p>Schnabel W. / Lohse, D. (2011): Grundlagen der Straßenverkehrstechnik und der Straßenverkehrsplanung, vol. 1: Straßenverkehrstechnik; 3rd edition; Beuth Verlag, Berlin/Kirschbaum Verlag, Bonn</p> <p>Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV) (2012): Empfehlungen für Verkehrserhebungen (EVE); FGSV-Verlag, Köln</p>					

Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV) (2005): Hinweise zum Fundamentaldiagramm; FGSV-Verlag, Köln



**WMV 30 Seminar Traffic Projects**

<b>No:</b> WMV 30	<b>Mandatory module:</b> Seminar Traffic Projects	<b>Language:</b> German		<b>Credit points:</b> 5	
		<b>Frequency:</b> each spring term		<b>Term:</b> 6	
		<b>Workload:</b> 150 hrs.		<b>Form of examination:</b> PA / PR	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 56 hrs.	<b>Self-study hours:</b> 94 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Seminar Traffic Projects		Prof. Dr. Santel		S	2
Project Management				V+Ü	1+1
This module is used for the following degree programs: MPM, WMV					
<b>Contents</b>					
<p><u>Seminar Traffic Projects:</u> Current topics in the field of traffic are prepared and supervised. Collaboration with industry partners is sought. Students work on individual projects within the respective topic. Finally, the results of the student teams will be presented and discussed.</p> <p><u>Project Management:</u></p> <ul style="list-style-type: none"> <li>- Definition, types and characteristics of projects</li> <li>- Standards and norms in project management</li> <li>- Importance, general conditions and current challenges</li> <li>- Procedure models at a glance</li> <li>- Project management phases (initialization, definition, planning, control and closure)</li> <li>- Project organization (roles and organizational forms)</li> <li>- Elements of project planning (structure, sequence, schedule, capacity and cost plan)</li> <li>- Monitoring of project progress and derivation of control measures</li> <li>- Continuous tasks (stakeholder management, risk management, project marketing, ...)</li> <li>- Methods and tools of classical project management</li> <li>- Introduction to agile project management</li> <li>- Leadership, communication and cooperation in the project team</li> <li>- Multi-project management (portfolio and program management)</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
<p><u>Seminar Traffic Projects</u> The module provides students with practice-oriented methodological competencies to work on concrete projects. The various roles within the project structure are learned, from project management to project control to project processing.</p> <p><u>Project Management:</u> Students recognize the increasing importance of project work in large parts of the economy, are able to determine the project worthiness of projects and define and independently plan projects according to classical procedures. They know the most important instruments for project planning and monitoring and can apply them using relevant software. If necessary, students will be able to derive appropriate control measures. They can also analyze and critique third-party project plans and progress. In addition, students are made aware of the importance of internal and external communication as well as leadership and cooperation within a team and can take targeted team-building measures.</p>					

**Literature and teaching aids**Seminar Traffic Projects:

Literature and working materials as well as competent contact persons will be presented and named during the course.

Project Management:

Burghardt, M. (2018): Projektmanagement. Leitfaden für die Planung, Überwachung und Steuerung von Projekten, 10th edition, Publicis Publishing, Erlangen.

Drews, G. et al. (2016): Praxishandbuch Projektmanagement, 2nd edition, Haufe, Freiburg, München.

Jenny, B. (2017): Projektmanagement. Das Wissen für eine erfolgreiche Karriere, 6th edition, vdf-Verlag, Zurich

Kuster, J. et al. (2019): Handbuch Projektmanagement. agil – klassisch – hybrid, 4th edition, Springer, Berlin

Patzak, G. / Rattay, G. (2017): Projektmanagement. Projekte, Projektportfolios, Programme und projektorientierte Unternehmen, 7th edition, Linde Verlag, Vienna.

Schwarze, J. (2016): Projektmanagement mit Netzplantechnik, 11th edition, NWB-Verlag, Herne.

**WMV 31 Specialization Module II**

<b>No:</b> MPM 31	<b>Mandatory module:</b> Specialization Module II	<b>Language:</b> German		<b>Credit points:</b> 8	
		<b>Frequency:</b> each spring term		<b>Term:</b> 6	
		<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> see catalog SPM	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 84 hrs.	<b>Self-study hours:</b> 156 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Specialization Module II		See catalog SPM		See catalog SPM	6
This module is used for the following degree programs: LOM, LOP, LIM, MPM, WMV					
<b>Contents</b>					
See catalog SPM					
<b>Learning objectives and competencies to be imparted</b>					
See catalog SPM					
<b>Literature and teaching aids</b>					
See catalog SPM					

**WMV 26 Electives**

<b>No:</b> WMV 26	<b>Mandatory elective module:</b> Electives	<b>Language:</b> German		<b>Credit points:</b> 2 (4)	
		<b>Frequency:</b> each spring term		<b>Term:</b> 6	
		<b>Workload:</b> 60 hrs.		<b>Form of examination:</b> see catalog WPF	
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 28 hrs.	<b>Self-study hours:</b> 32 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Elective II		See catalog WPF		See catalog WPF	2
This module is used for the following degree programs: cross-curricular					
<b>Contents</b>					
See catalog WPF					
<b>Learning objectives and competencies to be imparted</b>					
See catalog WPF					
<b>Literature and teaching aids</b>					
See catalog WPF					

## 7. Term 7

### WMV 32 Supervised Internship

<b>No:</b> WMV 32	<b>Mandatory module:</b> Supervised Internship	<b>Language:</b> German		<b>Credit points:</b> 15	
		<b>Frequency:</b> each fall term		<b>Term:</b> 7	
		<b>Workload:</b> 450 hrs.		<b>Form of examination:</b> -	
	<b>Prerequisites for participation:</b> see "Prüfungsordnung"	<b>Contact hours:</b> 0 hrs.	<b>Self-study hours:</b> 450 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (CP)</b>
Supervised Internship		Supervising lecturer		B	15
This module is used for the following degree programs: LOM, LOP, MPM, WMV					
<b>Contents</b>					
<p>As a rule, the supervised internships are designed in such a way that the students work on a project at the hosting institution or receive a self-contained sub-project within this framework. In addition to a general orientation in the company / the hosting institution or the establishment of a working environment, the students spend the first weeks of their internship familiarizing themselves with their work. Normally, the actual topic for the Bachelor's thesis is derived from the problem/task posed by the hosting institution in consultation with the university supervisor.</p>					
<b>Learning objectives and competencies to be imparted</b>					
<p>During the internship, students learn to integrate themselves into the usual work processes in a company. In doing so, they apply the knowledge they have acquired in their previous studies in practice-oriented methods.</p>					
<b>Literature and teaching aids</b>					
None					

**WMV 33 Bachelor's Thesis and Defense**

<b>No:</b> WMV 33	<b>Mandatory module:</b> Bachelor's Thesis and Defense	<b>Language:</b> German		<b>Credit points:</b> 15	
		<b>Frequency:</b> each fall term		<b>Term:</b> 7	
	<b>Prerequisites for participation:</b>	<b>Workload:</b> 450 hrs.		<b>Form of examination:</b> BA + KO	
<b>Contact hours:</b> 0 hrs.		<b>Self-study hours:</b> 450 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (CP)</b>
Bachelor's Thesis		Supervising lecturer		B	12
Defense				B	3
This module is used for the following degree programs: LOM, LOP, LIM, MPM, WMV					
<b>Contents</b>					
<p>After the official issue of the topic by the examination board, the actual preparation of the Bachelor's thesis is a continuous process, which is usually started during the internship term (in the last third) and intensified after completion. The supervision of the internship term and the supervision of the bachelor's thesis are carried out by the same supervisor.</p> <p>In the defense, the student gives a summary of his or her bachelor's thesis. In a short presentation the student presents the results of the bachelor's thesis. The examiners ask questions about the content of the thesis.</p>					
<b>Learning objectives and competencies to be imparted</b>					
<p>With their Bachelor's thesis, students demonstrate that they are able to independently work on a problem/task from their field of study, which is formulated by a supervisor/first examiner after consultation with the student, using scientific methods and within a specified period of time. The exact procedure for this is regulated by the "Prüfungsordnung". By preparing a presentation for the defense, students show that they are able to summarize and abstract the content of their bachelor's thesis.</p>					
<b>Literature and teaching aids</b>					
The relevant literature and working materials.					

## Specialization Modules Catalog (SPM)

### SPM 1 Cooperation Management

No: SPM 1	Specialization Module: Cooperation Management	Language: German		Credit points: 8	
		Frequency: each spring term		Term: 6	
	Prerequisites for participation: General business knowledge, business administration and logistics knowledge. Knowledge of how to facilitate meetings is helpful.	Workload: 240 hrs.		Form of examination: PA+KO	
Contact hours: 84 hrs.		Self-study hours: 156 hrs.			
Courses:		Module commissioner:		Teaching and learning types:	Scope (SWS):
Cooperation Management in the Field of Logistics		Prof. Dr. Ordemann		V	2
Cooperation Management Projects				P	4
This module is used for the following degree programs: LOM, LOP, LIM, WMV, MPM					
<b>Contents</b>					
<p><u>Cooperation Management in the Field of Logistics Service Providers:</u> For many medium-sized logistics service providers, collaborations are the key to success in maintaining or increasing their competitiveness.</p> <p><u>Methods of Managing Cooperations:</u> The supply side of the logistics market in Germany is characterized on the one hand by large logistics groups and on the other by more medium-sized industry and specialists. Innovations that originated from medium-sized logistics service providers, e.g. the development of parcel service and general cargo networks in Germany, show that these companies have held their own very well against the logistics groups. The key to success here is often cooperation, i.e. well-organized collaboration between these companies. The performance of such medium-sized companies is all the more remarkable because the same companies are competitors in some of the same and, as a rule, in other logistical service areas. Since cooperative ventures are based on contractual agreements that can be terminated at any time, these contexts make it clear that designing a cooperative venture is much more difficult than, for example, the prescribed cooperation between branches of a logistics group. The aim should always be to achieve a balance of interests that results in a higher cooperation benefit for each cooperating party in the medium term than its cooperation costs (monetary and non-monetary). Due to advancing globalization and the increasing complexity of logistical services, it is not particularly surprising that even logistics groups, especially at an international level, also (have to) provide part of their range of services on the basis of such cooperation.</p> <p>However, collaborations do not arise "just by the way", e.g. merely on the basis of a few meetings by managing directors of potential cooperators who would like to cooperate. Rather, knowledge and methods are required which make it possible to identify and remove potential barriers to the formation and development of cooperation. In the lecture part of this module, therefore, the typically required functions of a cooperation, such as the development, production, distribution, etc. are examined in more detail from a cooperation point of view. Apart from the alternative of organizing such functions in cooperative systems or by oneself, possible obstacles to cooperation as well as measures to overcome them are identified.</p> <p><u>Cooperation Management Projects:</u></p>					

In this part of the module, practice-oriented business management projects are carried out by the students under the direction and participation of the instructor.

**Learning objectives and competencies to be imparted**

After successful participation, students will be able to independently establish new collaborations, further develop existing collaborations or participate in them.

**Literature and teaching aids**Collaboration Management in the Transport Industry:

Eckstein, W. E./ Szafera, S. (1998): Prozesse und Hemmnisse der Kooperation in der Transportwirtschaft, Bremen.

Deutscher Speditions- und Logistikverband DSLV (ed.), Speditionskooperationen in Deutschland, n.p., current edition.

Wiendahl, H.-P./ Dreher, C./ Engelbrecht, A. (eds.; 2005): Erfolgreich kooperieren, Springer Verlag, Heidelberg.

Zentes, J./ Swoboda, B./ Morschett, D. (2005): Kooperationen, Allianzen und Netzwerke, 2nd revised edition, Springer Verlag, Wiesbaden

Bretzke, W.-R./ Barkawi, K., Nachhaltige Logistik, Berlin, Heidelberg 2010

Lecture notes (will be provided as PDF file)

Cooperation Management Projects:

Lecture notes (will be provided as PDF file)

Documents by industry partners



**SPM 2 Special Topics of the Transport Industry**

<b>No:</b> SPM 2	<b>Specialization Module:</b> Special Topics of the Transport Industry	<b>Language:</b> German		<b>Credit points:</b> 8
		<b>Frequency:</b> each fall term		<b>Term:</b> 5
		<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> KL90 / KL60+RE / RE
	<b>Prerequisites for participation:</b>	<b>Contact hours:</b> 90 hrs.	<b>Self-study hours:</b> 150 hrs.	
<b>Courses:</b>		<b>Module commissioner:</b>	<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Transport, Infrastructure and Pricing Policy		Prof. Dr. Trost	V	3+1
Current Problems of Freight Transport			S	2
This module is used for the following degree programs: LOM, LOP, LIM, MPM und WMV				
<b>Contents</b>				
<p><u>Transport, Infrastructure and Pricing Policy:</u> Current status of national and international transport policy; deregulation of transport markets and deregulation experiences; pricing policy in the transport industry for different modes of transport; transport infrastructure calculations; economic transport infrastructure planning; (private and public) financing of transport infrastructure investments and transport modes; transport externalities and internalization.</p> <p><u>Current Problems of Freight Transport:</u> Independent work on current topics from selected areas of freight transport, preferably with reference to transport, infrastructure and pricing policy. Preparation of a short, written topic paper, presentation and discussion of the results in plenary sessions. Instructor-led guidance in the selection and in the various stages of elaboration is obligatory.</p>				
<b>Learning objectives and competencies to be imparted</b>				
<p>The module allows students to view the transportation sector from both a macroeconomic and business perspective. Following this module, students will be familiar with current developments in the national and international competitive framework. Deregulation experiences abroad can be critically examined and discussed by students. Students will be familiar with the problem areas of tolls/infrastructure charges, infrastructure accounting, economic transportation planning issues, and infrastructure and transportation financing issues after taking this module.</p> <p>Based on selected topics of freight transport, the students are be enabled to scientifically illuminate a given topic and to communicate the results of the analyses both in writing and in the context of a presentation. The current topics are critically discussed in plenary sessions, partial aspects are deepened, and the presented topics are evaluated. Overall, this succeeds in advancing to taxonomy level six, as this module does not only require knowledge and understanding, but also focuses on the use and application of what has been learned, as well as communication. Ultimately, even solutions can be developed.</p>				
<b>Literature and teaching aids</b>				
<p><u>Transport, Infrastructure and Pricing Policy:</u> Lecture notes (will be provided as PDF files) Aberle, G. (2009): Transportwirtschaft, 5th edition, Munich Bundesminister für Verkehr und digitale Infrastruktur (2016): Bundesverkehrswegeplan 2030, Berlin</p>				

Bundesminister für Verkehr und digitale Infrastruktur (2018): Berechnung der Wegekosten für das Bundesfernstraßennetz sowie der externen Kosten nach Maßgabe der Richtlinie 1999/62/EG für die Jahre 2018 bis 2022, Berlin

DB Netze (ed.) (2019): Das Trassenpreissystem 2020 der DB Netz AG, Frankfurt am Main

Eisenkopf, A. (2002): Effiziente Straßenbenutzungsabgaben, Theoretische Grundlagen und konzeptionelle Vorschläge für ein Infrastrukturabgabensystem, Giessener Studien zur Transportwirtschaft und Kommunikation, vol. 17, Hamburg

Grandjot, H.-H/ Bernecker, T. (2014): Verkehrspolitik – Grundlagen, Funktionen und Perspektiven für Wissenschaft und Praxis, Hamburg

Hennecke, R. (2003), Wegeausgabenorientierte Straßenbenutzungsgebühren – Wegerechnungen für das deutsche Straßennetz, Sensitivitätsanalyse und konzeptionelle Weiterentwicklungen, vol. 19, Giessener Studien zur Transportwirtschaft und Kommunikation, Hamburg

Link, H. / Dodgson, J. S. / Maibach, M. / Herry, M. (1999): The Costs of Road Infrastructure and Competition in Europe, Heidelberg – New York

Link, H./ Kalinowska, D./ Kunert, U./ Radke, S. (2009): Wegekosten und Wegekostendeckung des Straßen- und Schienenverkehrs in Deutschland im Jahre 2007, Berlin

Schade, J. (2005): Akzeptanz von Straßenbenutzungsgebühren: Entwicklung und Überprüfung eines Modells, Lengerich, Dresden

Stock, W./ Bernecker, T. (2014): Verkehrsökonomie, 2nd edition, Wiesbaden

Current Problems of Freight Transport:

Current specialist literature on the chosen topics.

**SPM 3 Airline and Airport Management**

<b>No:</b> SPM 3	<b>Specialization Module:</b> Airline and Airport Management	<b>Language:</b> German		<b>Credit points:</b> 8	
		<b>Frequency:</b> each fall term		<b>Term:</b> 5	
	<b>Prerequisites for participation:</b> Fundamentals of business administration	<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> KL90	
<b>Contact hours:</b> 90 hrs.		<b>Self-study hours:</b> 150 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Airline Management with Seminar		Prof. Dr. Cerbe		V+S	2+2
Airport Management				V+Ü	1+1
This module is used for the following degree programs: LOM, LOP, LIM, MPM und WMV					
<b>Contents</b>					
<p><u>Airline Management with Seminar:</u> The lecture covers the following topics: Market structure, strategies and business models, corporate connections, network management, route and profit accounting, marketing management, information technologies. The seminar includes a business simulation (General Airline Management Simulation by Lufthansa Consulting): Three airlines are simulated over eight scheduling periods. Participants will gain insight into airline management, route planning, aircraft deployment, marketing, yield management, fleet planning, and crew and personnel planning.</p> <p><u>Airport Management:</u> Integration of airports into the air transport system, responsibilities and services of an airport, airport as a business enterprise, planning and financing of airports, growth management, airport cooperation, intermodal transport port management.</p>					
<b>Learning objectives and competencies to be imparted</b>					
<p>This module provides basic aviation knowledge. After completing the module, students have sound business knowledge using the example of airlines, airports and their interaction with other companies and organizations in the aviation industry. In a business simulation, students apply the knowledge imparted in the lectures to the task of leading an airline to entrepreneurial success and deepen their knowledge and skills. With the knowledge gained about the interdependencies and functionalities of air traffic, students will later be able to process and solve a wide variety of operational and strategic tasks in aviation companies.</p>					
<b>Literature and teaching aids</b>					
<p><u>Airline Management with Seminar:</u> Conrady, R.; Fichert, F.; Sterzenbach, R. (2019): „Luftverkehr: betriebswirtschaftliches Lehr- und Handbuch“, 6th edition, De Gruyter Oldenbourg, Munich Literature and working materials as well as competent contact persons will be presented and named during the course.</p> <p><u>Airport Management:</u> Schulz, A.; Baumann, S.; Wiedenmann S. (2010): „Flughafen Management“, Oldenbourg Verlag, München Mensen, H. (2013): Planung, Anlage und Betrieb von Flugplätzen, 2nd edition, Springer Gabler, Berlin/Heidelberg. Literature and working materials as well as competent contact persons will be presented and named during the course.</p>					



**SPM 4 Human Resources**

<b>No:</b> SPM	<b>Specialization Module:</b> Human Resources	<b>Language:</b> German		<b>Credit points:</b> 8	
		<b>Frequency:</b> each fall term		<b>Term:</b> 5	
		<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> KL90 / RE	
	<b>Prerequisites for participation:</b> none	<b>Contact hours:</b> 90 hrs.	<b>Self-study hours:</b> 150 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Human Resources		Prof. Dr. Saleh		V+Ü	3+1
Labor Law				V+Ü	1+1
This module is used for the following degree programs: LOM, LOP, LIM, WMV, MPM					
<b>Contents</b>					
<u>Human Resources</u>					
<ul style="list-style-type: none"> <li>- Foundations of human resource management</li> <li>- Organization of the personnel department</li> <li>- Personnel planning and recruitment</li> <li>- Personnel deployment and development</li> <li>- Personnel assessment and remuneration</li> <li>- Personnel management and release</li> <li>- Current developments in human resource management</li> </ul>					
<u>Labor Law</u>					
<ul style="list-style-type: none"> <li>- Labor law in the legal system</li> <li>- Establishment and termination of employment relationships</li> <li>- Rights and focal points arising from the employment relationship</li> <li>- Legal protection in labor law</li> <li>- The main features of collective labor law</li> <li>- The recruitment process</li> <li>- The employment contract</li> <li>- Special forms of the employment contract</li> <li>- Termination of the employment relationship</li> <li>- Industrial action law; the labor court procedure</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
<p>This module teaches students the creative, planning and controlling tasks of human resources management. They will learn to distinguish between the framework functions and the core functions of HR. Students are taught the many external as well as internal influences on human resources management as well as the resulting necessary operational measures.</p> <p>Students should be able to assess and apply human resources management tasks in the overall context of the company.</p>					
<b>Literature and teaching aids</b>					
<u>Human Resources</u>					
Hentze, J. (2005): Personalwirtschaftslehre, 7th edition, UTB, Stuttgart.					
Jung, H. (2017): Personalwirtschaft, 10th edition, De Gruyter Oldenbourg, Munich					
Olfert, K. (2015): Personalwirtschaft, 16th edition, Kiehl, Herne.					
Schmeisser, W./Clermont, A., Krimohove, D.(Hrsg.) (2015): Personalführung und Organisation, Vahlen Verlag,					

Munich.

Labor Law

Richardi, R. (2019): Arbeitsgesetze ArbG, 94th edition, Beck-Texte im dtv, Munich.

Junker, A. (2019): Grundkurs Arbeitsrecht, 18th edition, C.H. Beck, Munich.

Wörlen, R. (2011): Arbeitsrecht, 10th edition, Vahlen, Munich.

Mues, W.M., Eisenbeis, E., Laber, J. (2010): Handbuch zum Kündigungsrecht, Dr. Otto Schmidt Verlag, Cologne.

Greiner, S.; Preis, U.; Rolfs, C.; Stoffels, M.; Wagner, K.J. (2015): Der Arbeitsvertrag, Dr. Otto Schmidt Verlag, Köln.

Gaul, B. (2018): Aktuelles Arbeitsrecht, Dr. Otto Schmidt Verlag, Köln.

Neue Zeitschrift Arbeitsrecht (NZA), Beck, Munich, Frankfurt a. Main.

Sowie

Extensive lecture notes (will be provided as PDF files)

**SPM 5 Business Application Systems**

<b>No:</b> SPM 5	<b>Specialization Module:</b> Business Application Systems	<b>Language:</b> German		<b>Credit points:</b> 8	
		<b>Frequency:</b> each spring term		<b>Term:</b> 6	
		<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> ED +PR / KL90	
	<b>Prerequisites for participation:</b> none	<b>Contact hours:</b> 84 hrs.	<b>Self-study hours:</b> 156 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Building Blocks of Business Application Systems in Logistics		Prof. Dr. Franke		V	2
Implementation of Logistics Application Systems				L	4
This module is used for the following degree programs: LOM, LOP, LIM, WMV, MPM					
<b>Contents</b>					
<u>Building Blocks of Business Application Systems in Logistics:</u> <ul style="list-style-type: none"> <li>- Theory and implementation of different topics of logistic information and application systems</li> <li>- IT in logistics, processes in the area of transport and warehouse</li> <li>- Basics of special programming languages</li> </ul>					
<u>Implementation of Logistics Application Systems:</u> <ul style="list-style-type: none"> <li>- Project planning of a logistic application example</li> <li>- Implementation of the example</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
<u>Building Blocks of Business Application Systems in Logistics:</u> After participation, students will master basic, selected business tasks of logistical information and application systems and will be able to implement them prototypically.					
<u>Implementation of Logistics Application Systems:</u> Building blocks of logistical application systems are examined in more detail in order to implement them directly in software. As a result, a prototypically developed logistics application system from the areas of transportation and warehousing is created.					
<b>Literature and teaching aids</b>					
<u>Building Blocks of Business Application Systems in Logistics:</u> Lecture notes A. Stern (2016): Keine Angst vor Microsoft Access! Datenbanken verstehen, entwerfen und entwickeln - Für Access 2007 bis 2016, O'Reilly; edition: 5 Held, B. (2016): VBA mit Access: Das umfassende Handbuch mit VBA-Lösungen für Access 2007 bis Access 2016. Inkl. Makro-Lösungen und Praxisbeispielen, Rheinwerk Computing; edition: 2 Langer, W. (2016): Access 2016: Das umfassende Handbuch. Tabellen, Formulare, Berichte, Datenbankdesign, Abfragen, Import und Export, SQL, VBA, DAO u. v. m., Rheinwerk Computing; edition: 1					
<u>Implementation of Logistics Application Systems:</u> Lecture notes					

A. Stern (2016): Keine Angst vor Microsoft Access! Datenbanken verstehen, entwerfen und entwickeln - Für Access 2007 bis 2016, O'Reilly; edition: 5  
Held, B. (2016): VBA mit Access: Das umfassende Handbuch mit VBA-Lösungen für Access 2007 bis Access 2016. Inkl. Makro-Lösungen und Praxisbeispielen, Rheinwerk Computing; edition 2  
Langer, W.( 2016): Access 2016: Das umfassende Handbuch. Tabellen, Formulare, Berichte, Datenbankdesign, Abfragen, Import und Export, SQL, VBA, DAO u. v. m. ,Rheinwerk Computing; edition: 1...



**SPM 6 Process Management in Logistics and Supply Chain**

<b>No:</b> SPM 6	<b>Specialization Module:</b> Process Management in Logistics and Supply Chain	<b>Language:</b> German		<b>Credit points:</b> 8	
		<b>Frequency:</b> each fall term		<b>Term:</b> 5	
	<b>Prerequisites for participation:</b> Fundamentals of business administration, bookkeeping and accounting, cost accounting and cost management, investment and financing	<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> RE / PA / KL60	
<b>Contact hours:</b> 90 hrs.		<b>Self-study hours:</b> 150 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Process Management in Logistics and Supply Chain		Prof. Dr. Czenskowsky		V	2
Exercises / Projects				Ü / P	4
This module is used for the following degree programs: LOM, LOP, WMV, LIM, MPM					
<b>Contents</b>					
<ul style="list-style-type: none"> <li>- Introduction</li> <li>- Processes and sub-processes</li> <li>- Process management</li> <li>- Instruments for process mapping or process recording and documentation</li> <li>- Instruments for time recording in processes</li> <li>- Instruments for overhead cost control as the basis of activity-based costing</li> <li>- Activity-based costing</li> <li>- Supply chain controlling and performance measurement</li> <li>- Organizational aspects in process management</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
<p>After participating in this module, students will be familiar with the various internal and external processes in the supply chain and logistics. They can record and document these independently and systematically using appropriate instruments. Using controlling and cost accounting methods, students are also able to independently assess processes and sub-processes from a commercial perspective and plan and control them in terms of capacities, costs and times. The challenges that arise in the organizational anchoring of process management in companies and the requirements for the use of "process owners" can be assessed and overcome.</p>					
<b>Literature and teaching aids</b>					
<p>Lecture notes  Czenskowsky, T.; Poussa, J.; Segelken, U. (2/2002): Prozessorientierte Kostenrechnung in der Logistik, in: Kostenrechnungspraxis krp 2/2002, pp. 75-86  Czenskowsky, T.; Piontek, J. (2012): Logistikcontrolling, 2nd edition, Deutscher Betriebswirte Verlag, Gernsbach  Delfmann, W.; Reihlen, M. (Eds.; 2003): Controlling von Logistikprozessen, Schäffer Poeschel, Stuttgart  Erlach, K. (2010): Wertstromdesign, 2nd edition, Springer, Heidelberg  Gadatsch, A. (2012): Grundkurs Geschäftsprozess-Management, 7th edition, Gabler, Wiesbaden  Klaus, P.; Staberhofer, F.; Rothböck, M. (Eds.; 2007): Steuerung von Supply Chains, Gabler, Wiesbaden</p>					

Remer, D. (2005): Einführen der Prozesskostenrechnung, 2nd edition, Schäffer-Poeschel, Stuttgart.  
Richert, J. (2006): Performance Measurement in Supply Chains, Gabler, Wiesbaden  
Schick, U.; Haupt, H.; Mallon, P. u. a. (2009): Spedition und Logistikdienstleistung Leistungsprozesse, 3rd edition, Winkler's Verlag, Brunswick, Germany  
Weber, J.; Wallenburg, C. (2010): Logistik- und Supply Chain Controlling, 6th edition, Schäffer-Poeschel, Stuttgart.

**SPM 7 Optimization of Transport and Traffic**

<b>No:</b> SPM 7	<b>Specialization Module:</b> Optimization of Transport and Traffic	<b>Language:</b> German		<b>Credit points:</b> 8	
		<b>Frequency:</b> each fall term		<b>Term:</b> 6	
		<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> KL60+ED	
	<b>Prerequisites for participation:</b> Basics in mathematics, computer science and operations research, knowledge of the programming language C	<b>Contact hours:</b> 90 hrs.	<b>Self-study hours:</b> 150 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Modeling and Quantitative Solutions		Prof. Dr. Hansmann		V	2
Computer-Aided Optimization				L	4
This module is used for the following degree programs: LIM (,LOM, LOP, MPM, WMV)					
<b>Contents</b>					
<u>Modeling and Quantitative Solutions:</u>					
<ul style="list-style-type: none"> <li>- Graph theoretical concepts</li> <li>- Paths and flows in time-expanded networks</li> <li>- Mathematical Modeling, Mixed-Integer Models</li> <li>- Preprocessing techniques for model reduction</li> <li>- Generation of models (independently or via modeling languages) for optimization by commercial solvers</li> <li>- Decomposition approaches, rolling horizon methods, greedy heuristics</li> </ul>					
<u>Computer-Aided Optimization:</u>					
<p>In the laboratory, various optimization methods are developed and tested for specific practical problems. In the process, an almost complete project cycle is simulated:  verbal problem description → model building → design of a solution procedure → implementation → program run → admissibility test of the particular solution → back transformation of the solution into user language</p>					
<b>Learning objectives and competencies to be imparted</b>					
<u>Modeling and Quantitative Solutions:</u>					
Students will be familiar with concepts for modeling and solving optimization problems for transportation and traffic. They are aware of advantages and disadvantages of different solutions such as heuristic or exact approaches.					
<u>Computer-Aided Optimization:</u>					
After successful participation, students are able to independently implement solutions for practical problems in logistics (in the programming language C). They are capable of using modeling environments and commercial solvers for optimization, and they have gained experience in the relationships between instance size, computation time, and solution quality. With the solutions generated by their own programs, students can contribute to decision support in logistics and transportation.					
<b>Literature and teaching aids</b>					
Lecture notes, results of projects and studies carried out by lecturer Krumke, S. O.; Noltemeier, H. (2009): Graphentheoretische Konzepte und Algorithmen, 2nd edition,					

Vieweg+Teubner, Wiesbaden

Cormen, Th. H. et al (2007): Algorithmen - Eine Einführung, 2nd edition, Oldenbourg Verlag, München

Grünert, T.; Irnich, St. (2005): Optimierung im Transport - Grundlagen (vol. I), Shaker Verlag, Aachen

Grünert, T.; Irnich, St. (2005): Optimierung im Transport - Wege und Touren (vol. II), Shaker Verlag, Aachen

Domschke, W. (2010): Logistik - Transport, 5th edition, Oldenbourg Verlag, München

Domschke, W. (2007): Logistik - Rundreisen und Touren, 5th edition, Oldenbourg Verlag, München

**SPM 8 Applied Market Research**

<b>No:</b> SPM 8	<b>Specialization Module:</b> Applied Market Research	<b>Language:</b> German		<b>Credit points:</b> 8
		<b>Frequency:</b> each fall term		<b>Term:</b> 5
	<b>Prerequisites for participation:</b> Knowledge from the field of passenger and/or freight transport or logistics	<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> PA / RE / KL90
<b>Contact hours:</b> 90 hrs.		<b>Self-study hours:</b> 150 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>	<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Introduction to Applied Market Research		Prof. Dr. Ernst	V	2
Project			P	4
This module is used for the following degree programs: LOM, LOP, WMV, LIM, MPM				
<b>Contents</b>				
<u>Introduction to Applied Market Research:</u>				
<ul style="list-style-type: none"> <li>- Epistemological foundations, theory and empiricism</li> <li>- Structure and process of empirical research (concept specification, operationalization and measurement, research design and forms of investigation, sampling, data collection techniques, data preparation and analysis)</li> </ul>				
<u>Project:</u>				
<ul style="list-style-type: none"> <li>- Conversion of an entrepreneurial decision problem into market research</li> <li>- Implementation of the market research</li> <li>- Derivation of recommendations for the solution of the entrepreneurial decision problem from the results of the market research</li> </ul>				
<b>Learning objectives and competencies to be imparted</b>				
<p>After participation, students will have mastered the basics of applied market research and will be able to independently design and manage market research projects and carry them out or outsource the implementation to a service provider.</p> <p>To this end, students first learn the basics of quantitative and qualitative empirical research, which they then apply in the context of a market research project.</p>				
<b>Literature and teaching aids</b>				
<p>Schnell, R., Hill, P.B., Esser, E. (2018): Methoden der empirischen Sozialforschung, München</p> <p>Meffert, H., Bruhn, M. (2018): Dienstleistungsmarketing: Grundlagen – Konzepte – Methoden, Wiesbaden</p> <p>Kuß, A. (2018): Marktforschung – Datenerhebung und Datenanalyse, Wiesbaden</p> <p>Bleymüller J. (2015): Statistik für Wirtschaftswissenschaftler, München</p> <p>Backhaus, K., et.al. (2018): Multivariate Analysemethoden – Eine anwendungsorientierte Einführung, Heidelberg</p>				

**SPM 9 Electromobility**

<b>No:</b> SPM 9	<b>Specialization Module:</b> Electromobility	<b>Language:</b> German		<b>Credit points:</b> 8
		<b>Frequency:</b> each spring term		<b>Term:</b> 6
	<b>Prerequisites for participation:</b> Basic knowledge in the field of transportation. Solidified basic knowledge of physics.	<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> KL60+PA
<b>Contact hours:</b> 84 hrs.		<b>Self-study hours:</b> 156 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>	<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Introduction to Electromobility		Hon. Prof. Strube	V	2
Electric Drives			V	2
Current Topics Electromobility			V+P	2
This module is used for the following degree programs: LOM, LOP, WMV, LIM, MPM				
<b>Contents</b>				
<ul style="list-style-type: none"> <li>- Basics</li> <li>- Drivers/motivation</li> <li>- Electric vehicle structure</li> <li>- Drive components (motors, inverters, control)</li> <li>- Vehicle types</li> <li>- Power generation/distribution/storage</li> <li>- Secondary consumers</li> <li>- Charging infrastructure and grid integration</li> <li>- Environmental impact</li> <li>- Business models</li> <li>- Outlook/challenges</li> </ul>				
<b>Learning objectives and competencies to be imparted</b>				
<p>The aim is to provide students with knowledge in the field of electromobility and to introduce them step by step to the necessary basics and terminology. All major components of electrically powered vehicles, as well as the most common designs, are covered. Students gain a holistic understanding of electromobility. After participation, students will have developed a sound understanding of the concepts of electromobility. The modes of operation of the drive, storage, generation and distribution components with all essential boundary conditions are part of the acquired knowledge. They understand the connections between the power grid and the charging infrastructure and are familiar with possible business models and mobility concepts. Students are put in a position to decide on possible applications in companies and to help shape business models. They also know the essential components of electrically powered vehicles.</p>				
<b>Literature and teaching aids</b>				
<p>Lecture notes  Öko-Institut, Optum, Ergebnisbroschüre: Umweltentlastungspotenziale von Elektrofahrzeugen -Integrierte Betrachtung von Fahrzeugnutzung und Energiewirtschaft, Berlin, 09/2011  UBA, Umweltverträglicher Verkehr 2050: Argumente für eine Mobilitätsstrategie für Deutschland, Berlin, 02/2014  BEE/InnoZ, Die neue Verkehrswelt - Mobilität im Zeichen des Überflusses: schlau organisiert, effizient, bequem und nachhaltig unterwegs, Berlin, 01/2015  Böhm, W.: Elektrische Antriebe, Würzburg, 2009</p>				

Schröder, D.: Elektrische Antriebe, Regelung von Antriebssystemen, Berlin, 2015  
Fischer, R.: Elektrische Maschinen, München, 2017

**SPM 10 Specialization in Overland Transport Technology**

<b>No:</b> SPM 10	<b>Specialization Module:</b> Specialization in Overland Transport Technology	<b>Language:</b> German		<b>Credit points:</b> 8	
		<b>Frequency:</b> each spring term		<b>Term:</b> 6	
	<b>Prerequisites for participation:</b> Basic knowledge of transport systems	<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> KL90 / KL60+PA	
<b>Contact hours:</b> 84 hrs.		<b>Self-study hours:</b> 156 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Specialization in Rail Transport		Prof. Dr. sc. ETH Santel		V+Ü	1+1
Specialization in Road Transport				V+Ü	3+1
This module is used for the following degree programs: LIM, LOM, LOP, MPM, WMV					
<b>Contents</b>					
<u>Specialization in Rail Transport:</u>					
<ul style="list-style-type: none"> <li>- Essential elements of the railroad system including various track technologies, alignment parameters, etc.</li> <li>- The most important securing techniques</li> <li>- Function and variants of interlockings, level crossings, the dispatching and control technology for wheel/rail systems</li> <li>- Special track guided systems</li> </ul>					
<u>Specialization in Road Transport:</u>					
<ul style="list-style-type: none"> <li>- Overview of structure, design and dimensioning of road traffic facilities</li> <li>- Relevant guidelines issued by the German Road and Transportation Research Association (FGSV)</li> </ul> <p>Topics from the following list can be studied in greater depth:</p> <ul style="list-style-type: none"> <li>- Structure of the system of interurban roads or structure and design of transport networks outside towns and within towns (cf. RIN)</li> <li>- Design of roads in site plan, elevation plan and cross section (cf. RASt, RAL and RAA)</li> <li>- Intersection shapes, basics of design methodology (cf. HBS 2015)</li> <li>- Dimensioning of junction-free sections, facilities for pedestrian traffic, bicycle traffic as well as stationary traffic.</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
After successful participation, the students master contexts, procedures and methods that enable them to technically design or/and operate components or elements in the areas of road traffic engineering or rail traffic engineering.					
<b>Literature and teaching aids</b>					
<u>Specialization in Rail Transport:</u>					
Extensive lecture notes (will be provided as PDF files)					
Documents from rail transport companies, e.g. DB AG and supply industry e.g. Siemens, Vossloh					
EU documents, e.g. „Technische Spezifikationen für die Interoperabilität (TSI)“					
Maschek, U., „Sicherung des Schienenverkehrs“, Wiesbaden 2012					
Hausmann, A./ Enders, D.; Grundlagen des Bahnbetriebs, DB-Fachbuch 2007					
Janicki, J.; Systemwissen Eisenbahn, DB-Fachbuch 2008					
Pachl, J.; Systemtechnik des Schienenverkehrs, Wiesbaden 2011					
H. Freystein, „Handbuch Entwerfen von Bahnanlagen“, Hamburg 2008					
P. Neumann, „Leit- und Sicherungstechnik im Bahnbetrieb“, Hamburg 2004					



Specialization in Road Transport:

Natzschka, H.: Straßenbau – Entwurf und Bautechnik; 3rd edition 2011; Teubner Verlag, Wiesbaden

Velske S., H. Mentlein und P. Eymann: Straßenbautechnik; 7th edition 2013; Werner Verlag, Düsseldorf

Schnabel W. and D. Lohse: Grundlagen der Straßenverkehrstechnik und der Straßenverkehrsplanung, vol. 1

Straßenverkehrstechnik; 3rd edition 2011; Beuth Verlag, Berlin/Kirschbaum Verlag, Bonn

Forschungsgesellschaft für Straßen- und Verkehrswesen (FGSV):

Handbuch für die Bemessung von Straßenverkehrsanlagen (HBS)

Richtlinien für die Standardisierung des Oberbaus von Verkehrsflächen (RStO)

Richtlinien für die Anlage von Autobahnen (RAA)

Richtlinien für die Anlage von Landstraßen (RAL)

Richtlinien für die Anlage von Stadtstraßen (RASt)

**SPM 11 Integrated Network Planning**

<b>No:</b> SPM 11	<b>Specialization Module:</b> Integrated Network Planning	<b>Language:</b> German		<b>Credit points:</b> 8	
		<b>Frequency:</b> each spring term		<b>Term:</b> 6	
		<b>Workload:</b> 240 hrs.		<b>Form of examination:</b> KL60+PA	
	<b>Prerequisites for participation:</b> none	<b>Contact hours:</b> 84 hrs.	<b>Self-study hours:</b> 156 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Integrated Network Planning		Prof. Dr. Menzel		V	2
Case Studies of Integrated Network Planning				V+Ü	1+1
Integrated Interface Planning				V+Ü	1+1
This module is used for the following degree programs: LIM, LOM, LOP, MPM, WMV					
<b>Contents</b>					
<u>Integrated Network Planning/Case Studies of Integrated Network Planning:</u>					
<ul style="list-style-type: none"> <li>- Theoretical background of integrated planning in the transport sector</li> <li>- Aspects of transdisciplinary planning, planning and project processes</li> <li>- Theories of individual modes of transport in the overall context</li> <li>- Complementary case studies, some of whose backgrounds are explored in depth in short field trips and exercises</li> </ul>					
<u>Integrated Interface Planning:</u>					
<ul style="list-style-type: none"> <li>- Relevance of transport links as a basis for multi- and intermodal mobility, determinants of mobility, current planning strategies, approaches and measures as well as planning tools</li> <li>- Entire range of intra- and intermodal interfaces of transport systems</li> <li>- Practical examples as a basis for discussion with regard to their respective system-technical characteristics as well as with regard to organizational aspects</li> <li>- Discussion of the mobile station concept</li> <li>- Discussion of business models and economic constraints of complex travel chains across multiple intra- and intermodal interfaces</li> <li>- Demand- or behavior-oriented interventions to promote multimodal mobility under the umbrella term of mobility management</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
<u>Integrated Network Planning/Case Studies of Integrated Network Planning:</u>					
<p>Upon successful completion of the course, students will have methodological and conceptual competencies in integrated urban, transportation, and environmental planning, as well as meta-level systems theory and its areas of application. In the lecture part, the taxonomy levels "analysis" and "synthesis" have to be achieved for the most part in order to pass with at least the grade "good". To achieve the grade 1.0 (very good), additional knowledge must be developed through independent study. To pass with a "sufficient" 4.0, the "analysis" taxonomy level must be achieved in at least core aspects of traffic. Accordingly, the exam is divided into three equal parts: "collection questions", "comprehension questions" and "transfer questions". Correct answers to the "collection questions" and at least half of the "comprehension questions" correspond to reaching the taxonomy level "analysis" in core aspects. Content transfer performances with aspects of traffic object planning and mobility management correspond to taxonomy level "assessment" and can lead to an improvement of the performance in the exam (also to a pass).</p>					
<u>Integrated Interface Planning:</u>					

Based on the task given, students demonstrate skills in analyzing, adapting, and reflecting on issues in integrated interface planning.

**Literature and teaching aids**

Literature and working materials as well as competent contact persons will be presented and named during the course.

## Catalog of Mandatory Elective Subjects (WPF)

### WPF 1 Practical Philosophy - erroneous paths you'd better leave to others

<b>No:</b> WPF 1	<b>Mandatory elective module:</b> Practical Philosophy - erroneous paths you'd better leave to others	<b>Language:</b> German		<b>Credit points:</b> 2	
		<b>Frequency:</b> each fall term		<b>Term:</b> 5	
		<b>Workload:</b> 60 hrs.		<b>Form of examination:</b> PR	
	<b>Prerequisites for participation:</b> none	<b>Contact hours:</b> 30 hrs.	<b>Self-study hours:</b> 30 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Practical Philosophy - erroneous paths you'd better leave to others		Prof. Dr. Ernst		S	2
This module is used for the following degree programs: cross-curricular					
<p><b>Contents</b></p> <p>Older structures in the human brain can lead to thinking errors when dealing with contemporary problems, which remain undetected because their perception requires special attention. The brain just does not think by itself that it sometimes does not think correctly.</p> <p>Independent work on short case studies that highlight errors in one's logic.</p>					
<p><b>Learning objectives and competencies to be imparted</b></p> <p>Students know flaws in their reasoning that lead to behavior that is not useful to them. They understand basic structures of the human brain and their influence on cognitive thinking. They analyze short case studies and reenact the unfavorable thinking patterns presented in them. They transfer these thinking patterns to their own thinking and evaluate the influence of their own thinking on their behavior.</p>					
<p><b>Literature and teaching aids</b></p> <p>Dobelli, R. (2015): Die Kunst des Klaren Denkens, 52 Denkfehler, die Sie lieber anderen überlassen, München.  Dobelli, R. (2015): Die Kunst des klugen Handelns, 52 Irrwege, die Sie besser anderen überlassen, München.  Kahnemann, D. (2012): Schnelles denken, langsames denken, München.  Hessen, J. (1964): Lehrbuch der Philosophie, München</p>					

**WPF 2 International Summer School Traffic and Infrastructure**

<b>No:</b> WPF 2	<b>Mandatory elective module:</b> International Summer School Traffic and Infrastructure	<b>Language:</b> English		<b>Credit points:</b> 2	
		<b>Frequency:</b> each summer term at changing locations		<b>Term:</b> 4 / 6	
	<b>Prerequisites for participation:</b> none	<b>Workload:</b> 60 hrs.		<b>Form of examination:</b> PA	
<b>Contact hours:</b> 28 hrs.		<b>Self-study hours:</b> 32 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Summer School with Széchenyi István University (Hungary)		Prof. sc. ETH Santel		S	2
The module is used for the following courses of study: cross-curricular					
<b>Contents</b>					
<p>In addition to input sessions to impart necessary knowledge, the focus is on working on a practical example. Field trips to the study site as well as to best-practice applications are part of the content, as is work with traffic models and simulations.</p> <p>Within one week, groups work on, document and present a traffic-related issue based on a practical example in the region.</p> <p>The summer school alternately takes place at Ostfalia University in Salzgitter and at Széchenyi István University in Győr.</p>					
<b>Learning objectives and competencies to be imparted</b>					
<p>Upon successful participation, students possess methodological and conceptual competencies in all areas of traffic planning starting from the superordinate level of traffic development planning up to concrete traffic object planning.</p> <p>During the summer school, students consolidate and expand their theoretical knowledge based on a practical example as well as their social skills.</p>					
<b>Literature and teaching aids</b>					
Literature and working materials as well as competent contact persons will be presented during the course.					

**WPF 3 Cost and Activity Accounting Goods Transport Land/Sea**

<b>No:</b> WPF 3	<b>Mandatory elective module:</b> Cost and Activity Accounting Goods Transport Land/Sea	<b>Language:</b> German		<b>Credit points:</b> 2	
		<b>Frequency:</b> each spring term		<b>Term:</b> 6	
	<b>Prerequisites for participation:</b> none	<b>Workload:</b> 60 hrs.		<b>Form of examination:</b> KL60 / PR / RE / HA	
<b>Contact hours:</b> 28 hrs.		<b>Self-study hours:</b> 32 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Cost and Activity Accounting Goods Transport Land/Sea		Prof. Dr. Ordemann		V+Ü	1+1
This module is used for the following degree programs: cross-curricular					
<b>Contents</b>					
In addition to the content taught in various transport and logistics courses and the course "Cost Accounting and Cost Management", this elective deals with a more in-depth and specialized study of cost and activity accounting, including price calculation. The focus of this course will be the establishment of cost and activity accounting in the area of truck transports as well as container maritime transports.					
<b>Learning objectives and competencies to be imparted</b>					
The students are able to develop a cost and activity accounting in the mentioned area (see contents) in corresponding companies.					
<b>Literature and teaching aids</b>					
Lecture notes (will be provided as PDF file) Kerler, S. W., Fit für den Preiskampf, 2nd edition, Munich. Wittenbrink, P, Transportmanagement, 2nd edition, Wiesbaden. Eberhardt, M., Egger, N., Weckbach, N., Rechnungswesen – Spedition und Logistikleistung, 17th edition Braunschweig 2017 Drewry Maritime Research (ed.), Ship Operating Costs Annual Review and Forecast, Annual Report, op. cit, latest ed. Schönknecht, A.: Maritime Containerlogistik, Heidelberg 2009 Ordemann, F., Szenario für eine Seehafenkooperation im Bereich des Containerverkehrs, ed. by WWF-Deutschland, Berlin 2013 Ordemann, F., Kooperation der deutschen Containerseehäfen -hat eine größere Wirkung als Flussvertiefungen, Salzgitter 2015					

**WPF 4 Current Issues in the Maritime and Seaport Industries**

<b>No:</b> WPF 4	<b>Mandatory elective module:</b> Current Issues in the Maritime and Seaport Industries	<b>Language:</b> German		<b>Credit points:</b> 2	
		<b>Frequency:</b> each fall term		<b>Term:</b> 5	
	<b>Prerequisites for participation:</b> none	<b>Workload:</b> 60 hrs.		<b>Form of examination:</b> KL60 / PR / RE / HA	
<b>Contact hours:</b> 30 hrs.		<b>Self-study hours:</b> 30 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Current Issues in the Maritime and Seaport Industries		Prof. Dr. Ordemann		V+Ü	1+1
This module is used for the following degree programs: cross-curricular					
<b>Contents</b>					
<p>The maritime industry is a dynamically developing transport market segment. Changes range from parts of the market regime, such as the softening and eventual abolition of shipping conferences in 2008, to procedural changes, such as the introduction of blockchain technology, for which well-known shipping companies are pioneering logistics. Accordingly, special topics are permanently offered, which are treated here and which represent a supplement to a part of the compulsory module "Logistics Service Management". Similarly, the seaport industry must adapt to the changes taking place in the maritime sector. The importance of the German seaports in the context of their competitors and their position worldwide, the factors influencing seaport competition, and the diversity of the typical logistics service providers operating at the seaport location are taught.</p>					
<b>Learning objectives and competencies to be imparted</b>					
Students have structural knowledge and current knowledge of the maritime and seaport industries.					
<b>Literature and teaching aids</b>					
<p>Lecture notes (will be provided as PDF file)</p> <p>Hölser, T (Hrsg.), Grundwissen Spedition und Logistik, Lorenz 1, 25th edition, DVV, Hamburg 2016</p> <p>Schönknecht, A.: Maritime Containerlogistik, Heidelberg 2009</p> <p>Ordemann, F., Szenario für eine Seehafenkooperation im Bereich des Containerverkehrs, ed. by WWF-Deutschland, Berlin 2013</p> <p>Ordemann, F., Kooperation der deutschen Containerseehäfen -hat eine größere Wirkung als Flussvertiefungen, Salzgitter 2015</p>					

**WPF 5 Introduction to SAP**

<b>No:</b> WPF 5	<b>Mandatory elective module:</b> Introduction to SAP	<b>Language:</b> German		<b>Credit points:</b> 2
		<b>Frequency:</b> each fall and spring term		<b>Term:</b> 5 / 6 / 7
	<b>Prerequisites for participation:</b> none	<b>Workload:</b> 60 hrs.		<b>Form of examination:</b> KL60
<b>Contact hours:</b> 00/00 hrs		<b>Self-study hours:</b> 00/00 hrs		
<b>Courses:</b>		<b>Module commissioner:</b>	<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Introduction to SAP		Prof. Dr. Brey	V+L	1+1
The module is used for the following courses of study: cross-curricular				
<b>Learning objectives and competencies to be imparted</b>				
<p>After participation, students master the principle transaction-oriented business process modeling and processing within the SAP ERP system. To this end, students are taught how ERP systems work and how they are structured, using the SAP Business Suite as an example. Business processes specified in case studies are implemented and analyzed in SAP.</p> <p>In this way, the students will gain the knowledge they need to understand how SAP works and to work with the system in a company later on.</p>				
<b>Contents</b>				
<ul style="list-style-type: none"> <li>- Theoretical basics of the SAP ERP architecture</li> <li>- General operation of the SAP GUI</li> <li>- Mapping of business structures in SAP</li> <li>- Interactive representation of business processes and their integration using the example of the SAP model companies IDES and/or GBI</li> </ul>				
<b>Literature and teaching aids</b>				
<p>Lecture notes and manuals  Fallstudien im Rahmen des University Alliances Program der SAP AG  Frick et. al : Grundkurs SAP ERP, vieweg, 1st edition 2008  Benz/ Höflinger : Logistikprozesse mit SAP, vieweg + Teubner, 2nd edition 2008</p>				



**WPF 6 Practical Modeling and Robot Programming**

<b>No:</b> WPF 6	<b>Mandatory elective module:</b> Practical Modeling and Robot Programming	<b>Language:</b> German		<b>Credit points:</b> 2	
		<b>Frequency:</b> each fall and spring term		<b>Term:</b> from the 3rd term onwards	
	<b>Prerequisites for participation:</b> none	<b>Workload:</b> 60 hrs.		<b>Form of examination:</b> KL30 / PR / RE / PA	
<b>Contact hours:</b> 30/28 hrs.		<b>Self-study hours:</b> 30/32 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Practical Modeling and Robot Programming		Prof. Dr. Brey		V+Ü	1+1
This module is used for the following degree programs: cross-curricular					
<b>Contents</b>					
<p>Theory:</p> <ul style="list-style-type: none"> <li>- Object-oriented programming</li> <li>- General information about object orientation</li> <li>- Basic structures of OOP</li> <li>- Variables and methods</li> <li>- Expressions, statements and blocks</li> <li>- Control structures</li> <li>- Interfaces</li> </ul> <p>Laboratory:</p> <ul style="list-style-type: none"> <li>- Modeling</li> <li>- Programming in general</li> <li>- Robotics programming</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
<p>The goal is to impart competencies in the field of model building by practically translating real-world issues into adequate computer models in standard environments (operating system: Linux, programming language: JAVA, Python, etc.).</p> <p>Students deepen their knowledge acquired in "Introduction to Computer Science" using practical examples (including the LEGO MINDSTORMS EV3 system) and learn how to program sensors and actuators.</p> <p>After successful participation, students can understand mathematical methods of digital signal processing, create their own programs and design basic algorithms for controlling robot systems.</p>					
<b>Literature and teaching aids</b>					
<p>Lecture notes</p> <p>Maximilian Schöbel, Thorsten Leimbach, Beate Jost: Roberta - EV3 Programmieren mit Java - Lernen mit Robotern. Fraunhofer Verlag 2015</p> <p>Various JAVA textbooks</p>					

**WPF 7 Management of Working Time**

<b>No:</b> WPF 7	<b>Mandatory elective module:</b> Management of Working Time	<b>Language:</b> German		<b>Credit points:</b> 2	
		<b>Frequency:</b> each fall and spring term		<b>Term:</b> 4 / 5 / 6 / 7	
	<b>Prerequisites for participation:</b> none	<b>Workload:</b> 60 hrs.		<b>Form of examination:</b> RE / HA	
<b>Contact hours:</b> 30/28 hrs.		<b>Self-study hours:</b> 30/32 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Management of Working Time		Prof. Dr. Ernst		S	1+1
This module is used for the following degree programs: cross-curricular					
<b>Contents</b>					
<ul style="list-style-type: none"> <li>- Legal system (Working Hours Act, collective agreements, company agreements)</li> <li>- Basic pattern of working time organization</li> <li>- Trends towards flexibility</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
<p>The students recognize the strategies and flexible processes of personnel responsibility as a target for real innovation and learn to implement them especially in companies of the transportation sector.</p> <p>Knowledge of the relevant economic and legal framework.  Knowledge of current work schedule models including basic patterns.  Competence to develop models that are appropriate to the subject matter and interests.</p>					
<b>Literature and teaching aids</b>					
<p>Hellert, U. (2018): Arbeitszeitmodelle der Zukunft. Arbeitszeiten flexibel und attraktiv gestalten, 2nd edition, Freiburg/Munich/Stuttgart</p> <p>Hoff, A. (2015): Gestaltung betrieblicher Arbeitszeitsysteme. Ein Überblick für die Praxis, Wiesbaden</p> <p>Pletke, M./Schrader, P./Siebert, J. et al (2017): Rechtshandbuch Flexible Arbeit. Flexible Beschäftigungsverhältnisse, Personalanpassung, Vergütungssysteme, Arbeitszeitmodelle, Aufgabenänderung, München</p> <p>Reh, D. A./Kilz, G. (1996): Die Neugestaltung der Arbeitszeit als Gegenstand des betrieblichen Innovationsmanagements, 1st edition, Baden-Baden.</p> <p>Reh, D. A./Kilz, G. (1996): Innovative Arbeitszeitsysteme nach dem neuen Arbeitszeitrecht, Berlin</p> <p>Schaub, G. (2017): Arbeitsrechts-Handbuch. Systematische Darstellung und Nachschlagewerk für die Praxis, 17th edition, Munich</p>					

**WPF 8 Management of Non-Profit Organizations**

<b>No:</b> WPF 8	<b>Mandatory elective module:</b> Management of Non-Profit Organizations	<b>Language:</b> German		<b>Credit points:</b> 2	
		<b>Frequency:</b> each spring term		<b>Term:</b> 4 / 6	
	<b>Prerequisites for participation:</b> none	<b>Workload:</b> 60 hrs.		<b>Form of examination:</b> RE / HA	
<b>Contact hours:</b> 28 hrs.		<b>Self-study hours:</b> 32 hrs.			
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Management of Non-Profit Organizations		Prof. Dr. Ernst		S	1+1
This module is used for the following degree programs: cross-curricular					
<b>Contents</b>					
<ul style="list-style-type: none"> <li>- Legal system (European social law, SGB I-XII)</li> <li>- Basic pattern of the social system</li> <li>- Management approaches</li> </ul>					
<b>Learning objectives and competencies to be imparted</b>					
<p>Students will learn about the unique structures of the non-profit sector. At the same time, the relevance of the logics that apply there should also be recognized for profit organizations. In particular, students should be able to transfer approaches of NPO management to the profit sector, such as corporate health management, corporate culture.</p> <p>Knowledge of the relevant economic, social and legal framework.  Knowledge of current concepts of management of NPOs.  Competence to develop appropriate management strategies to achieve organizational goals.</p>					
<b>Literature and teaching aids</b>					
<p>Arnold, U./Grunwald, K./Maelicke, B., eds. (2014): Lehrbuch der Sozialwirtschaft, 4th edition, Baden-Baden  Decker, F. (1997): Das große Handbuch Management für soziale Institutionen, Landsberg/Lech  Halfar, B. (1999): Finanzierung sozialer Dienste und Einrichtungen, Baden-Baden  Haller, S. (2017): Dienstleistungsmanagement: Grundlagen, Konzepte, Instrumente, 7th edition, Wiesbaden  Reh, D. A./Kilz, G. (1997): Der Weg in die Teilzeitgesellschaft, Berlin  Reh, D. A./Kilz, G. (1997): Einführung in die Telearbeit, Berlin  Schauhoff, S./Bott, H. (2010): Handbuch der Gemeinnützigkeit: Verein, Stiftung, GmbH; Recht, Steuern, Personal, 3rd edition, Munich  Simsa, R./Meyer, M./Badelt, C., Hrsg. (2013): Handbuch der Nonprofit-Organisation: Strukturen und Management, 5th edition, Stuttgart  Simsa, R. (2016): Leadership in Non-Profit-Organisationen: Die Kunst der Führung ohne Profitdenken, 2nd edition, Wiley,  Stöger, R./Salcher, M. (2006): NPOs erfolgreich führen: Handbuch für Nonprofit-Organisationen in Deutschland, Österreich und der Schweiz, Stuttgart  Wöhe, G./Döring, U./Brösel, G. (2016): Einführung in die Allgemeine Betriebswirtschaftslehre, 26th edition, Munich</p>					

**WPF 9 Rail Transport in Practice**

<b>No:</b> WPF 9	<b>Mandatory module:</b> Rail Transport in Practice	<b>Language:</b> German		<b>Credit points:</b> 2	
		<b>Frequency:</b> each spring term		<b>Term:</b> from the 4th Term	
		<b>Workload:</b> 60 hrs.		<b>Form of examination:</b> KL30	
	<b>Prerequisites for participation:</b> none	<b>Contact hours:</b> 28 hrs.	<b>Self-study hours:</b> 32 hrs.		
<b>Courses:</b>		<b>Module commissioner:</b>		<b>Teaching and learning types:</b>	<b>Scope (SWS):</b>
Rail Transport in Practice		Prof. Dr. Santel		S	2
This module is used for the following degree programs: cross-curricular					
<b>Contents</b>					
<p>After some basic introductory lectures: visits to railroad companies in Lower Saxony, experts for railroad technology, system house Siemens, etc., including a two-day seminar "Railway Experience Days" in BS (ER.bahn-consulting GmbH) with two short theory blocks on railroad systems and vehicle technologies and subsequent practical activities, e.g. in signal boxes, on the traction unit or when coupling wagon trains</p>					
<b>Learning objectives and competencies to be imparted</b>					
<p>This module provides an in-depth look at the day-to-day practice of rail transportation for interested students from transportation and logistics programs. In addition to the transfer of knowledge in terms of content, contacts in the rail industry are made, which can be important for the students' further careers. Direct exchange with players on the ground paints the real picture of this industry.</p>					
<b>Literature and teaching aids</b>					
<p>Janicki, Jürgen (2016): "Systemwissen Eisenbahn", DB-Fachbuch, Bahn-Fachverlag, ISBN 978-3-943214-15-4  Janicki, Jürgen; Reinhard, Horst (2008): „Schienenfahrzeugtechnik“, DB-Fachbuch, Bahn-Fachverlag, ISBN 978-3-9808002-5-9  Jänsch, Eberhard (Ed.) (2016): „Handbuch: Das System Bahn“, Eurailpress, ISBN 978-3-87154-511-5  Lichtberger, Bernhard (2010): „Handbuch Gleis: Unterbau, Oberbau, Instandhaltung, Wirtschaftlichkeit“, Eurailpress, ISBN 978-3-7771-0400-3  Janicki, J. (2002): „Fahrzeugtechnik - Triebfahrzeuge“, Heidelberg  Breuer, B. (2006): „Bremsenhandbuch - Grundlagen, Komponenten, Systeme, Fahrdynamik“, Wiesbaden  IVE, Universität Hannover (Hrsg.) (2006) „Handbuch Dynamis – Fahrdynamische Berechnungen beliebiger Zugkonfigurationen“, Hannover  Wende, D. (2003), "Fahrdynamik des Schienenverkehrs", Stuttgart</p>					