TUHH

Hamburg University of Technology

Module Manual

Master of Science

Logistics, Infrastructure and Mobility

Cohort: Winter Term 2018

Updated: 28th September 2018

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Module Manual

Master

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Program description

Content

Efficient delivery of goods, persons and services to satisfy deadlines and customers is now a critical success factor in the production of complex products in globally networked companies. Logistics specialists control and design the flows within and between business enterprises. Logistics requires a functioning transport infrastructure, which is also a prerequisite for the mobility of persons. Transport systems give human beings access to workplaces, educational institutions, leisure and shopping facilities. Therefore, the efficient and environmentally friendly movement of persons and goods is an important future challenge in a society based on the division of labor.

The design and control of networked logistics systems from both the micro- and macroeconomic viewpoint requires in particular the ability to understand complex interrelations, appropriate method and process competence, and the requisite knowledge of engineering, economics, and fundamental social parameters. The interdisciplinary Master Program in Logistics, Infrastructure and Mobility therefore follows an engineering orientation, imparts the necessary economic knowledge, and enables students to specialize in either Production and Logistics or Transport and Mobility. For the first time, this program links the two promising subjects Logistics and Transport, which are often planned separately, thereby opening up new career prospects.

Core qualification

Module M0981: Operation of Public Transportation Systems

Courses

Title	Typ	Hrs/wk	CP
Operation of Public Transportation Systems (L1179)	Project-/problem-based Learning	4	6

Module Responsible	Prof. Carsten Gertz
Admission Requirements	None
Recommended Previous Knowledge	some knowledge of transport planning, e.g. through taking the undergraduate class „Transport Planning and Traffic Engineering“
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students are able to: • describe public transport (PT) systems in technical language. • outline the entire PT system including the interdependencies of the different elements. • explain the requirements for a PT system from different perspectives. • explain the role of PT in the transport system.
Skills	Students are able to: • systematically develop a public transport system when there are no clear cut correct or incorrect approaches. • cope with imprecise and incomplete data. • develop and appraise alternative solutions. • distinguish or develop appropriate methods of analysis and modes of presentation. • reflect and evaluate their own transport concept, considering competing requirements.
Personal Competence	
Social Competence	Students are able to: • carry out and complete a group project, inclusive of an appropriate allocation of tasks. • constructively provide and accept feedback. • present their own results to others.
Autonomy	• independently develop a bus PT concept within a given framework. • determine and justify the focus of their work. • organize and follow their work process regarding time and content. • independently author a written report. • assess the consequences of the solutions they develop.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	None
Examination	Written elaboration
Examination duration and scale	written assignment as groupwork with presentation during the semester
Assignment for the Following Curricula	Logistics, Infrastructure and Mobility: Core qualification: Compulsory Water and Environmental Engineering: Specialisation Cities: Elective Compulsory

Course L1179: Operation of Public Transportation Systems	
Typ	Project-/problem-based Learning
Hrs/wk	4
CP	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Prof. Carsten Gertz
Language	DE
Cycle	WiSe
Content	The course primarily deals with the planning and operational challenges of public transport systems. A bus-system is the example for studying these problems in depth. The following topics and systemic elements are covered: • PT network planning • timetabling • operational concepts • requirements for vehicle technology and operation • infrastructural requirements • inter- and multimodal connections • financing and competition • organisational structures The topics are discussed with guests lecturers from the public transport sector and are considered in practice during an excursion.
Literature	Verband Deutscher Verkehrsunternehmen / VDV-Förderkreis (Hrsg.) (2010) Nachhaltiger Nahverkehr. Köln. (2 Bände) Wuppertal Institut (2009) Handbuch zur Planung flexibler Bedienungsformen im ÖPNV : ein Beitrag zur Sicherung der Daseinsvorsorge in nachfrageschwachen Räumen. Bundesministerium für Verkehr, Bau und Stadtentwicklung / Bundesinstitut für Bau-, Stadt- und Raumforschung. Bonn. Forschungsgesellschaft für Straßen- und Verkehrswesen (2009) HVÖ - Hinweise für den Entwurf von Verknüpfungsanlagen des öffentlichen Personennahverkehrs. FGSV Verlag. Köln. Kirchhoff, Peter (2002) Städtische Verkehrsplanung – Konzepte, Verfahren, Maßnahmen. Vieweg+Teubner Verlag. Wiesbaden. Kirchhoff, Peter & Tsakarestos, Antonius (2007) Planung des ÖPNV in ländlichen Räumen, Ziele – Entwurf-Realisierung. Vieweg+Teubner Verlag. Wiesbaden Forschungsgesellschaft für Straßen- und Verkehrswesen (2008) Richtlinien für integrierte Netzgestaltung: RIN. FGSV-Verlag. Köln.

Module M0524: Nontechnical Elective Complementary Courses for Master

Module Responsible	Dagmar Richter
Admission Requirements	None
Recommended Previous Knowledge	None
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	**The Nontechnical Academic Programms (NTA)** imparts skills that, in view of the TUHH's training profile, professional engineering studies require but are not able to cover fully. Self-reliance, self-management, collaboration and professional and personnel management competences. The department implements these training objectives in its **teaching architecture**, in its **teaching and learning arrangements**, in **teaching areas** and by means of teaching offerings in which students can qualify by opting for **specific competences** and a **competence level** at the Bachelor's or Master's level. The teaching offerings are pooled in two different catalogues for nontechnical complementary courses. **The Learning Architecture** consists of a cross-disciplinarily study offering. The centrally designed teaching offering ensures that courses in the nontechnical academic programms follow the specific profiling of TUHH degree courses. The learning architecture demands and trains independent educational planning as regards the individual development of competences. It also provides orientation knowledge in the form of "profiles". The subjects that can be studied in parallel throughout the student's entire study program - if need be, it can be studied in one to two semesters. In view of the adaptation problems that individuals commonly face in their first semesters after making the transition from school to university and in order to encourage individually planned semesters abroad, there is no obligation to study these subjects in one or two specific semesters during the course of studies. **Teaching and Learning Arrangements** provide for students, separated into B.Sc. and M.Sc., to learn with and from each other across semesters. The challenge of dealing with interdisciplinarity and a variety of stages of learning in courses are part of the learning architecture and are deliberately encouraged in specific courses. **Fields of Teaching** are based on research findings from the academic disciplines cultural studies, social studies, arts, historical studies, communication studies, migration studies and sustainability research, and from engineering didactics. In addition, from the winter semester 2014/15 students on all Bachelor's courses will have the opportunity to learn about business management and start-ups in a goal-oriented way. The fields of teaching are augmented by soft skills offers and a foreign language offer. Here, the focus is on encouraging goal-oriented communication skills, e.g. the skills required by outgoing engineers in international and intercultural situations. **The Competence Level** of the courses offered in this area is different as regards the basic training objective in the Bachelor's and Master's fields. These differences are reflected in the practical examples used, in content topics that refer to different professional application contexts, and in the higher scientific and theoretical level of abstraction in the B.Sc. This is also reflected in the different quality of soft skills, which relate to the different team positions and different group leadership functions of Bachelor's and Master's graduates in their future working life. **Specialized Competence (Knowledge)** Students can • explain specialized areas in context of the relevant non-technical disciplines, • outline basic theories, categories, terminology, models, concepts or artistic techniques in the disciplines represented in the learning area, • different specialist disciplines relate to their own discipline and differentiate it as well as make connections, • sketch the basic outlines of how scientific disciplines, paradigms, models, instruments, methods and forms of representation in the specialized sciences are subject to individual and socio-cultural interpretation and historicity, • Can communicate in a foreign language in a manner appropriate to the subject.
Skills	**Professional Competence (Skills)** In selected sub-areas students can • apply basic and specific methods of the said scientific disciplines, • aquestion a specific technical phenomena, models, theories from the viewpoint of another, aforementioned specialist discipline, • to handle simple and advanced questions in aforementioned scientific disciplines in a sucsessful manner, • justify their decisions on forms of organization and application in practical questions in contexts that go beyond the technical relationship to the subject.
Personal Competence	
	Personal Competences (Social Skills) Students will be able

Social Competence	• to learn to collaborate in different manner, • to present and analyze problems in the abovementioned fields in a partner or group situation in a manner appropriate to the addressees, • to express themselves competently, in a culturally appropriate and gender-sensitive manner in the language of the country (as far as this study-focus would be chosen), • to explain nontechnical items to auditorium with technical background knowledge.
Autonomy	**Personal Competences (Self-reliance)** Students are able in selected areas • to reflect on their own profession and professionalism in the context of real-life fields of application • to organize themselves and their own learning processes • to reflect and decide questions in front of a broad education background • to communicate a nontechnical item in a competent way in writen form or verbaly • to organize themselves as an entrepreneurial subject country (as far as this study-focus would be chosen)
Workload in Hours	Depends on choice of courses
Credit points	6

Courses
Information regarding lectures and courses can be found in the corresponding module handbook published separately.

Module M0979: System Theory and Planning Analysis

Courses

Title	Typ	Hrs/wk	CP
Planning Analysis (L1178)	Project Seminar	1	3
System Theory and Analysis (L0605)	Lecture	2	2
System Theory and Analysis (L0606)	Recitation Section (large)	1	1

Module Responsible	Prof. Heike Flämig
Admission Requirements	None
Recommended Previous Knowledge	none
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students can... • describe the historical development and various views of systems theory • handle basic concepts and definitions of selected systems theories with confidence • explain the relevance of systems thinking for logistics
Skills	Students can... • Describe and analyze logistics systems with the help of systems theory • Apply planning analysis and classify it methodically • Apply methods of process analysis and visualization and classify them methodically • Apply Vester's paper computer and classify it methodically • Apply the stakeholder management cycle
Personal Competence	
Social Competence	Students can... • solve small tasks and problems in teams • develop a sense of social responsibility
Autonomy	Students can... • author small research papers independently • present the course of research
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	**Compulsory** **Bonus** **Form** **Description** Yes 5 % Excercises
Examination	Written elaboration
Examination duration and scale	Seminar assignment in groups approx. 15 pages per person, group presentation 30 minutes. Studienleistung: 10 exercises during the semester (min 80%)
Assignment for the Following Curricula	Logistics, Infrastructure and Mobility: Core qualification: Compulsory

Course L1178: Planning Analysis

Typ	Project Seminar
Hrs/wk	1
CP	3
Workload in Hours	Independent Study Time 76, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	WiSe
Content	• Practical application and discussion of planning analysis
Literature	Flämig, H.: Wirtschaftsverkehrssysteme in Verdichtungsräumen - Empirirsche Analysen, Umsetzungsprozesse, Handlungsempfehlungen. Dissertation, Hamburg 2004.

Course L0605: System Theory and Analysis	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	WiSe

Content	• Basic concepts and ideas of systems theory
	• Basics of systems analysis and modeling
	• Selected approaches to traffic systems analysis
	• Introduction to planning analysis to analyze and design corporate and planning processes from a systems theory and political science perspective, with the following levels of analysis:
	  ◦ creating systems understanding and boundaries
	  ◦ target system description and analysis procedure
	  ◦ Analysis of measures: description of measures
	  ◦ action impact analysis: identifying the discrepancy between actual and desired action
	  ◦ measures impact analysis: methods of identifying substantial impact
	  ◦ ▪
	  determinant analysis to identify successor factors and obstacles for the purpose of deducing recommendations for action by
	  ▪ Tracing implementation processes
	  ▪ Stakeholder management cycle
	• Practical examples

Literature	--

Course L0606: System Theory and Analysis	
Typ	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M1002: Production and Logistics Management

Courses

Title	Typ	Hrs/wk	CP
Operative Production and Logistics Management (L1198)	Lecture	2	2
Strategic Production and Logistics Management (L1089)	Project-/problem-based Learning	3	4

Module Responsible	Prof. Wolfgang Kersten
Admission Requirements	None
Recommended Previous Knowledge	Introduction to Business and Management The previous knowledge, that is necessary for the successful participation in this module is accessable via e-learning. Log-in and additional information will be distributed during the admission process.
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students will be able - to differentiate between strategic and operational production and logistics management, - to describe the areas of production and logistics management, - understand the difference between traditional and new concepts of production planning and control, - to describe and explain the actual challenges of production and logistics management, esp. in an international context.
Skills	Based on the acquired knowledge students are capable of - Applying methods of production and logistics management in an international context, - Selecting sufficient methods of production and logistics management to solve practical problems, - Selecting appropriate methods of production and logistics management also for non-standardized problems, - Making a holistic assessment of areas of decision in production and logistics management and relevant influence factors.
Personal Competence	
Social Competence	After completion of the module students can - lead discussions and team sessions, - arrive at work results in groups and document them, - develop joint solutions in mixed teams and present them to others, - present solutions to specialists and develop ideas further.
Autonomy	After completion of the module students can - assess possible consequences of their professional activity, - define tasks independently, acquire the requisite knowledge and use suitable means of implementation, - define and carry out research tasks bearing in mind possible societal consequences.
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70
Credit points	6

Studienleistung	**Compulsory**	**Bonus**	**Form**	**Description**
	Yes	2.5 %	Excercises	Online-Modul
	No	15 %	Subject theoretical and practical work	PBL

Examination	Written exam
Examination duration and scale	120 min
Assignment for the Following Curricula	International Management and Engineering: Core qualification: Compulsory Logistics, Infrastructure and Mobility: Core qualification: Compulsory Product Development, Materials and Production: Specialisation Product Development: Elective Compulsory Product Development, Materials and Production: Specialisation Production: Elective Compulsory Product Development, Materials and Production: Specialisation Materials: Elective Compulsory

Course L1198: Operative Production and Logistics Management	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Thorsten Blecker
Language	DE
Cycle	WiSe
Content	• Further knowledge of operational production management • Traditional production planning and control concepts • Recent production planning and control concepts • Understanding and application of quantitative methods • Further concepts regarding operational production management
Literature	Corsten, H.: Produktionswirtschaft: Einführung in das industrielle Produktionsmanagement, 12. Aufl., München 2009. Dyckhoff, H./Spengler T.: Produktionswirtschaft: Eine Einführung, 3. Aufl., Berlin Heidelberg 2010. Heizer, J./Render, B: Operations Management, 10. Auflage, Upper Saddle River 2011. Kaluza, B./Blecker, Th. (Hrsg.): Produktions- und Logistikmanagement in Virtuellen Unternehmen und Unternehmensnetzwerken, Berlin et al. 2000. Kaluza, B./Blecker, Th. (Hrsg.): Erfolgsfaktor Flexibilität. Strategien und Konzepte für wandlungsfähige Unternehmen, Berlin 2005. Kurbel, K.: Produktionsplanung und steuerung, 5., Aufl., München - Wien 2003. Schweitzer, M.: Industriebetriebslehre, 2. Auflage, München 1994. Thonemann, Ulrich (2005): Operations Management, 2. Aufl., München 2010. Zahn, E./Schmid, U.: Produktionswirtschaft I: Grundlagen und operatives Produktionsmanagement, Stuttgart 1996 Zäpfel, G.: Grundzüge des Produktions- und Logistikmanagement, 2. Aufl., München - Wien 2001

Course L1089: Strategic Production and Logistics Management	
Typ	Project-/problem-based Learning
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Wolfgang Kersten
Language	DE
Cycle	WiSe
Content	• Identification of the scope of production, operations and logistics management • Understanding of actual challenges concerning production and logistics strategy • Understanding operations as a competitive weapon • Identification and design of the main elements of an operations strategy (level of vertical integration, technology strategy, location strategy, capacity strategy) of a company • Evaluation of operation strategies of different companies and industrial sectors • In depth discussion of methods and concepts of production and logistics management • In depth discussion of lean management: Main goals and measures of lean management and lean production concepts, impact of lean management on production strategy • Presentation and discussion of current research topics in the field of production and logistics management • Integration of Problem-Based-Learning sessions in order to enhance teamworking and problem solving skills as well as presentation skills
Literature	Corsten, H. /Gössinger, R. (2009): Produktionswirtschaft – Einführung in das industrielle Produktionsmanagement, 12. Auflage, München: Oldenbourg. Dyckhoff, H. /Spengler, T. (2007): Produktionswirtschaft – eine Einführung für Wirtschaftsingenieure, 2. Auflage, Berlin Heidelberg [u.a.]: Springer. Heizer, J./Render, B (2011): Operations Management, 10. Auflage, Upper Saddle River. Henderson, S./ Illidge, R./Machardy, P. (1994): Management for engineers, Oxford: Butterworth-Heinemann. Porter, M. E. (2008): Wettbewerbsstrategie – Methoden zur Analyse von Branchen und Konkurrenten, 11. Auflage, Frankfurt/Main [u.a.]: Campus-Verlag. Slack, N./ Lewis, M.(2002): Operations Strategy, Harlow u.a. Swink, M./ Melnyk, S./ Cooper, M./ Hartley, J.(2011): Managing Operations across the Supply Chain, New York u.a. Wortmann, J. C. (1992): Production management systems for one-of-a-kind products, Computers in Industry 19, S. 79-88 Womack, J./ Jones, D./ Roos, D. (1990): The Machine that changed the world; New York. Zahn, E. /Schmid, U. (1996): Grundlagen und operatives Produktionsmanagement, Stuttgart: Lucius & Lucius Zäpfel, G.(2000): Produktionswirtschaft: Strategisches Produktions-Management, 2. Aufl., München u.a.

Module M1119: Quantitative Methods in Logistics

Courses

Title	Typ	Hrs/wk	CP
Optimization in Logistics (L1454)	Lecture	2	3
Simulation Methods (L1453)	Lecture	2	2
Exercises to Optimization in Logistics (L1455)	Recitation Section (small)	1	1

Module Responsible	Prof. Kathrin Fischer
Admission Requirements	None
Recommended Previous Knowledge	Knowledge of linear algebra and analysis (Bachelor level); basic knowledge of Statistics and Operations Research.
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students know • linear and integer programming methods for solving planning problems and appropriate software for solving these problems; • selected advanced methods of transportation and network optimization, e.g. the transshipment method; • selected exact and heuristic integer programming models and methods, e.g. for location planning or vehicle routing; • approaches for inventory optimization; • the potential of simulation for examining logistics scenarios; • standard simulation methods for the analysis of logistics scenarios and business research in general; • concepts and tools for the implementation and analysis of simulation models.
Skills	Students are able to • construct appropriate quantitative - linear or integer - models for Logistics planning situations; • apply advanced methods from transport and network planning as well as inventory optimization and location planning, and to interpret and evaluate the results; • use models and methods from Statistics and OR to analyse problems from the areas of business and engineering and to evaluate the results, and to develop a critical judgement of the different methods and their applicability; • use appropriate software to solve these problems • apply their theoretical knowledge of the different methods to practical Logistics problems; • choose appropriate simulation methods and tools for a given problem and may discuss their advantages and disadvantages; • develop a conceptual simulation model; • design systematic simulation experiments and analyze the results for answering the given problem statement.
Personal Competence	
Social Competence	Students are able to • engage in scientific discussions on topics from the fields of Optimization and Simulation and their application in Logistics; • present the results of their work to specialists; • work successfully and respectfully in a team.
Autonomy	Students are able to • solve complex planning problems independently or in a team, selecting and using appropriate software; • gather knowledge in the area independently and to apply their knowledge also in new and unknown situations; • critically evaluate the results of their work and the consequences.
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70
Credit points	6
Studienleistung	**Compulsory** **Bonus** **Form** **Description** No 10 % Written elaboration
Examination	Written exam
Examination duration and scale	2 hours
Assignment for the Following Curricula	Logistics, Infrastructure and Mobility: Core qualification: Compulsory

Course L1454: Optimization in Logistics	
Typ	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Kathrin Fischer
Language	DE
Cycle	WiSe
Content	• Repetition of the most important topics from linear programming • Transportation Planning: Modelling and solving of capacitated transportation problems and of transshipment problems in global networks; • Network Optimization Problems: Modelling Production and Logistics Networks, solving optimization problems in networks, e.g. network flow problems; • Integer optimization problems: e.g. model building for location decisions; solving problems by exact and heuristics solution procedures; • Inventory optimization: Optimizing inventory holding under different asumptions; integrated models for production and inventory holding and/ or transportation planning; • Solving planning problems using appropriate software. •
Literature	Ausgewählte Bücher: D.R. Anderson / D.J. Sweeney / T.A. Williams / Martin: Quantitative Methods for Business. 11th Edition, Thomson, South Western 2008. Domschke, W., Drexl, A.: Einführung in Operations Research, 7. Auflage, Springer, Berlin et al. 2007. Domschke, W. / A. Drexl / R. Klein / A. Scholl / S. Voß: Übungen und Fallbeispiele zum Operations Research, 6. Auflage, Springer, Berlin et al. 2007 Domschke, W.: Logistik: Transport. 5. Auflage, Oldenbourg Verlag, 2007. Domschke, W., Scholl, A.: Logistik: Rundreisen und Touren. 5. Auflage, Oldenbourg Verlag, 2010. Domschke, W.: Logistik: Standorte. Oldenbourg Verlag 1995. Eiselt, H.A., Sandblom, C.-L.: Integer Programming and Network Models, Springer 2000. Eiselt, H.A., Sandblom, C.-L.: Decision Analysis, Location Models, and Scheduling Problems, Springer 2004. Hillier, F.S., Lieberman, G.J.: Introduction to Operations Research. 8th Edition, McGraw-Hill, 2005. Williams, H.P.: Model Building in Mathematical Programming. 5th edition, Wiley & Sons, 2013. Zudem: Skript und Unterlagen, die zur Vorlesung herausgegeben werden.

Course L1453: Simulation Methods	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Iris Lorscheid
Language	DE
Cycle	WiSe

Content	Simulation is a relevant method in logistics research. A deeper understanding of logistics scenarios and their relationships may be achieved by modeling and analyzing the processes and interactions on different levels of detail in a simulation. Simulation experiments allow the consideration of variations of scenarios and their effect on the performance.
	
	This lecture gives an overview of common simulation methods and their applications in research and companies. In particular, their advantages, disadvantages and challenges in concrete implementations are discussed. Criteria for the selection of suitable simulation methods, tools and programming languages are addressed, which should prepare the students for the application of the simulation methods. Also, a description of the research process, including modeling, designing simulation experiments, as well as communication of results, should enable the students to plan and manage a simulation project.
	
	In particular, the lecture deals with the following topics:
	
	• Simulation - Definition, potentials und challenges
	• Simulation methods und applications
	  ◦ Monte-Carlo simulation
	  ◦ Discrete-event simulation
	  ◦ System dynamics
	  ◦ Agent-based simulation
	• Simulation software and tools
	• Simulation in companies
	• Modeling process and implementation aids, including examples

Literature	I. • Law, A.M. (2014). Simulation Modeling and Analysis. 5th Edition. McGraw-Hill. • Gilbert, N., & Troitzsch, K. (2005). Simulation for the social scientist. McGraw-Hill International. • Cassandras, C.G. (2008). Introduction to discrete event systems. 2nd Edition. Springer, New York. • Nahrstedt, H. (2015). Die Monte-Carlo Methode: Beispiele unter Excel VBA II. • Balakrishnan, N., Render, B., & Stair, R.M. (2014). Managerial decisions with spreadsheets. 3rd Edition. Pearson. • Gilbert, N. (2008). Agent-based models. Sage: Thousand Oaks, CA. • Grimm, V., Berger, U., Bastiansen, F., Eliassen, S., Ginot, V., Giske, J., ... & DeAngelis, D. L. (2006). A standard protocol for describing individual-based and agent-based models. Ecological modelling, 198(1), 115-126. • Grimm, V., Berger, U., DeAngelis, D. L., Polhill, J. G., Giske, J., & Railsback, S. F. (2010). The ODD protocol: a review and first update. Ecological Modelling, 221(23). • Lorscheid, I., Heine, B. O., & Meyer, M. (2012). Opening the 'black box'of simulations: increased transparency and effective communication through the systematic design of experiments. Computational and Mathematical Organization Theory, 18(1), 22-62. • Meyer, Matthias & Heine, B.O. (2009). Das Potenzial agentenbasierter Simulationsmodelle: Aufgezeigt im Anwendungsfeld „Computational Organization Theory". Die Betriebswirtschaft. 69:495-520. • Woolridge, M. (2002). An Introduction to Multiagent Systems, Wiley & Sons, Chichester. • Railsback, S.F. & Grimm, V. (2012). Agent-based and individual-based modeling. A practical introduction. Princeton University Press: Princeton, NJ & Oxford, UK.

Course L1455: Exercises to Optimization in Logistics	
Typ	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Kathrin Fischer
Language	DE
Cycle	WiSe
Content	• Repetition of the most important topics from linear programming • Transportation Planning: Modelling and solving of capacitated transportation problems and of transshipment problems in global networks; • Network Optimization Problems: Modelling Production and Logistics Networks, solving optimization problems in networks, e.g. network flow problems; • Integer optimization problems: e.g. model building for location decisions; solving problems by exact and heuristics solution procedures; • Inventory optimization: Optimizing inventory holding under different asumptions; integrated models for production and inventory holding and/ or transportation planning; • Solving planning problems using appropriate software. •
Literature	Ausgewählte Bücher: D.R. Anderson / D.J. Sweeney / T.A. Williams / Martin: Quantitative Methods for Business. 11th Edition, Thomson, South Western 2008. Domschke, W., Drexl, A.: Einführung in Operations Research, 7. Auflage, Springer, Berlin et al. 2007. Domschke, W. / A. Drexl / R. Klein / A. Scholl / S. Voß: Übungen und Fallbeispiele zum Operations Research, 6. Auflage, Springer, Berlin et al. 2007 Domschke, W.: Logistik: Transport. 5. Auflage, Oldenbourg Verlag, 2007. Domschke, W., Scholl, A.: Logistik: Rundreisen und Touren. 5. Auflage, Oldenbourg Verlag, 2010. Domschke, W.: Logistik: Standorte. Oldenbourg Verlag 1995. Eiselt, H.A., Sandblom, C.-L.: Integer Programming and Network Models, Springer 2000. Eiselt, H.A., Sandblom, C.-L.: Decision Analysis, Location Models, and Scheduling Problems, Springer 2004. Hillier, F.S., Lieberman, G.J.: Introduction to Operations Research. 8th Edition, McGraw-Hill, 2005. Williams, H.P.: Model Building in Mathematical Programming. 5th edition, Wiley & Sons, 2013. Zudem: Skript und Unterlagen, die zur Vorlesung herausgegeben werden.

Module M1251: Law and Logistic, the Influence of Law on Complex Logistic Flow

Courses

Title	Typ	Hrs/wk	CP
Law and Logistic, the Influence of Law on Complex Logistic Flow (L1698)	Seminar	3	6

Module Responsible	Prof. Heike Flämig
Admission Requirements	None
Recommended Previous Knowledge	Module Legal Foundations of Transportation and Logistics
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students are able to... • illustrate interactions between logistics and law • understand complex logistic flows and evaluate risks
Skills	Students are able to... • analyze and solve questions of law concerning international logistic chains • discuss, examine and evaluate law cases with applicable laws
Personal Competence	
Social Competence	Students can come to results in groups and document them.
Autonomy	Students can... • develop systematical thinking • search and analyze laws independently • answer questions of law independently
Workload in Hours	Independent Study Time 138, Study Time in Lecture 42
Credit points	6
Studienleistung	None
Examination	Written elaboration
Examination duration and scale	Written assignment and short presentation
Assignment for the Following Curricula	Logistics, Infrastructure and Mobility: Core qualification: Elective Compulsory

Course L1698: Law and Logistic, the Influence of Law on Complex Logistic Flow

Typ	Seminar
Hrs/wk	3
CP	6
Workload in Hours	Independent Study Time 138, Study Time in Lecture 42
Lecturer	Dr. Oliver Peltzer
Language	DE
Cycle	WiSe
Content	• Construction logistics for offshore wind installations in the north and baltic sea • German Forwarders' Standard Terms & Conditions • International air transport across many borders • Connectivity of supply chains • Risks of importing goods • Dedicated use of ships for maritime trade • Using the incoterms
Literature	Aktueller Text des Bürgerlichen Gesetzbuches und Handelsgesetzbuches

Module M0558: Operations Research

Courses

Title	Typ	Hrs/wk	CP
Operations Research (L0155)	Lecture	2	2
Operations Research - Seminar (L0156)	Seminar	2	3
Project Operations Research (L1793)	Project-/problem-based Learning	1	1

Module Responsible	Prof. Kathrin Fischer
Admission Requirements	None
Recommended Previous Knowledge	Knowledge from the module "Quantitative Methods": Linear Programming, Network Optimization and basics of Integer Programming.
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students have an in-depth knowledge of the following areas: They are able to • explain complex quantitative models for applications, e.g. production models with integrated inventory holding over time, portfolio models, revenue management models • Discuss advanced topics in linear programming, e.g, duality theory and its application, special structures as upper/lower bounds for variables; revised simplex method etc. • Study problems with multiple objectives and under uncertainty, i.e. the adaption of linear programming models to realistic applications • Discuss advanced topics in integer programming: complex problems, e.g. from vehicle routing, and logical constraints; advanced solutions procedures as branch and bound, cutting-plane procedures etc. • Examine dynamic and non-linear programming problems and applications in Management
Skills	Students have in-depth abilities in the following areas: They are able to • formulate complex quantitative models for applications, e.g. production models with integrated inventory holding over time, portfolio models, revenue management models • Apply duality theory in linear programming and analyze special structures as upper/lower bounds for variables; use the revised simplex method etc. • Analyze problems with multiple objectives and under uncertainty, i.e. the adaption of linear programming models to realistic applications • Set up advanced models in integer programming and solve them, e.g. problems from vehicle routing, or logical constraints • Analyze dynamic and non-linear programming problems and applications in Management
Personal Competence	
Social Competence	Students are able to • work successfully in a team, organize the team, and solve complex tasks in a team in a given time frame • give structured feedback, following feedback rules, and also accept deeback from their fellow students • lead discussions on problems from the field of OR • present the results of their work to specialists.
Autonomy	Students are able to • independently acquire relevant scientific knowledge from the literature • independently carry out a (pre-defined) complex research task • aggregate their knowledge and results and present it to others • apply their knowledge and experience also to new problems and unknown situations.
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70
Credit points	6
Studienleistung	**Compulsory** Yes; **Bonus** 10 %; **Form** Group discussion; **Description**
Examination	Subject theoretical and practical work
Examination duration and scale	To be announced in Lecture
Assignment for the Following Curricula	International Management and Engineering: Specialisation I. Electives Management: Elective Compulsory Logistics, Infrastructure and Mobility: Core qualification: Elective Compulsory

Course L0155: Operations Research	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Kathrin Fischer
Language	DE
Cycle	SoSe
Content	• Complex quantitative models for applications, e.g. production models with integrated inventory holding over time, portfolio models, revenue management models • Advanced topics in linear programming, e.g, duality theory and its application, special structures as upper/lower bounds for variables; revised simplex method etc. • Problems with multiple objectives and under uncertainty: adaption of linear programming models to realistic applications • Advanced topics in integer programming: Modelling complex problems, e.g. from vehicle routing, and logical constraints; advanced solutions procedures as branch and bound, cutting-plane procedures etc. • Dynamic and non-linear programming and its applications in Management • Applications of models and methods in the area of supply chain management and logistics, e.g. in location planning etc.
Literature	Bücher: Albright, C., Winston, W.: Management Science Modeling. Revised Third Edition, South-Western 2009. Eiselt, H.A., Sandblom, C.-L.: Linear Programming and its Applications, Springer 2007. Eiselt, H.A., Sandblom, C.-L.: Integer Programming and Network Models, Springer 2000. Eiselt, H.A., Sandblom, C.-L.: Decision Analysis, Location Models, and Scheduling Problems, Springer 2004. Suhl, L., Mellouli, T.: Optimierungssysteme. Springer, Berlin et al., 2. Auflage, 2009. Williams, H.P.: Model Building in Mathematical Programming. 5th edition, Wiley & Sons, 2013. Winston, W., Venkataramanan, M.: Mathematical Programming. Operations Research, Volume 1, 4th Edition, Thomson, London et al. 2003. Sowie ein Skript, das zur Vorlesung herausgegeben wird.

Course L0156: Operations Research - Seminar	
Typ	Seminar
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Kathrin Fischer
Language	DE
Cycle	SoSe
Content	Special topics from different areas of the lecture are discussed in the seminar. Students are required to use current publications from highly esteemed journals in their assignment and to write an essay on a relevant OR topic. Moreover, they have to prepare and give a talk on that topic. The seminar is research-oriented and focuses on relevant research topics from the field. There is a limitation of the number of seminar participants (36 students). If necessary, selection of participants will be based on the results in the Quantitative Methods module which is a prerequisite for this course.
Literature	Fachartikel (Journal Papers), die zu Beginn des Seminars bekanntgegeben werden.

Course L1793: Project Operations Research	
Typ	Project-/problem-based Learning
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Kathrin Fischer
Language	DE
Cycle	SoSe
Content	In this course, students develop a computer-based realization for a business application problem in a team of students. In particular, they are required to carry out the following steps: • Modeling the planning situation • Implementation and documentation • Generation of appropriate test data • Testing the implementation, sensitivity analyses etc. • Documentation of results and critical evaluation
Literature	Siehe Vorlesung Operations Research

Module M0750: Economics

Courses

Title	Typ	Hrs/wk	CP
International Economics (L0700)	Lecture	2	4
Main Theoretical and Political Concepts (L0641)	Lecture	2	2

Module Responsible	Prof. Kathrin Fischer
Admission Requirements	None
Recommended Previous Knowledge	Keine
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students know • the most important principles of individual decision making in a national and international context • different market structures • types of market failure • the functioning of a single economy (including money market, financial and goods markets, labor market) • the difference between and the interdependence of short and long run equilibria • the significance of expectations on the effects of economic policy • the various links between economies • different economic policies (trade, monetary, fiscal and exchange rate policy) and their effects on the home and foreign economies
Skills	The students are able to model analytically or graphically • the most important principles of individual decision making in a national and international context • the market results of different market structures and market failure • the welfare effects of the market results • expectations hypothesis • the functioning of an economy (including money market, financial and goods markets, labor market) • links between economies • the effects of economic policies (trade, monetary, fiscal and exchange rate policies)
Personal Competence	
Social Competence	The students are able • to anticipate expectations and decisions of individuals or groups of individuals. These may be inside or outside of the own firm. • to take these decisions into account while deciding themselves • to understand the behavior of markets and to assess the opportunities and risks with respect to the own business activities.
Autonomy	With the methods taught the students will be able • to analyze empirical phenomena in single economies and the world economy and to reconile them with the studied theoretical concepts. • to design, analyze and evaluate micro- and macroeconomic policies against the background of different models.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	**Compulsory** Yes; **Bonus** 5 %; **Form** Excercises; **Description**
Examination	Written exam
Examination duration and scale	2 hours
Assignment for the Following Curricula	International Management and Engineering: Core qualification: Compulsory Logistics, Infrastructure and Mobility: Core qualification: Elective Compulsory Mechanical Engineering and Management: Specialisation Management: Elective Compulsory

Course L0700: International Economics	
Typ	Lecture
Hrs/wk	2
CP	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	Prof. Annette Olbrisch-Ziegler
Language	EN
Cycle	SoSe

Content	• International Trade Theory and Policy:
	  ◦ Comparative Advantage, the Ricardian Model
	  ◦ The Heckscher-Ohlin Model
	  ◦ The Standard Trade Model
	  ◦ Intrasectoral Trade
	  ◦ International Trade Policy
	• Open Economy Macroeconomics
	  ◦ The Foreign Exchange Market
	  ◦ Determinants of Prices, Interest Rates, Exchange Rates, Output in the Short Run
	  ◦ Determinants of Prices, Interest Rates, Exchange Rates, Output in the Long Run
	  ◦ Monetary and Fiscal and Exchange Rate Policies in Open Economies in the Long and the Short Run

Literature	Krugman/Obstfeld: International Economics, Longman, 9th ed. 2011 Mankiw/Taylor: Economics, South-Western 2008 Documents and notes handed out during the lecture.

Course L0641: Main Theoretical and Political Concepts	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Annette Olbrisch-Ziegler
Language	EN
Cycle	SoSe

Content	• **Introduction: Ten Principles of Economics**
	• Microeconomics:
	  ◦ Theory of the Household
	  ◦ Theory of the Firm
	  ◦ Competitive Markets in Equilibrium
	  ◦ Market Failure: Monopoly and External Effects
	  ◦ Government Policies
	• Macroeconomics:
	  ◦ A Nation's Real Income and Production
	  ◦ The Real Economy in the Long Run: Capital and Labour Market
	  ◦ Money and Prices in the Long Run
	  ◦ Aggregate Demand and Supply: Short-Run Economic Fluctuations
	  ◦ Monetary and Fiscal Policy in the Short and the Long Run

Literature	Mankiw/Taylor: Economics, South-Western 2008 Pindyck/Rubinfeld: Microeconomics, Prentice Hall International , 7th ed. 2010 Documents and notes handed out during the lecture.

Module M0992: Transportation Economics

Courses

Title	Typ	Hrs/wk	CP
Transportation Economics (L1194)	Lecture	2	4
Transportation Economics (L1195)	Recitation Section (large)	2	2

Module Responsible	Prof. Carsten Gertz
Admission Requirements	None
Recommended Previous Knowledge	Fundamentals of Transportation Economics
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students can... • Specify the different functions of transportation • Describe macroeconomic developments in transportation • Explain the tasks of national and international transport policy • Assess evaluation and decision problems of transport infrastructure policy • Compare different financing models and instruments for transport infrastructure
Skills	Students can... • Use analysis methods for the evaluation of transport infrastructure appropriately • Choose the appropriate instrument for financing transport infrastructure from a set of alternatives
Personal Competence	
Social Competence	Students can... • Prepare, document and present results individually or in a group • Assess your own performance and enhance it constructively
Autonomy	Students can... • Assess your own learning progress and state of knowledge • Carry out literature research and analyses • Perform assigned tasks on your own, structure them with regard to contents and finish them on time • Create written works on your own
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	None
Examination	Written exam
Examination duration and scale	60 minutes
Assignment for the Following Curricula	Logistics, Infrastructure and Mobility: Core qualification: Compulsory

Course L1194: Transportation Economics	
Typ	Lecture
Hrs/wk	2
CP	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	Martin Makait
Language	DE
Cycle	SoSe
Content	The course transfers knowledge on the principles of transport policy in the following areas • Functions and macroeconomic developments in transportation • National und international transport policy • Transport infrastructure policy and economic evaluation problems of infrastructure • Financing models and instruments for transport infrastructure Key contents of the course are further explored and discussed in the tutorial
Literature	Aberle, G. (2009): Transportwirtschaft, 5. Auflage, Oldenbourg Verlag, München. Button, K. (2010): Transport Economics, 3rd Edition, Edw. Elgar Publishing Cheltenham UK. Daehre-Kommission (2012): Zukunft der Verkehrsinfrastruktur-finanzierung, Berlin. Frerich, J. u. Müller, G. (2004): Europäische Verkehrspolitik, Band 1 - 3, München. Grandjot, H.-H. (2002): Verkehrspolitik - Grundlagen, Funktionen und Perspektiven für Wissenschaft und Praxis, Deutscher Verkehrs-Verlag, Hamburg. Kummer, S. (2006): Einführung in die Verkehrswirtschaft. Facultas Verlag, Wien

Course L1195: Transportation Economics	
Typ	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Martin Makait
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Module M1034: Technology Entrepreneuship

Courses

Title	Typ	Hrs/wk	CP
Creation of Business Opportunities (L1280)	Project-/problem-based Learning	3	4
Entrepreneurship (L1279)	Lecture	2	2

Module Responsible	Prof. Christoph Ihl
Admission Requirements	None
Recommended Previous Knowledge	Basic knowledge in business economics obtained in the compulsory modules as well as an interest in new technologies and the pursuit of new business opportunities either in corporate or startup contexts.
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Wissen (subject-related knowledge and understanding): • develop a working knowledge and understanding of the entrepreneurial perspective • understand the difference between a good idea and scalable business opportunity • understand the process of taking a technology idea and finding a high-potential commercial opportunity • understand the components of business models • understand the components of business opportunity assessment and business plans
Skills	• Fertigkeiten (subject-related skills): ◦ identify and define business opportunities ◦ assess and validate entrepreneurial opportunities ◦ create and verify a business model of how to sell and market an entrepreneurial opportunity ◦ formulate and test business model assumptions and hypotheses ◦ conduct customer and expert interviews regarding business opportunities ◦ prepare business opportunity assessment ◦ create and verify a plan for gathering resources such as talent and capital ◦ pitch a business opportunity to your classmates and the teaching team
Personal Competence	
Social Competence	Sozialkompetenz (Social Competence): • team work • communication and presentation • give and take critical comments • engaging in fruitful discussions
Autonomy	Selbständigkeit (Autonomy): • autonomous work and time management • project management • analytical skills
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70
Credit points	6
Studienleistung	None
Examination	Subject theoretical and practical work
Examination duration and scale	Three presentations on the respective project status
Assignment for the Following Curricula	Global Technology and Innovation Management & Entrepreneurship: Core qualification: Elective Compulsory International Management and Engineering: Specialisation I. Electives Management: Elective Compulsory Logistics, Infrastructure and Mobility: Core qualification: Elective Compulsory Mechanical Engineering and Management: Specialisation Management: Elective Compulsory

Course L1280: Creation of Business Opportunities	
Typ	Project-/problem-based Learning
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Christoph Ihl
Language	EN
Cycle	SoSe
Content	Important note: This course is part of an 6 ECTS module consisting of two courses "Entrepreneurship" & "Creation of Business Opportunities", which have to be taken together in one semester. Startups are temporary, team-based organizations, which can form both within and outside of established companies, to pursue one central objective: taking a new venture idea to market by designing a business model that can be scaled to a full-grown company. In this course, students will form startup teams around self-selected ideas and run through the process just like real startups would do in the first three months of intensive work. Startup Engineering takes an incremental and iterative approach, in that it favors variety and alternatives over one detailed, linear five-year business plan to reach steady state operations. From a problem solving and systems thinking perspective, student teams create different possible versions of a new venture and alternative hypotheses about value creation for customers and value capture vis-à-vis competitors. To test critical hypotheses early on, student teams engage in an evidence-based, experimental trial-and-error learning process that measures real progress. Upon completion of this course, students will be able to: · Apply a modern innovation toolkit relevant in both the corporate & startup world · Analyze given business opportunities in terms of its constituent elements · Design new business models by gathering and combining relevant ideas, facts and information · Evaluate business opportunities and derive judgment about next steps & decisions Course language is English, but participants can decide to give their graded presentations in German. Students are invited to apply to this course module already with a startup idea and/ or team, but this is not a requirement! We will form teams and ideas in the beginning of the course. Class meetings have alternate intervals of lecture inputs, teamwork, mentoring, and peer feedback. Attendance is mandatory for at least 80% of class time due to large proportion of teamwork sessions. Student teams give three presentations and submit them with backup analyses. Grading scheme: · Startup discovery presentation after 5 weeks: 30% · Startup validation presentation after 10 weeks: 30% · Final startup pitches after 13 weeks: 40%
Literature	• Blank, S. & Dorf, B. (2012). The startup owner's manual. • Gans, J. & Stern, S. (2016). Entrepreneurial Strategy. • Osterwalder, A. & Yves, P. (2010). Business model generation. • Maurya, A. (2012). Running lean: Iterate from plan A to a plan that works. • Maurya, A. (2016). Scaling lean: Mastering the Key Metrics for Startup Growth. • Wilcox, J. (2016). FOCUS Framework: How to Find Product-Market Fit.

Course L1279: Entrepreneurship	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Christoph Ihl
Language	EN
Cycle	SoSe
Content	Important note: This course is part of an 6 ECTS module consisting of two courses "Entrepreneurship" & "Creation of Business Opportunities", which have to be taken together in one semester. Startups are temporary, team-based organizations, which can form both within and outside of established companies, to pursue one central objective: taking a new venture idea to market by designing a business model that can be scaled to a full-grown company. In this course, students will form startup teams around self-selected ideas and run through the process just like real startups would do in the first three months of intensive work. Startup Engineering takes an incremental and iterative approach, in that it favors variety and alternatives over one detailed, linear five-year business plan to reach steady state operations. From a problem solving and systems thinking perspective, student teams create different possible versions of a new venture and alternative hypotheses about value creation for customers and value capture vis-à-vis competitors. To test critical hypotheses early on, student teams engage in an evidence-based, experimental trial-and-error learning process that measures real progress. Upon completion of this course, students will be able to: · Apply a modern innovation toolkit relevant in both the corporate & startup world · Analyze given business opportunities in terms of its constituent elements · Design new business models by gathering and combining relevant ideas, facts and information · Evaluate business opportunities and derive judgment about next steps & decisions Course language is English, but participants can decide to give their graded presentations in German. Students are invited to apply to this course module already with a startup idea and/ or team, but this is not a requirement! We will form teams and ideas in the beginning of the course. Class meetings have alternate intervals of lecture inputs, teamwork, mentoring, and peer feedback. Attendance is mandatory for at least 80% of class time due to large proportion of teamwork sessions. Student teams give three presentations and submit them with backup analyses. Grading scheme: · Startup discovery presentation after 5 weeks: 30% · Startup validation presentation after 10 weeks: 30% · Final startup pitches after 13 weeks: 40%
Literature	• Blank, S. & Dorf, B. (2012). The startup owner's manual. • Gans, J. & Stern, S. (2016). Entrepreneurial Strategy. • Osterwalder, A. & Yves, P. (2010). Business model generation. • Maurya, A. (2012). Running lean: Iterate from plan A to a plan that works. • Maurya, A. (2016). Scaling lean: Mastering the Key Metrics for Startup Growth. • Wilcox, J. (2016). FOCUS Framework: How to Find Product-Market Fit.

Module M0995: Organization international companies and IT

Courses

Title	Typ	Hrs/wk	CP
Logistics and Information Technology (L0065)	Lecture	2	2
Organization and Process Management (L1217)	Project-/problem-based Learning	2	2
Human Resource Management and Organization Design (L0108)	Lecture	2	2

Module Responsible	Prof. Thorsten Blecker
Admission Requirements	None
Recommended Previous Knowledge	none
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Potentiale und Anwendungen neuer Informationstechnologien in der Logistik vor dem Hintergrund solider theoretischer Kenntnisse kritisch zu würdigen praktische Fragestellungen auf Basis theoretischer Erkenntnisse zu diskutieren, bzw. einen Praxisbezugdurch Beispiele und Fallstudien herzustellen. sich fachspezifische Kenntnisse aus der Literatur selbständig zu erarbeiten Fallbeispiele und neue technische Entwicklungen ausder Praxis Darstellung und vergleichende Analyse möglicher innerbetrieblicher und zwischenbetrieblicher Organisationsformen sowie Übertragung des theoretisch erworbenen Wissens auf Beispiele der internationalen Unternehmenspraxis; Diskussion ihrer Anwendbarkeit im Unternehmen sowie Erfolgsabwägungen
Skills	application of theoretical content, approaches and models of human resource management, organization and process management • Analyze Workplace Design • Monitor performance indicators, advantages and disadvantages of international cooperation • Evaluation of empirical studies related to IT in the supply chain • Assess the relevance of the information in the supply chain • Analysis of the start-up phase of business and weighing of associated opportunities and risks deriving from common recommendations for action during the establishment phase • Definition and assessment of possible legal forms; Transfer to national and international companies • design and analysis of the process-oriented organizations targeting for efficient design of business processes • weighing the pros and cons of process management; Development of approaches for optimization
Personal Competence	
Social Competence	• to develop joint problem solving proposals in the context of intercultural teamwork and to develop and process the results using modern presentation media; • to conduct subject-specific and interdisciplinary discussions; • presentations of work and results in German and English
Autonomy	• work independently on a subject and transfer the acquired knowledge to new problems. Discussion of applicability and success rates.
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84
Credit points	6

Studienleistung

Compulsory	Bonus	Form	Description
Yes	5 %	Excercises	
No	10 %	Subject theoretical and practical work	im Rahmen der Lehrveranstaltung "Organisation und Prozessmanagement"

Examination	Written exam
Examination duration and scale	180 min
Assignment for the Following Curricula	International Management and Engineering: Core qualification: Compulsory Logistics, Infrastructure and Mobility: Core qualification: Elective Compulsory

Course L0065: Logistics and Information Technology	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Thorsten Blecker
Language	DE
Cycle	SoSe
Content	• Basics of Logistics and Supply Chain Management • Basis of Information Management • Basics of Information Systems • Empirical Studies Related to IT in Supply Chains • Relevance of Information in the Supply Chain • Logistics Information Systems • Radio Frequency Identification (RFID) • E-Logistics • Electronic Sourcing • E-Supply Chains • Case Studies and New Technical Developments
Literature	• Kummer, S./Einbock, M., Westerheide, C.: RFID in der Logistik - Handbuch für die Praxis, Wien 2005. Pepels, W. (Hsg.): E-Business-Anwendungen in der Betriebswirtschaft, Herne/Berlin 2002. Reindl, M./Oberniedermaier, G.: eLogistics: Logistiksysteme und -prozesse im Internetzeitalter, München et al. 2002. Schulte, C.: Logistik, 5. Auflage, München 2009 Wildemann, H.: Logistik Prozessmanagement, 4. Aufl., München 2009. Wildemann H. (Hsg.): Supply Chain Management, München 2000.

Course L1217: Organization and Process Management	
Typ	Project-/problem-based Learning
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Wolfgang Kersten
Language	DE
Cycle	SoSe
Content	• Analyzing the set-up phase of new enterprises as well as associated risks and opportunities; joint development of recommendations for the set-up phase • Definition and consideration of possible legal forms; application to national and international examples from the industry • Analysis of process-oriented business structures for efficient configuration of operational workflows • Description and comparative analysis of possible organizational forms and transfer into the praxis; opportunities to organize a company in practice; pros and cons of different organizational forms • Analysis of possible cooperation forms between companies and applications in the industry • Development of different participation types for employers and employees within the company; discussion and reflection of legal principles based on practical examples • Description of the basics concerning corporate culture and knowledge management, as well as options for the practical implementation • Weighing up the pros and cons of process management; development of optimization options • Integration of problem based learning sessions to work on relevant case studies; joint development of possible problem solving solutions within intercultural teams; preparation of the results with modern presentation methods
Literature	• Becker, J. / Kugeler, M. / Rosemann, M. (2005): Prozessmanagement: Ein Leitfaden zur prozessorientierten Organisationsgestaltung, 5. Aufl., Berlin. • Bullinger, H.-J. / Warnecke, H. J. (2003): Neue Organisationsformen im Unternehmen, 2. Auflage, Berlin. • Eversheim, W. (2005): Integrierte Produkt- und Prozessgestaltung, Heidelberg. • Gaitanides, M. (2007): Prozessorganisation: Entwicklung, Ansätze und Programme des Managements von Geschäftsprozessen, 2. Auflage, München. • Heucher, M. et al. (2000): Planen, Gründen, Wachsen – Mit dem professionellen Businessplan zum Erfolg, 2. Auflage, Zürich. • Hopfenbeck, W. (2002): Allgemeine Betriebswirtschafts- und Managementlehre – das Unternehmen im Spannungsfeld zwischen ökonomischen, sozialen und ökologischen Interessen, 14. Auflage, München. • Porter, M. (1999): Wettbewerbsstrategie (competitive strategy): Methoden zur Analyse von Branchen und Konkurrenten, 10. Auflage, Frankfurt. • Schreyögg, G. (2008): Organisation. Grundlagen moderner Organisationsgestaltung. 5. Auflage. GWV Fachverlag. Wiesbaden • Wöhe, G. (2008): Einführung in die Allgemeine Betriebswirtschaftslehre, 23. Aufl., München.

Course L0108: Human Resource Management and Organization Design	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Christian Ringle
Language	EN
Cycle	SoSe
Content	Advanced topics of • The Study of Organizations and Organizational Theories • The processes of developing organizational structures for multinational firms • Analysis and Design of Work • Strategic Management of the Human Resource Function in international business • Human Resource Planning and Recruitment in the global environment • Managing performance measurement, compensation and benefits of international corporations • Employee Development • Employee Separation and Retention
Literature	Dessler, G.: Human Resource Management, 12/e, Boston: Pearson, 2010. Gibson, J.L./ Ivancevich, J.M./ Donnelly, J.H./ Konopaske, R.: Organizations: Behavior, Structure, Processes, 13/e, Boston: McGraw-Hill, 2009. Jones, G. R.: Organizational Theory, Design, and Change, 7/e, Boston: Pearson, 2013. Mondy, R. W.: Human Resource Management, 12/e, Boston: Pearson, 2012. Noe, R.A./ Hollenbeck, J.R./ Gerhart, B./ Wright, P.M.: Human Resource Management: Gaining a Competitive Advantage, 7/e, New York: McGraw-Hill, 2010.

Module M1107: Research and Innovative Projects

Courses

Title	Typ	Hrs/wk	CP
Introduction to Research (L1252)	Lecture	2	2
Future Laboratory (L1251)	Practical Course	4	4

Module Responsible	Prof. Thorsten Blecker
Admission Requirements	None
Recommended Previous Knowledge	none
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	**Part 1: General** • Basis for research and scientific work • Research process and research request • Analysis of literate (Addendum) • Ethics in research **Part 2: Research design** • Quantitative and qualitative research • Strategies regarding random sample • Research on surveys • Secondary data and archive sources • Observation, content analysis and ethnograffic research • Case studies and qualitative interviews • Experiments **Part 3: research instruments** • Measurement and scales • Field research and questionnaires
Skills	• Topics on the future of logistics • Writing of “Projektarbeiten” related to contemporary research and trendsetting results
Personal Competence	
Social Competence	• to conduct subject-specific and interdisciplinary discussions; • oral and written presentation of results • respectful team work
Autonomy	• work independently on a subject and transfer the acquired knowledge to new problems.
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84
Credit points	6
Studienleistung	**Compulsory** Yes; **Bonus** None; **Form** Midterm; **Description** Midterm-Klausur, 20% der Endnote
Examination	Written elaboration
Examination duration and scale	approx. 20 pages, presentation (30 minutes per group), midterm exam (60 minutes)
Assignment for the Following Curricula	Logistics, Infrastructure and Mobility: Core qualification: Compulsory

Course L1252: Introduction to Research	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Thorsten Blecker
Language	DE
Cycle	SoSe
Content	**Part 1: General** • Basis for research and scientific work • Research process and research request • Analysis of literate (Addendum) • Ethics in research **Part 2: Research design** • Quantitative and qualitative research • Strategies regarding random sample • Research on surveys • Secondary data and archive sources • Observation, content analysis and ethnograffic research • Case studies and qualitative interviews • Experiments **Part 3: research instruments** • Measurement and scales • Field research and questionnaires
Literature	• Blumberg, B. / Cooper, D. R. / Schindler, P. S. (2008): Business Research Methods, 2nd Edition, London et al.: McGraw Hill 2008. • Bortz, J. / Döring, N. (2006): Forschungsmethoden und Evaluation für Human- und Sozialwissenschaftler, 4. überarbeitete Auflage, Heidelberg: Springer 2006. • Bryman, A. / Bell, E. (2003): Business Research Methods, 2nd revised edition, New York: Oxford University Press 2003. • Hair, J. F. / Money, A. H. / Samouel, P. (2007): Research Methods for Business, Chichester: John Wiley & Sons 2007. • Raithel, J. (2006): Quantitative Forschung – Ein Praxiskurs, Wiesbaden: VS Verlag für Sozialwissenschaften 2006. • Yin, Robert K. (2003): Case Study Research – Design and Methods, 3 rd. Edition, Thousand Oaks et al. Sage Publications 2003. • Weitere Literatur wird in der Veranstaltung bekannt gegeben.

Course L1251: Future Laboratory	
Typ	Practical Course
Hrs/wk	4
CP	4
Workload in Hours	Independent Study Time 64, Study Time in Lecture 56
Lecturer	Prof. Thorsten Blecker
Language	DE
Cycle	WiSe
Content	The subject „Zukunftslabor“deals with different issues which define the future of logistic. For that purpose the students will write a project thesis that treats current researches and shall possess trendsetting results. In order to participate successful in this subject the students should be familiar with the contents of the lecture “Einführung in die Logistik” and applicate the contents practically
Literature	Wird in der Veranstaltung bekannt gegeben

Module M0993: Project Studies Logistics, Infrastructure and Mobility

Courses

Title	Typ	Hrs/wk	CP

Module Responsible	Dozenten des Studiengangs
Admission Requirements	None
Recommended Previous Knowledge	none
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students deepen their knowledge and skills in a business, logistics and or mobility related research field and can reproduce this knowledge.
Skills	After the project work in a business related, logistical and or mobility related research field, students are able to... • work on a challenging scientific and or application oriented problem of this area • analyze the problem and find a solution (possibly in teams) • to find relevant literature for the work on a problem as well as to critically evaluate publications • write a well founded scientific paper on the examined problem (possibly in teams)
Personal Competence	
Social Competence	After the project work students are able to... • work respectufully in teams and to organize themselves in teams • analyse a problem in a team and to find a solution together • present and defend their project work to a bigger (professional) audience
Autonomy	After the project work students are able to... • incorporate into a challenging scientific or application oriented problem independently • prepare and hold a presentation on their results independently
Workload in Hours	Independent Study Time 180, Study Time in Lecture 0
Credit points	6
Studienleistung	None
Examination	Study work
Examination duration and scale	
Assignment for the Following Curricula	Logistics, Infrastructure and Mobility: Core qualification: Compulsory

Specialization Infrastructure and Mobility

Module M0828: Urban Environmental Management

Courses

Title	Typ	Hrs/wk	CP
Noise Protection (L1109)	Lecture	2	2
Urban Infrastructures (L0874)	Project-/problem-based Learning	2	4

Module Responsible	Dr. Dorothea Rechtenbach
Admission Requirements	None
Recommended Previous Knowledge	• Knowledge on Urban planning • Knowledge on measures for climate protection • General knowledge of scientific writing/working
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students can describe urban development corridors as well as current and future urban environmental problems. They are able to explain the causes of environmental problems (like noise). Students can specify applications for various technical innovations and explain why these contribute to the improvement of urban life. They can, for example, derive and discuss measures for effective noise abatement.
Skills	Students are able to develop specific solutions for correcting existing or future environment-related problems of urban development. They can define a range of conceptual and technical solutions for environmental problems for different development paths. To solve specific urban environmental problems they can select technical innovations and integrate them into the urban context.
Personal Competence	
Social Competence	The students can work together in international groups.
Autonomy	Students are able to organize their work flow to prepare themselves for presentations and contributions to the discussions. They can acquire appropriate knowledge by making enquiries independently.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	None
Examination	Written elaboration
Examination duration and scale	Written Report plus oral Presentation
Assignment for the Following Curricula	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory Civil Engineering: Specialisation Water and Traffic: Elective Compulsory Environmental Engineering: Core qualification: Elective Compulsory Joint European Master in Environmental Studies - Cities and Sustainability: Core qualification: Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory Water and Environmental Engineering: Specialisation Environment: Elective Compulsory Water and Environmental Engineering: Specialisation Cities: Compulsory

Course L1109: Noise Protection

Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Martin Jäschke
Language	EN
Cycle	SoSe
Content	
Literature	1) Müller & Möser (2013): Handbook of Engineering Acoustics (also available in German) 2) WHO (1999): Guidelines for Community Noise 3) Environmental Noise Directive 2002/49/EG 4) ISO 9613-2 (1996): Acoustics, Attenuation of sound during propagation outdoors, Part 2: General method of calculation

Course L0874: Urban Infrastructures	
Typ	Project-/problem-based Learning
Hrs/wk	2
CP	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	Dr. Dorothea Rechtenbach
Language	EN
Cycle	SoSe
Content	Problem Based Learning Main topics are: • Central vs. Decentral Wastewater Treatment. • Compaction of Cities. • Car Free Cities. • Multifunctional Places in Cities. • The Sustainability of Freight Transport in Cities.
Literature	Depends on chosen topic.

Module M0922: City Planning

Courses

Title	Typ	Hrs/wk	CP
City Planning (L1066)	Project-/problem-based Learning	4	6

Module Responsible	Prof. Carsten Gertz
Admission Requirements	None
Recommended Previous Knowledge	for "Principles of Urban Planning": none for "Designing Urban Streetscapes": some knowledge of transport planning, e.g. through taking the undergraduate class „Transport Planning and Traffic Engineering“
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students are able to: • use technical terms of urban planning. • describe the main determinants of urban development. • explain and compare different possibilities of how urban development can be influenced. • discuss requirements for public streetscapes. • explain the importance of street design.
Skills	Students are able to: • read and analyze urban development concepts and designs for streetscapes • appraise such concepts in the context of competing requirements. • design, justify and reflect their own solutions for concrete examples.
Personal Competence	
Social Competence	Students are able to: • discuss intermediate results with each other. • constructively accept feedback on their own work. • provide constructive feedback to others.
Autonomy	Students are able to: • independently complete a written report including drawings following a broadly pre-defined process. • assess the consequences of their proposed solutions. • independently acquire knowledge and apply this to new issues or problem areas.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	None
Examination	Written elaboration
Examination duration and scale	written assignment, designwork during the semester
Assignment for the Following Curricula	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory Civil Engineering: Specialisation Water and Traffic: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory Water and Environmental Engineering: Specialisation Water: Elective Compulsory Water and Environmental Engineering: Specialisation Environment: Elective Compulsory Water and Environmental Engineering: Specialisation Cities: Compulsory

Course L1066: City Planning	
Typ	Project-/problem-based Learning
Hrs/wk	4
CP	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Prof. Carsten Gertz
Language	DE
Cycle	SoSe
Content	„Principles of Urban Planning“ deals with the determinants of urban development and their interactions. Topics include: • legal framework, • instruments and methods of planning, • functional requirements, • stakeholders and actors • basic design requirements • different planning levels and • historical contexts. The objective of the course is for students to acquire a basic understanding of urban development problems and approaches for solving them. They will also be able to comprehend the process of urban planning. The course also covers the various functional and aesthetic requirements for designing streetscape as the most important elements of public space. The project work deals with a real life scenario and includes drawing up a development plan, an urban design concept, a building masterplan and a street redesign.
Literature	Albers, Gerd; Wekel, Julian (2009) Stadtplanung: Eine illustrierte Einführung. Primus Verlag. Darmstadt. Frick, Dieter (2008) Theorie des Städtebaus: Zur baulich-räumlichen Organisation von Stadt. Wasmuth-Verlag. Tübingen Jonas, Carsten (2009) Die Stadt und ihr Grundriss. Wasmuth-Verlag. Tübingen Kostof, Spiro; Castillo, Greg (1998) Die Anatomie der Stadt. Geschichte städtischer Strukturen. Campus-Verlag. Frankfurt/New York.

Module M0977: Construction Logistics and Project Management

Courses

Title	Typ	Hrs/wk	CP
Construction Logistics (L1163)	Lecture	1	2
Construction Logistics (L1164)	Recitation Section (small)	1	2
Project Development and Management (L1161)	Lecture	1	1
Project Development and Management (L1162)	Project-/problem-based Learning	1	1

Module Responsible	Prof. Heike Flämig
Admission Requirements	None
Recommended Previous Knowledge	none
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students can... • give definitions of the main terms of construction logistics and project development and management • name advantages and disadvantages of internal or external construction logistics • explain characteristics of products, demand and production of construction objects and their consequences for construction specific supply chains • differentiate constructions logistics from other logistics systems
Skills	Students can... • carry out project life cycle assessments • apply methods and instruments of construction logistics • apply methods and instruments of project development and management • apply methods and instruments of conflict management • design supply and waste removal concepts for a construction project
Personal Competence	
Social Competence	Students can... • hold presentations in and for groups • apply methods of conflict solving skills in group work and case studies
Autonomy	Students can... • solve problems by holistic, systemic and flow oriented thinking • improve their creativity, negotiation skills, conflict and crises solution skills by applying methods of moderation in case studies
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	None
Examination	Written elaboration
Examination duration and scale	Two written papers with presentations
Assignment for the Following Curricula	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory Civil Engineering: Specialisation Water and Traffic: Elective Compulsory International Management and Engineering: Specialisation II. Civil Engineering: Elective Compulsory International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory

Course L1163: Construction Logistics	
Typ	Lecture
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	SoSe
Content	The lecture gives deeper insight how important logistics are as a competetive factor for construction projects and which issues are to be adressed. The following toppics are covered: • competetive factor logistics • the concept of systems, planning and coordination of logistics • material, equipment and reverse logistics • IT in construction logistics • elements of the planning model of construction logistics and their connections • flow oriented logistics systems for construction projects • logistics concepts for ready to use construction projects (especially procurement and waste removel logistics) • best practice examples (construction logistics Potsdamer Platz, recent case study of the region) Contents of the lecture are deepened in special exercises.
Literature	Flämig, Heike: Produktionslogistik in Stadtregionen. In: Forschungsverbund Ökologische Mobilität (Hrsg.) Forschungsbericht Bd. 15.2. Wuppertal 2000. Krauss, Siri: Die Baulogistik in der schlüsselfertigen Ausführung, Bauwerk Verlag GmbH Berlin 2005. Lipsmeier, Klaus: Abfallkennzahlen für Neubauleistungen im Hochbau : Verlag Forum für Abfallwirtschaft und Altlasten, 2004. Schmidt, Norbert: Wettbewerbsfaktor Baulogistik. Neue Wertschöpfungspotenziale in der Baustoffversorgung. In: Klaus, Peter: Edition Logistik. Band 6. Deutscher Verkehrs-Verlag. Hamburg 2003. Seemann, Y.F. (2007): Logistikkoordination als Organisationseinheit bei der Bauausführung Wissenschaftsverlag Mainz in Aachen, Aachen. (Mitteilungen aus dem Fachgebiet Baubetrieb und Bauwirtschaft (Hrsg. Kuhne, V.): Heft 20)

Course L1164: Construction Logistics	
Typ	Recitation Section (small)
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L1161: Project Development and Management	
Typ	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig, Dr. Anton Worobei
Language	DE
Cycle	SoSe
Content	Within the lecture, the main aspects of project development and management are tought: • Terms and definitions of project management • Advantages and disadvantages of different ways of project handling • organization, information, coordination and documentation • cost and fincance management in projects • time- and capacity management in projects • specific methods and instruments for successful team work Contents of the lecture are deepened in special exercises.
Literature	Projektmanagement-Fachmann. Band 1 und Band 2. RKW-Verlag, Eschborn, 2004.

Course L1162: Project Development and Management	
Typ	Project-/problem-based Learning
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig, Dr. Anton Worobei
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Module M0978: Mobility of Goods and Logistics Systems

Courses

Title	Typ	Hrs/wk	CP
Mobility of Goods, Logistics, Traffic (L1165)	Lecture	2	2
International Logistics and Transport Systems (L1168)	Project-/problem-based Learning	3	4

Module Responsible	Prof. Heike Flämig
Admission Requirements	None
Recommended Previous Knowledge	• Introduction to Logistics and Mobility • Foundations of Management • Legal Foundations of Transportation and Logistics
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students are able to... • give definitions of system theory, (international) transport chains and logistics in the context of supply chain management • explain trends and strategies for mobility of goods and logistics • describe elements of integrated and multi-modal transport chains and their advantages and disadvantages • deduce impacts of management decisions on logistics system and traffic system and explain how stakeholders influence them • explain the correlations between economy and logistics systems, mobility of goods, space-time-structures and the traffic system as well as ecology and politics
Skills	Students are able to... • Design intermodal transport chains and logistic concepts • apply the commodity chain theory and case study analysis • evaluate different international transport chains • cope with differences in cultures that influence international transport chains
Personal Competence	
Social Competence	Students are able to... • develop a feeling of social responsibility for their future jobs • give constructive feedback to others about their presentation skills • plan and execute teamwork tasks
Autonomy	Students are able to improve presentation skills by feedback of others
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70
Credit points	6

Studienleistung	**Compulsory**	**Bonus**	**Form**	**Description**
	Yes	None	Participation in excursions	
	Yes	None	Excercises	

Examination	Written exam
Examination duration and scale	written exam (60 minutes), exercises in groups (min. 80% attendance), one-day excursion with short presentations
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory Mechanical Engineering and Management: Specialisation Management: Elective Compulsory

Course L1165: Mobility of Goods, Logistics, Traffic	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Heike Flämig
Language	EN
Cycle	SoSe
Content	The intention of this lecture is to provide a general system analysis-based overview of how transportation chains emerge and how they are developed. The respective advantages and disadvantages of different international transportation chains of goods are to be pointed out from a micro- and a macroeconomic point of view. The effects on the traffic system as well as the ecological and social consequences of a spatial devision of economical activities are to be discussed. The overview of current international transportation chains is carried out on the basis of concrete material- and appendant information flows. Established transportation chains and some of their individual elements are to become transparent to the students by a number of practical examples. 1. A conceptual systems model 2. Elements of integrated and multi-modal transportation chains 3. interaction of transport and traffic, demand and supply on different layers of the transport system 4. Global Issues in Supply Chain Management 5. Global Players and networks 6. Logistics and corporate social responsibility (CSR) 7. Methods and data for assessment of international transport chains 8. Influence of cultural aspects on international transport chains 9. New solutions using different focuses of the transport and logstics system
Literature	David, Pierre A.; Stewart, Richard D.: International Logistics: The Management of International Trade Operations, 3rd Edition, Mason, 2010 Schieck, Arno: Internationale Logistik: Objekte, Prozesse und Infrastrukturen grenzüberschreitender Güterströme, München, 2009 BLOECH, J., IHDE, G. B. (1997) Vahlens Großes Logistiklexikon, München, Verlag C.H. Beck IHDE, G. B. (1991) Transport, Verkehr, Logistik, München, Verlag Franz Vahlen, 2. völlig überarbeitete und erweiterte Auflage NUHN, H., HESSE, M. (2006) Verkehrsgeographie, Paderborn, München, Wien, Zürich, Verlage Ferdinand Schöningh PFOHL, H.-C. (2000) Logistiksysteme - Betriebswirtschaftliche Grundlagen, Berlin, Heidelberg, New York, Springer-Verlag, 6. Auflage

Course L1168: International Logistics and Transport Systems	
Typ	Project-/problem-based Learning
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Heike Flämig
Language	EN
Cycle	SoSe
Content	The problem-oriented-learning lecture consists of case studies and complex problems concerning the systemic characteristics of different modes of transport as well as the organization and realization of transport chains. Students get to know specific issues from practice of logistics and mobility of goods and work out recommondations for solutions.
Literature	David, Pierre A.; Stewart, Richard D.: International Logistics: The Management of International Trade Operations, 3rd Edition, Mason, 2010 Schieck, Arno: Internationale Logistik: Objekte, Prozesse und Infrastrukturen grenzüberschreitender Güterströme, München, 2009

Module M0982: Transportation Modelling

Courses

Title	Typ	Hrs/wk	CP
Transportation Modelling (L1180)	Project-/problem-based Learning	4	6

Module Responsible	Prof. Carsten Gertz
Admission Requirements	None
Recommended Previous Knowledge	some knowledge of transport planning, e.g. through taking the undergraduate class „Transport Planning and Traffic Engineering"
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students are able to understand the operation and potential applications of transport models.
Skills	Students are able to: • use travel demand modelling software packages for solving practical problems. • design a database structure for travel demand models. • assess modelling results. • appraise potential applications and limitations of such models.
Personal Competence	
Social Competence	Students are able to independently develop and document solutions.
Autonomy	Students are able to: • independently organise, manage and solve set tasks. • independently prepare written reports.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	None
Examination	Written elaboration
Examination duration and scale	written assignment with presentation during the semester
Assignment for the Following Curricula	Civil Engineering: Specialisation Water and Traffic: Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory Water and Environmental Engineering: Specialisation Cities: Elective Compulsory

Course L1180: Transportation Modelling

Typ	Project-/problem-based Learning
Hrs/wk	4
CP	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Prof. Carsten Gertz
Language	DE
Cycle	SoSe
Content	• Principles of transport modelling • Role of transport modelling in the planning process • Fundamentals of mobility behaviour • Design and evaluation of transport/mobility surveys • mode of operation and data requirements for different stages of modelling • Forecasting and scenarios in the transport planning • The range of model applications (from transport infrastructure planning over simulation of traffic flows to integrated land-use and transport models as well as the use of models for evaluating locations) • Practice-oriented project for assessing consequences of infrastructure projects and changes in land-use
Literature	Lohse, Dieter und Schnabel, Werner (2011): Grundlagen der Straßenverkehrstechnik und der Verkehrsplanung – Band 2. 3. Auflage. Beuth. Ortúzar, Juan de Dios und Willumsen, Luis G. (2011): Modelling Transport. 4. Auflage. John Wiley & Sons.

Module M1132: Maritime Transport

Courses

Title	Typ	Hrs/wk	CP
Maritime Transport (L0063)	Lecture	2	3
Maritime Transport (L0064)	Recitation Section (small)	2	3

Module Responsible	Prof. Carlos Jahn
Admission Requirements	None
Recommended Previous Knowledge	
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students are able to… • name different players involved in the maritime transport chain and their typical tasks; • name common types of cargo and classify cargo to the corresponding categories; • name and explain operation modes of maritime shipping, transportation options and management of maritime networks; • illustrate main trade routes, straits (existing and possible in the future); • name and discuss relevant factors for port / seaport terminal location planning.
Skills	The students are able to... • define transportation modes, players involved and their functions in a maritime transportation network; • identify possible cost drivers in a maritime transport chain and suggest possible reduction measures; • identify, analyse, model and suggest optimisation measures regarding material and information flows within a maritime logistics chain.
Personal Competence	
Social Competence	The students are able to... • discuss and organise extensive work packages in groups; • document and present the elaborated results.
Autonomy	
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6

Studienleistung	Compulsory Bonus	Form	Description
	No 15 %	Subject theoretical and practical work	Teilnahme an einem Planspiel und anschließende schriftliche Ausarbeitung

Examination	Written exam
Examination duration and scale	120 minutes
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory Renewable Energies: Specialisation Wind Energy Systems: Elective Compulsory Theoretical Mechanical Engineering: Specialisation Maritime Technology: Elective Compulsory Theoretical Mechanical Engineering: Technical Complementary Course: Elective Compulsory

Course L0063: Maritime Transport

Typ	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	SoSe
Content	The lecture aims to provide detailed knowledge about maritime transportation and to describe its main challenges and functions. In this context, conventional and current problems are dealt with. All actors of a maritime transport chain are considered during the lecture. In this context, ports, vessels and sea routes are analysed and discussed in details. Conventional problems, planning tasks and current subjects, e. g. Green Logistics, are also part of the lecture.
Literature	• Brinkmann, Birgitt. Seehäfen: Planung und Entwurf. Berlin Heidelberg: Springer-Verlag, 2005. • Schönknecht, Axel. Maritime Containerlogistik: Leistungsvergleich von Containerschiffen in intermodalen Transportketten. Berlin Heidelberg: Springer-Verlag, 2009. • Stopford, Martin. Maritime Economics Routledge, 2009

Course L0064: Maritime Transport	
Typ	Recitation Section (small)
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	SoSe
Content	The exercise lesson bases on the haptic management game MARITIME. MARITIME focuses on providing knowledge about structures and processes in a maritime transport network. Furthermore, the management game systematically provides process management methodology and also promotes personal skills of the participants.
Literature	• Brinkmann, Birgitt. Seehäfen: Planung und Entwurf. Berlin Heidelberg: Springer-Verlag, 2005.

Module M1133: Port Logistics

Courses

Title	Typ	Hrs/wk	CP
Port Logistics (L0686)	Lecture	2	3
Port Logistics (L1473)	Recitation Section (small)	2	3

Module Responsible	Prof. Carlos Jahn
Admission Requirements	None
Recommended Previous Knowledge	none
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students are able to… • describe the historical port development (regarding port functions, port terminals and the corresponding operating models) and consider these facts in the historical contest; • explain different types of seaport terminals and their typical characteristics (type of cargo, handling and transportation equipment, functional areas); • name typical planning and scheduling tasks (e. g. berth planning, stowage planning, yard planning) as well as corresponding approaches (methods and tools) for performing these tasks in seaport terminals; • name and discuss trends regarding planning and scheduling in innovative seaport terminals.
Skills	The students are able to… • recognise functional areas within seaports and within seaport terminals; • define and assess possible operation systems for a container terminal; • conduct static calculations of container terminals regarding capacity requirements based on given conditions; • reliably estimate how certain conditions effect typical logistics metrics in the context of the static planning process of selected seaport terminals.
Personal Competence	
Social Competence	The students are able to… • discuss and organise extensive work packages in groups; • document and present the elaborated results.
Autonomy	The students are able to • research and select technical literature as well as norms and guidelines • to hand in on time and to present an own share of a considerable written scientific work which was compiled in a small team together with other students
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	**Compulsory** **Bonus** **Form** **Description** No 15 % Written elaboration
Examination	Written exam
Examination duration and scale	120 minutes
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory Renewable Energies: Specialisation Wind Energy Systems: Elective Compulsory Naval Architecture and Ocean Engineering: Core qualification: Elective Compulsory Theoretical Mechanical Engineering: Specialisation Maritime Technology: Elective Compulsory Theoretical Mechanical Engineering: Technical Complementary Course: Elective Compulsory

Course L0686: Port Logistics	
Typ	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	SoSe
Content	The outstanding role of maritime transport for international trade requires efficient ports. These must meet numerous requirements in terms of profitability, speed, safety and environment. Recognising this, port logistics contains the planning, management, operation and control of material flows and the corresponding information flows in the system and its interfaces to several actors within and outside the port area. The course “Port Logistics” aims to provide skills to comprehend structures and processes in ports. It focuses on different terminal types, their characteristic layouts, the technical equipment which is used and the interaction between the actors.
Literature	• Brinkmann, Birgitt. Seehäfen: Planung und Entwurf. Berlin Heidelberg: Springer-Verlag, 2005.

Course L1473: Port Logistics	
Typ	Recitation Section (small)
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	SoSe
Content	The exercise lesson focuses on analytical tasks in the field of terminal planning. During the exercise lesson, the students work in small groups on designing terminal layouts under consideration of given conditions. The calculated logistics metrics, respectively the corresponding terminal layouts must be illustrated in 2D and 3D using special planning software.
Literature	• Brinkmann, Birgitt. Seehäfen: Planung und Entwurf. Berlin Heidelberg: Springer-Verlag, 2005.

Module M0923: Integrated Transportation Planning

Courses

Title	Typ	Hrs/wk	CP
Integrated Transportation Planning (L1068)	Project-/problem-based Learning	4	6

Module Responsible	Prof. Carsten Gertz
Admission Requirements	None
Recommended Previous Knowledge	some knowledge of transport planning, e.g. through taking the undergraduate class „Transport Planning and Traffic Engineerin
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students are able to: • describe interdependencies between land-use/location choice and transportation/mobility behaviour • explain and evaluate the social, ecological and economic effects of transport and land-use policy measures. • relate current issues in the area of integrated transport planning and formulate an opinion on them.
Skills	Students are able to: • quantify important parameters, which influence travel demand or are influenced by it. • comprehensively examine a pre-defined or self-selected topic from a transportation studies perspective and document the results in accordance with scientific conventions.
Personal Competence	
Social Competence	Students are able to: • provide feedback on topical contents and their teaching. • constructively handle feedback on their own work. • produce results in group work and document these.
Autonomy	Students are able to: • assess potential consequences of their future professional activities • independently plan working on a pre-defined project topic, acquire the necessary knowledge and use appropriate means for its execution.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	None
Examination	Written elaboration
Examination duration and scale	written assignment with presentation during the semester
Assignment for the Following Curricula	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory Civil Engineering: Specialisation Water and Traffic: Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory Water and Environmental Engineering: Specialisation Water: Elective Compulsory Water and Environmental Engineering: Specialisation Environment: Elective Compulsory Water and Environmental Engineering: Specialisation Cities: Compulsory

Course L1068: Integrated Transportation Planning	
Typ	Project-/problem-based Learning
Hrs/wk	4
CP	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Prof. Carsten Gertz, Dr. Philine Gaffron, Jacqueline Bianca Maaß
Language	DE
Cycle	WiSe
Content	The course will provide students with an understanding of interdependencies between land-use and transportation. Specific topics include a.o.: • interactions between transport and the environment and consequent limitations • characteristics of integrated planning • complex planning processes • interdependencies of location choice and mobility behaviour • transport and land-use policies • project on current issues in transportation studies
Literature	Kutter, Eckhard (2005) Entwicklung innovativer Verkehrsstrategien für die mobile Gesellschaft. Erich Schmidt Verlag. Berlin. Bracher, Tilman u. a. (Hrsg.) (68. Ergänzung 2013) Handbuch der kommunalen Verkehrsplanung. Herbert Wichmann Verlag. Berlin, Offenbach. (Loseblattsammlung mit kontinuierlichen Ergänzungen)

Module M1032: Airport Planning and Operations

Courses

Title	Typ	Hrs/wk	CP
Airport Operations (L1276)	Lecture	3	3
Airport Planning (L1275)	Lecture	2	2
Airport Planning (L1469)	Recitation Section (small)	1	1

Module Responsible	Prof. Volker Gollnick
Admission Requirements	None
Recommended Previous Knowledge	• Bachelor Mech. Eng. • Vordiplom Mech. Eng. • Lecture Air Transportation Systems
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	1. Regulatory principles of airport planning and operations 2. Design of an airport incl. Regulatory baselines 3. Airport operation in the terminal and at the airfield
Skills	• Understanding of different interdisciplinary interdependencies • Planning and design of an airport • Modelling and assessment of airport operation
Personal Competence	
Social Competence	• Working in interdisciplinary teams • Communication
Autonomy	Organization of workflows and -strategies
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84
Credit points	6
Studienleistung	None
Examination	Written exam
Examination duration and scale	120 min
Assignment for the Following Curricula	Aircraft Systems Engineering: Specialisation Air Transportation Systems: Elective Compulsory Aircraft Systems Engineering: Specialisation Cabin Systems: Elective Compulsory International Management and Engineering: Specialisation II. Aviation Systems: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory

Course L1276: Airport Operations

Typ	Lecture
Hrs/wk	3
CP	3
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42
Lecturer	Prof. Volker Gollnick, Peter Bießlich
Language	DE
Cycle	WiSe
Content	FA-F Flight Operations Flight Operations - Production Infrastructures Operations Planning Master plan Airport capacity Ground handling Terminal operations
Literature	Richard de Neufville, Amedeo Odoni: Airport Systems, McGraw Hill, 2003

Course L1275: Airport Planning	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Volker Gollnick, Dr. Ulrich Häp
Language	DE
Cycle	WiSe
Content	1. Introduction, definitions, overviewg 2. Runway systems 3. Air space strucutres around airports 4. Airfield lightings, marking and information 5. Airfield and terminal configuration
Literature	N. Ashford, Martin Stanton, Clifton Moore: Airport Operations, John Wiley & Sons, 1991 Richard de Neufville, Amedeo Odoni: Airport Systems, Aviation Week Books, MacGraw Hill, 2003

Course L1469: Airport Planning	
Typ	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Volker Gollnick, Dr. Ulrich Häp
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M1091: Flight Guidance and Airline Operations

Courses

Title	Typ	Hrs/wk	CP
Airline Operations (L1310)	Lecture	3	3
Introduction to Flight Guidance (L0848)	Lecture	3	2
Introduction to Flight Guidance (L0854)	Recitation Section (large)	1	1

Module Responsible	Prof. Volker Gollnick
Admission Requirements	None
Recommended Previous Knowledge	• Bachelor Mech. Eng. • Vordiplom Mech. Eng. • Lecture Air Transportation Systems
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	1. Principles of Air Traffic Management and technologies 2. Design and modelling of traffic flows, avionics and sensor systems, cockpit design 3. Principles of Airline organization and business 4. Fleet setup, fleet operation, aircraft selection, maintenance, repair overhaul technologies and business
Skills	• Understanding and application of different interdisciplinary interdependencies • Integration and assessment of new technologies in the air transportation system • Modelling and assessment of flight guidance systems • Airline fleet planning and fleet operation
Personal Competence	
Social Competence	• Working in interdisciplinary teams • Communication
Autonomy	Organization of workflows and -strategies
Workload in Hours	Independent Study Time 82, Study Time in Lecture 98
Credit points	6
Studienleistung	None
Examination	Written exam
Examination duration and scale	180 min
Assignment for the Following Curricula	Aircraft Systems Engineering: Specialisation Aircraft Systems: Elective Compulsory Aircraft Systems Engineering: Specialisation Air Transportation Systems: Compulsory Aircraft Systems Engineering: Specialisation Cabin Systems: Elective Compulsory International Management and Engineering: Specialisation II. Aviation Systems: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory

Course L1310: Airline Operations

Typ	Lecture
Hrs/wk	3
CP	3
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42
Lecturer	Prof. Volker Gollnick, Dr. Karl Echtermeyer
Language	DE
Cycle	SoSe
Content	1. Introdution and overview 2. Airline business models 3. Interdependencies in flight planning (network management, slot management, netzwork structures, aircraft circulation) 4. Operative flight preparation (weight & balance, payload/range, etc.) 5. fleet policy 6. Aircraft assessment and fleet planning 7. Airline organisation 8. Aircraft maintenance, repair and overhaul
Literature	Volker Gollnick, Dieter Schmitt: The Air Transport System, Springer Berlin Heidelberg New York, 2014 Paul Clark: Buying the big jets, Ashgate 2008 Mike Hirst: The Air Transport System, AIAA, 2008

Course L0848: Introduction to Flight Guidance	
Typ	Lecture
Hrs/wk	3
CP	2
Workload in Hours	Independent Study Time 18, Study Time in Lecture 42
Lecturer	Prof. Volker Gollnick
Language	DE
Cycle	WiSe
Content	Introduction and motivation Flight guidance principles (airspace structures, organization of air navigation services, etc.) Navigation Radio navigation Satellite navigation Principles of flight measurement techniques Measurement of position (geometric methods, distance measurement, direction measurement) Determination of the aircraft attitude (magnetic field- and inertial sensors) Measurement of speed Airspace surveillance (radar systems) Commuication systems Avionics architectures (computer systems, bus systems) Cockpit systems and displays (cockpit design, cockpit equipment)
Literature	Rudolf Brockhaus, Robert Luckner, Wolfgang Alles: "Flugregelung", Springer Berlin Heidelberg New York, 2012 Holger Flühr: "Avionik und Flugsicherungssysteme", Springer Berlin Heidelberg New York, 2013 Volker Gollnick, Dieter Schmitt "Air Transport Systems", Springer Berlin Heidelberg New York, 2014

Course L0854: Introduction to Flight Guidance	
Typ	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Volker Gollnick
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M1100: Railways

Courses

Title	Typ	Hrs/wk	CP
Railways (L1466)	Lecture	2	3
Railways (L1468)	Recitation Section (large)	2	3

Module Responsible	Prof. Carsten Gertz
Admission Requirements	None
Recommended Previous Knowledge	Introduction to railways
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students can... • concieve the entrepreneurial perspective of transport and infrastructure companies • estimate intra- and intermodal competition • understand regulatory and transport policy determinants • reflect megatrends in the transport market • understand the key performance indicators for railway transport market
Skills	Students can... • apply traffic Intermodal perspective • understand strategic challenges, opportunities and issues of companies • recognize the relevance of sustainability and digitization for companies
Personal Competence	
Social Competence	Students can... • discuss and organize task packages in small groups • document and present work results in small groups
Autonomy	Students can... • research and select literature • submit their own shares of an extensive written work in small groups and present it collaborativly within a fixed time frame
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	None
Examination	Written exam
Examination duration and scale	
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory

Course L1466: Railways

Typ	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Rüdiger Grube
Language	DE
Cycle	WiSe
Content	
Literature	

Course L1468: Railways

Typ	Recitation Section (large)
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Rüdiger Grube
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M1402: Machine Learning in Logistics

Courses

Title	Typ	Hrs/wk	CP
Digitalization in Traffic and Logistics (L2004)	Lecture	1	2
Basics of Machine Learning (L2003)	Lecture	1	2
Machine Learning in Logistics (L2005)	Recitation Section (small)	2	2

Module Responsible	Prof. Carlos Jahn
Admission Requirements	None
Recommended Previous Knowledge	None
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students are able to explain the differences between instance and model based learning approaches and are able to use specific approaches in machine learning on the base of static and incremental growing data. By the use of uncertainty the students can explain how axioms, parameter or structures can be learned. Additional the students learn to develop different cluster techniques. Students should get an introduction in the topic of bid data and the anaylsis for applied problems in the maritime logistics. The focal point will be on problems of maritime logistics. Due to the increasing complexity of supply chains and the increasing digitalization in traffic and logistics the students should work on real life and applied examples.
Skills	Students are able to understand specific procedures of machine learning and to use on real life examples. Students are able to use appropriate procedures for given data. Additionally the students can edit raw data for machine learning procedures. The students should be prepared to evaluate the taught methods regarding its usefulness for real life examples. For example for data mining approaches for the controlling or forecasting approaches for the planning of enterprises.
Personal Competence	
Social Competence	Students are capable of: • Discussing and organizing extensive research tasks in small groups • Jointly describing, differentiating between and evaluating problems
Autonomy	Students are able: • To research and select specialized literature
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	None
Examination	Written exam
Examination duration and scale	90 minutes
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory

Course L2004: Digitalization in Traffic and Logistics	
Typ	Lecture
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	WiSe
Content	The students should get to know the importance of big data and get to know the analysis and processing of these for applied problems in logistics. The focal point will be on maritime logistics. The students should be enabled to use the learned methods in real life questions. The students should be prepared to evaluate the taught methods regarding its usefulness for real life examples. For example for data mining approaches for the controlling or forecasting approaches for the planning of enterprises. Planned content: • Big Data • Data-Mining • Decision Analytics • Forecasting • Information Management
Literature	John D. Kelleher, Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies (MIT Press) Tom M. Mitchell, Machine Learning Kevin P. Murphy, Machine Learning: A Probabilistic Perspective

Course L2003: Basics of Machine Learning	
Typ	Lecture
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Dozenten des SD E
Language	DE
Cycle	WiSe

Content	Students are able to understand specific procedures of machine learning and to use on real life examples. Students are able to use appropriate procedures for given data.
	
	Students are able to explain the differences between instance and model based learning approaches and are able to use specific approaches in machine learning on the base of static and incremental growing data.
	
	By the use of uncertainty the students can explain how axioms, parameter or structures can be learned. Additional the students learn to develop different cluster techniques.
	
	Planned content:
	
	• Supervised Learning:
	  ◦ Regressions
	  ◦ Decision trees
	  ◦ Bayesian networks
	  ◦ K-next neighbors
	  ◦ Logistical regressions
	  ◦ Neuronal Networks
	  ◦ Support Vector Machines
	  ◦ Ensemble Learning
	
	• Unsupervised Learning:
	  ◦ Hierarchical Clustering, K-Mean

Literature	John D. Kelleher, Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies (MIT Press) Tom M. Mitchell, Machine Learning Kevin P. Murphy, Machine Learning: A Probabilistic Perspective

Course L2005: Machine Learning in Logistics	
Typ	Recitation Section (small)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	WiSe
Content	In the exercise the skills which the students acquired in the lectures will be applied to real life examples.
Literature	John D. Kelleher, Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies (MIT Press) Tom M. Mitchell, Machine Learning Kevin P. Murphy, Machine Learning: A Probabilistic Perspective

Specialization Production and Logistics

Module M0866: EIP and Productivity Management

Courses

Title	Typ	Hrs/wk	CP
Elements of Integrated Production Systems (L0927)	Project-/problem-based Learning	2	3
Productivity Management (L0928)	Project-/problem-based Learning	2	2
Productivity Management (L0931)	Recitation Section (small)	1	1

Module Responsible	Prof. Hermann Lödding
Admission Requirements	None
Recommended Previous Knowledge	Basic lecture in Production Organization or Production Management
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students can explain the contents of the lectures in the module in detail and take a critical position to them.
Skills	Students can choose and apply appropriate methods from the lectures to an industrial problem, which is described in detail.
Personal Competence	
Social Competence	Students can develop joint solutions in mixed teams and present them to others.
Autonomy	Students are able to define tasks, acquire the requisite knowledge and to apply it to a problem.
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70
Credit points	6
Studienleistung	**Compulsory** Yes; **Bonus** None; **Form** Excercises; **Description**
Examination	Written exam
Examination duration and scale	180 Minuten
Assignment for the Following Curricula	International Management and Engineering: Specialisation I. Electives Management: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory

Course L0927: Elements of Integrated Production Systems

Typ	Project-/problem-based Learning
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Hermann Lödding
Language	DE
Cycle	SoSe
Content	not available
Literature	Harris, R.; Harris, C.; Wilson, E.: Making Materials Flow, Lean Enterprise Institute, Cambridge, 2003. Ohno, T.: Das Toyota-Produktionssystem, Campus-Verlag, Frankfurt et al, 1993. Rother, M.: Die Kata des Weltmarktführers. Toyotas Erfolgsmethoden, Campus-Verlag, Frankfurt et al, 2009. Rother, M.; Shook, J.: Sehen lernen: Mit Wertstromdesign die Wertschöpfung erhöhen und Verschwendung beseitigen, Lean Management Institut, Aachen, 2006. Rother, M.; Harris, R.: Creating Continuous Flow, Lean Enterprise Institute, Brookline, 2001. Shingo, S.: A Revolution in Manufacturing. The SMED System, Productivity Press, 2006. Womack, J. P. et al: Die zweite Revolution in der Autoindustrie, Frankfurt/New York, Campus Verlag, 1992.

Course L0928: Productivity Management	
Typ	Project-/problem-based Learning
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Hermann Lödding
Language	DE
Cycle	SoSe
Content	• Principles of productivity management • Shop floor management and standardisation • Takt analysis and design of manual operations • Maintenance Principles • Total Productive Maintenance (TPM) • Optimisation of set-up operations • Analysis of interlinked production systems
Literature	Bokranz, R.; Landau, K.:Produktivitätsmanagement von Arbeitssystemen. Schäffer-Poeschel, Stuttgart, 2006. Takeda, H.: Das synchrone Produktionssystem: Just-in-Time für das ganze Unternehmen. 5. Aufl., mi-Wirtschaftsbuch, FinanzBuch Verlag, München, 2006. Nakajima, S.: Management der Produktionseinrichtungen (Total Productive Maintenance). Campus Verlag, New York, 1995. Shingo, S.: A Revolution in Manufacturing: The SMED System. Productivity, Inc., 1985

Course L0931: Productivity Management	
Typ	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Hermann Lödding
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Module M0977: Construction Logistics and Project Management

Courses

Title	Typ	Hrs/wk	CP
Construction Logistics (L1163)	Lecture	1	2
Construction Logistics (L1164)	Recitation Section (small)	1	2
Project Development and Management (L1161)	Lecture	1	1
Project Development and Management (L1162)	Project-/problem-based Learning	1	1

Module Responsible	Prof. Heike Flämig
Admission Requirements	None
Recommended Previous Knowledge	none
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students can... • give definitions of the main terms of construction logistics and project development and management • name advantages and disadvantages of internal or external construction logistics • explain characteristics of products, demand and production of construction objects and their consequences for construction specific supply chains • differentiate constructions logistics from other logistics systems
Skills	Students can... • carry out project life cycle assessments • apply methods and instruments of construction logistics • apply methods and instruments of project development and management • apply methods and instruments of conflict management • design supply and waste removal concepts for a construction project
Personal Competence	
Social Competence	Students can... • hold presentations in and for groups • apply methods of conflict solving skills in group work and case studies
Autonomy	Students can... • solve problems by holistic, systemic and flow oriented thinking • improve their creativity, negotiation skills, conflict and crises solution skills by applying methods of moderation in case studies
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	None
Examination	Written elaboration
Examination duration and scale	Two written papers with presentations
Assignment for the Following Curricula	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory Civil Engineering: Specialisation Water and Traffic: Elective Compulsory International Management and Engineering: Specialisation II. Civil Engineering: Elective Compulsory International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory

Course L1163: Construction Logistics	
Typ	Lecture
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	SoSe
Content	The lecture gives deeper insight how important logistics are as a competetive factor for construction projects and which issues are to be adressed. The following toppics are covered: • competetive factor logistics • the concept of systems, planning and coordination of logistics • material, equipment and reverse logistics • IT in construction logistics • elements of the planning model of construction logistics and their connections • flow oriented logistics systems for construction projects • logistics concepts for ready to use construction projects (especially procurement and waste removel logistics) • best practice examples (construction logistics Potsdamer Platz, recent case study of the region) Contents of the lecture are deepened in special exercises.
Literature	Flämig, Heike: Produktionslogistik in Stadtregionen. In: Forschungsverbund Ökologische Mobilität (Hrsg.) Forschungsbericht Bd. 15.2. Wuppertal 2000. Krauss, Siri: Die Baulogistik in der schlüsselfertigen Ausführung, Bauwerk Verlag GmbH Berlin 2005. Lipsmeier, Klaus: Abfallkennzahlen für Neubauleistungen im Hochbau : Verlag Forum für Abfallwirtschaft und Altlasten, 2004. Schmidt, Norbert: Wettbewerbsfaktor Baulogistik. Neue Wertschöpfungspotenziale in der Baustoffversorgung. In: Klaus, Peter: Edition Logistik. Band 6. Deutscher Verkehrs-Verlag. Hamburg 2003. Seemann, Y.F. (2007): Logistikkoordination als Organisationseinheit bei der Bauausführung Wissenschaftsverlag Mainz in Aachen, Aachen. (Mitteilungen aus dem Fachgebiet Baubetrieb und Bauwirtschaft (Hrsg. Kuhne, V.): Heft 20)

Course L1164: Construction Logistics	
Typ	Recitation Section (small)
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L1161: Project Development and Management	
Typ	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig, Dr. Anton Worobei
Language	DE
Cycle	SoSe
Content	Within the lecture, the main aspects of project development and management are tought: • Terms and definitions of project management • Advantages and disadvantages of different ways of project handling • organization, information, coordination and documentation • cost and fincance management in projects • time- and capacity management in projects • specific methods and instruments for successful team work Contents of the lecture are deepened in special exercises.
Literature	Projektmanagement-Fachmann. Band 1 und Band 2. RKW-Verlag, Eschborn, 2004.

Course L1162: Project Development and Management	
Typ	Project-/problem-based Learning
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig, Dr. Anton Worobei
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Module M0996: Supply Chain Management

Courses

Title	Typ	Hrs/wk	CP
Supply Chain Management (L1218)	Project-/problem-based Learning	3	4
Value-Adding Networks (L1190)	Lecture	2	2

Module Responsible	Prof. Thorsten Blecker
Admission Requirements	None
Recommended Previous Knowledge	no
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Current developments in international business activities such as outsourcing, offshoring, internationalization and globalization and emerging markets illustrated by examples from practice. • Theoretical Approaches and methods in logistics and supply chain management and use in practice. • to identify fields of decision in SCM . • reasons for the formation of networks based on various theories from institutional economics (transaction cost theory, principal-agent theory, property-right theory) and the resource-based view. • Selected approaches to explain the development of networks. • to illustrate phases of network formation. • to understand the functional mechanisms of inter-organizational and international network relationships. • to explain and categorize relationships within networks. • to categorize sourcing concepts and explain motives/ barriers or advantages and disadvantages. • advantages and disadvantages of offshoring and outsourcing and to illustrate the distinction between the two terms . • to state criteria/ factors/ parameters that influence production location decisions at the global level (total network costs). • to explain methods for location finding/evaluation. • to interpret phenotypes of production networks. • recognize relationships between R & D and production and their locations and to describe coherent models. • to solve sub-problems with the configuration of logistics networks (distribution and spare parts networks) by the use of appropriate approaches. • to categorise special waste logistics including their duties & objectives and to state and describe practical examples of good networking.
Skills	• to asses trends and challenges in national and international supply chains and logistics networks and their consequences for companies. • to evaluate, anaylse and systematise networks and network relations based on the lecture. • to anaylse partners and their suitability for co-operation in collaborations and cooperative relations. • to select sourcing concepts for specific products / product components based on the lecture as well as advantages and disadvantages of each approach. • to evaluate location decisions for production and R & D based on concepts. • to recognize relationships between R & D and production as well as their locations and to evaluate the suitability of specific models for different situations. • to transfer the analyzed concepts to international practices. • to analyse and evaluate the product development processes. • to anaylse concepts of Information and communication management in logistics. • to design subcontracting, procurement, production and disposal as well as R & D networks to shape, • to plan reorganise efficient and flow-oriented enterprise networks. • to adopt methods of complexity management and risk management in logistics.
Personal Competence	
Social Competence	• to evaluate intercultural and international relationships based on discussed case studies. • advance planning and design of network formation and their objectives based on content discussed in the lecture. • definition of procurement strategies for individual parts using the gained knowledge of procurement networks. • design of the procurement network (external/internal/modules etc.) based on the sourcing concepts and core competencies, as well as on the findings of the case studies. • to make decision of location for production taking into account global contexts, evaluation methods and buying/selling markets, which were also discussed in the case studies and their dependence on R & D. • Decision on R & D locations based on the insights gained from case studies / practical examples and the selection of an appropriate model.
Autonomy	After completing the module students are capable to work independently on the subject of Supply Chain Management and transfer the acquired knowledge to new problems.
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70
Credit points	6

Studienleistung	Compulsory	Bonus	Form	Description
	No	15 %	Subject theoretical and practical work	im Rahmen der Lehrveranstaltung "Supply Chain Management"

Examination	Written exam
Examination duration and scale	120 min
Assignment for the Following Curricula	International Management and Engineering: Specialisation I. Electives Management: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Product Development, Materials and Production: Specialisation Product Development: Elective Compulsory Product Development, Materials and Production: Specialisation Production: Elective Compulsory Product Development, Materials and Production: Specialisation Materials: Elective Compulsory

Course L1218: Supply Chain Management	
Typ	Project-/problem-based Learning
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Wolfgang Kersten
Language	DE
Cycle	SoSe
Content	• Transmission of a profound understanding in logistics and supply chain management • Transmission of theoretical approaches and methods in the field of logistics and supply chain management; transfer from theoretical concepts to business cases • Identification of trends and challenges in national and international supply chains • Elaboration and critical discussions concerning different supply chain configurations, as well as strategic supply chain approaches (e.g. push or pull-based strategies, efficiency vs. responsiveness) • Elaboration of approaches and goals in the field of resource planning and supplier management • Identification and analyzes of concepts in logistics management • Implementation of the fields of purchasing, operations and sales into the business strategy • Transmission of knowledge concerning demand management and distribution logistics • Integration of a supply chain game based on the SCOR-model; preparation of the results with modern presentation methods
Literature	Bowersox, D. J., Closs, D. J. und Cooper, M. B. (2007): Supply chain logistics management, Boston, Mass. [u.a.], McGraw-Hill/Irwin. Chopra, S. und Meindl, P. (2007): Supply chain management: strategy, planning, and operation, 3rd edition, Upper Saddle River, NJ, Pearson/Prentice Hall. Heizer, J. und Render, B. (2006): Principles of Operations Management. Prentice Hall. Fisher, M. (1997): What is the right supply chain for your product?, Harvard Business Review, Vol. 75, No. pp., S. 105-116. Kuhn, A. und Hellingrath, B. (2002): Supply Chain Management: optimierte Zusammenarbeit in der Wertschöpfungskette, Berlin [u.a.], Springer. Larson, P., Poist, R., Halldórsson, Á. (2007): PERSPECTIVES ON LOGISTICS VS. SCM: A SURVEY OF SCM PROFESSIONALS, in: Journal of Business Logistics, Vol. 28, No. 1, 2007, S. 3ff. Kummer, S., Hrsg. (2006): Grundzüge der Beschaffung, Produktion und Logistik, München: Pearson Studium. Porter, M. (1986): Changing Patterns of International Competition, California Management Review, Vol. 28, No. 2, pp. 9-40. Simchi-Levi, D., Kaminsky, P. und Simchi-Levi, E. (2008): Designing and managing the supply chain: concepts, strategies and case studies, 3. ed., McGraw-Hill. Supply Chain Council (2010): Supply Chain Operations Reference (SCOR) model: Overview – Version 10.0, [online] :: http://supplychain.org/f/Web Scor Overview.pdf. Swink, M., Melnyk, S. A., Cooper, M. B., Hartley, J. L. (2011): Managing Operations – Across the Supply Chain. McGraw-Hill/Irwin.

Course L1190: Value-Adding Networks	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Thorsten Blecker
Language	DE
Cycle	SoSe
Content	• Introduction: Overview of current trade flows and development of global business cooperation • Networks explanations using neo institutional approaches as a theoretical basis • Networks organization and functioning • Development stages of networks • Presentation of different network types such as supplier, production, disposal and logistics network as well as their respective requirements, peculiarities and characteristics
Literature	• **Ballou, R.** Business Logistics/Supply Chain Management, Upper Saddle River 2004. • **Bellmann, K.** (Hrsg.): Kooperations- und Netzwerkmanagement, Berlin 2001. • **Bretzke, W.R.**: Logistische Netzwerke, Berlin Heidelberg 2008. • **Blecker, Th.** / **Gemünden, H. G.** (Hrsg.): Wertschöpfungsnetzwerke, Berlin 2006. • **Kaluza, B.** / **Blecker, Th.** (Hrsg.): Produktions- und Logistikmanagement in virtuellen Unternehmen und Unternehmensnetzwerken, Berlin et al. 2000. • **Sydow, J.** / **Möllering**: Produktion in Netzwerken, Berlin 2009. • **Willibald A. G.** (Hrsg.): Neue Wege in der Automobillogistik, Berlin Heidelberg 2007.

Module M0978: Mobility of Goods and Logistics Systems

Courses

Title	Typ	Hrs/wk	CP
Mobility of Goods, Logistics, Traffic (L1165)	Lecture	2	2
International Logistics and Transport Systems (L1168)	Project-/problem-based Learning	3	4

Module Responsible	Prof. Heike Flämig
Admission Requirements	None
Recommended Previous Knowledge	• Introduction to Logistics and Mobility • Foundations of Management • Legal Foundations of Transportation and Logistics
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students are able to... • give definitions of system theory, (international) transport chains and logistics in the context of supply chain management • explain trends and strategies for mobility of goods and logistics • describe elements of integrated and multi-modal transport chains and their advantages and disadvantages • deduce impacts of management decisions on logistics system and traffic system and explain how stakeholders influence them • explain the correlations between economy and logistics systems, mobility of goods, space-time-structures and the traffic system as well as ecology and politics
Skills	Students are able to... • Design intermodal transport chains and logistic concepts • apply the commodity chain theory and case study analysis • evaluate different international transport chains • cope with differences in cultures that influence international transport chains
Personal Competence	
Social Competence	Students are able to... • develop a feeling of social responsibility for their future jobs • give constructive feedback to others about their presentation skills • plan and execute teamwork tasks
Autonomy	Students are able to improve presentation skills by feedback of others
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70
Credit points	6

Studienleistung

Compulsory	Bonus	Form	Description
Yes	None	Participation in excursions	
Yes	None	Excercises	

Examination	Written exam
Examination duration and scale	written exam (60 minutes), exercises in groups (min. 80% attendance), one-day excursion with short presentations
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory Mechanical Engineering and Management: Specialisation Management: Elective Compulsory

Course L1165: Mobility of Goods, Logistics, Traffic	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Heike Flämig
Language	EN
Cycle	SoSe
Content	The intention of this lecture is to provide a general system analysis-based overview of how transportation chains emerge and how they are developed. The respective advantages and disadvantages of different international transportation chains of goods are to be pointed out from a micro- and a macroeconomic point of view. The effects on the traffic system as well as the ecological and social consequences of a spatial devision of economical activities are to be discussed. The overview of current international transportation chains is carried out on the basis of concrete material- and appendant information flows. Established transportation chains and some of their individual elements are to become transparent to the students by a number of practical examples. 1. A conceptual systems model 2. Elements of integrated and multi-modal transportation chains 3. interaction of transport and traffic, demand and supply on different layers of the transport system 4. Global Issues in Supply Chain Management 5. Global Players and networks 6. Logistics and corporate social responsibility (CSR) 7. Methods and data for assessment of international transport chains 8. Influence of cultural aspects on international transport chains 9. New solutions using different focuses of the transport and logstics system
Literature	David, Pierre A.; Stewart, Richard D.: International Logistics: The Management of International Trade Operations, 3rd Edition, Mason, 2010 Schieck, Arno: Internationale Logistik: Objekte, Prozesse und Infrastrukturen grenzüberschreitender Güterströme, München, 2009 BLOECH, J., IHDE, G. B. (1997) Vahlens Großes Logistiklexikon, München, Verlag C.H. Beck IHDE, G. B. (1991) Transport, Verkehr, Logistik, München, Verlag Franz Vahlen, 2. völlig überarbeitete und erweiterte Auflage NUHN, H., HESSE, M. (2006) Verkehrsgeographie, Paderborn, München, Wien, Zürich, Verlage Ferdinand Schöningh PFOHL, H.-C. (2000) Logistiksysteme - Betriebswirtschaftliche Grundlagen, Berlin, Heidelberg, New York, Springer-Verlag, 6. Auflage

Course L1168: International Logistics and Transport Systems	
Typ	Project-/problem-based Learning
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Heike Flämig
Language	EN
Cycle	SoSe
Content	The problem-oriented-learning lecture consists of case studies and complex problems concerning the systemic characteristics of different modes of transport as well as the organization and realization of transport chains. Students get to know specific issues from practice of logistics and mobility of goods and work out recommondations for solutions.
Literature	David, Pierre A.; Stewart, Richard D.: International Logistics: The Management of International Trade Operations, 3rd Edition, Mason, 2010 Schieck, Arno: Internationale Logistik: Objekte, Prozesse und Infrastrukturen grenzüberschreitender Güterströme, München, 2009

Module M1132: Maritime Transport

Courses

Title	Typ	Hrs/wk	CP
Maritime Transport (L0063)	Lecture	2	3
Maritime Transport (L0064)	Recitation Section (small)	2	3

Module Responsible	Prof. Carlos Jahn
Admission Requirements	None
Recommended Previous Knowledge	
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students are able to… • name different players involved in the maritime transport chain and their typical tasks; • name common types of cargo and classify cargo to the corresponding categories; • name and explain operation modes of maritime shipping, transportation options and management of maritime networks; • illustrate main trade routes, straits (existing and possible in the future); • name and discuss relevant factors for port / seaport terminal location planning.
Skills	The students are able to... • define transportation modes, players involved and their functions in a maritime transportation network; • identify possible cost drivers in a maritime transport chain and suggest possible reduction measures; • identify, analyse, model and suggest optimisation measures regarding material and information flows within a maritime logistics chain.
Personal Competence	
Social Competence	The students are able to... • discuss and organise extensive work packages in groups; • document and present the elaborated results.
Autonomy	
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6

Studienleistung	Compulsory Bonus	Form	Description
	No 15 %	Subject theoretical and practical work	Teilnahme an einem Planspiel und anschließende schriftliche Ausarbeitung

Examination	Written exam
Examination duration and scale	120 minutes
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory Renewable Energies: Specialisation Wind Energy Systems: Elective Compulsory Theoretical Mechanical Engineering: Specialisation Maritime Technology: Elective Compulsory Theoretical Mechanical Engineering: Technical Complementary Course: Elective Compulsory

Course L0063: Maritime Transport

Typ	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	SoSe
Content	The lecture aims to provide detailed knowledge about maritime transportation and to describe its main challenges and functions. In this context, conventional and current problems are dealt with. All actors of a maritime transport chain are considered during the lecture. In this context, ports, vessels and sea routes are analysed and discussed in details. Conventional problems, planning tasks and current subjects, e. g. Green Logistics, are also part of the lecture.
Literature	• Brinkmann, Birgitt. Seehäfen: Planung und Entwurf. Berlin Heidelberg: Springer-Verlag, 2005. • Schönknecht, Axel. Maritime Containerlogistik: Leistungsvergleich von Containerschiffen in intermodalen Transportketten. Berlin Heidelberg: Springer-Verlag, 2009. • Stopford, Martin. Maritime Economics Routledge, 2009

Course L0064: Maritime Transport	
Typ	Recitation Section (small)
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	SoSe
Content	The exercise lesson bases on the haptic management game MARITIME. MARITIME focuses on providing knowledge about structures and processes in a maritime transport network. Furthermore, the management game systematically provides process management methodology and also promotes personal skills of the participants.
Literature	• Brinkmann, Birgitt. Seehäfen: Planung und Entwurf. Berlin Heidelberg: Springer-Verlag, 2005.

Module M1089: Integrated Maintenance and Spare Part Logistics

Courses

Title	Typ	Hrs/wk	CP
Spare Part Logistics (L1403)	Lecture	1	2
Maintenance Logistics (L1401)	Lecture	2	2
Exercises to Integrated Maintenance and Spare Part Logistics (L1405)	Recitation Section (small)	1	2

Module Responsible	Prof. Kathrin Fischer
Admission Requirements	None
Recommended Previous Knowledge	Basic knowledge of logistical processes
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	• Students can explain basic concepts of maintenance and spare parts logistics and distinguish between them. • Students can explain key approaches and concepts of maintenance and spare parts logistics, locate them in a theoretical context and present practical applications.
Skills	• Students can plan and evaluate processes, techniques and organizational forms in the field of maintenance and spare parts logistics. • Students can apply planning methods in maintenance and spare parts logistics to practical examples. • Students can develop and apply key performance indicator systems and carry out current status analyses.
Personal Competence	
Social Competence	• Students can present and argue their own expert opinions and work results in front of teachers and other students in an appropriate manner. • Students can achieve accurate work results as members of a team.
Autonomy	• Students can access specialist knowledge independently and transfer the knowledge acquired to new problems.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	None
Examination	Written exam
Examination duration and scale	2 hours
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Logistics: Elective Compulsory International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory

Course L1403: Spare Part Logistics

Typ	Lecture
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Ingo Martens
Language	DE
Cycle	SoSe
Content	• Introduction: Logistical spare parts management, factors influencing need for spare parts, spare logistics requireents, integration of spare parts logistics and maintenance logistics. • Methoda: Analysis of spare parts stocks, diffentiation of spare parts strategy, forecasting need for spare parts, process chains • Planning: preliminary planning, concept planning and realisation, planning instruments and tools. • Practical examples for: optimization of spare parts centers, optimization of international spare parts distribution, performance-based logistics, new business models in spare parts logistics.
Literature	Scripts and text documents to be handed out during the course.

Course L1401: Maintenance Logistics	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Ingo Martens
Language	DE
Cycle	SoSe
Content	• Introduction: developments and trends in integrated maintenance and spare parts logistics, components of integrated maintenance, the terms maintenance and maintenance logistics, need for action and the “maintenance dilemma,” maintenance planning measures. • Basics of integrated maintenance: maintenance technology, organisational structures and workflows, maintenance controlling, integration of employees and management. • Knowledge-based business management and maintenance: Production and maintenance, condition knowledge and diagnosis, business management strategy, management, motivation and success. • Target and key performance indicator systems: developing target systems, performance indicator requirements, performance indicator analysis, strengths and weaknesses analysis, potential analysis, performance indicator models, monitoring (IH Cockpit) • Maintenance methods: make or buy versus outsourcing, total productive maintenance, differentiating between logistics strategies. • Maintenance planning: concept planning and realization, concept planning tasks and steps, supplementing planning basics, technology and organisation sub-concepts, overall concept of integrated maintenance and spare parts logistics. • Practical examples, including for: energy-efficient asset management, maintenance strategies in highly automated goods distribution centers, remote diagnosis and service management in wind energy plants, value stream analysis in maintenance.
Literature	Skripte und Textdokumente, die während der Vorlesung herausgegeben werden. Scripts and text documents to be handed out during the course.

Course L1405: Exercises to Integrated Maintenance and Spare Part Logistics	
Typ	Recitation Section (small)
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Ingo Martens
Language	DE
Cycle	SoSe
Content	
Literature	Es wird die in den Vorlesungen "Instandhaltungdslogistik" und "Ersatzteillogistik" verwendete Literatur empfohlen.

Module M1133: Port Logistics

Courses

Title	Typ	Hrs/wk	CP
Port Logistics (L0686)	Lecture	2	3
Port Logistics (L1473)	Recitation Section (small)	2	3

Module Responsible	Prof. Carlos Jahn
Admission Requirements	None
Recommended Previous Knowledge	none
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students are able to… • describe the historical port development (regarding port functions, port terminals and the corresponding operating models) and consider these facts in the historical contest; • explain different types of seaport terminals and their typical characteristics (type of cargo, handling and transportation equipment, functional areas); • name typical planning and scheduling tasks (e. g. berth planning, stowage planning, yard planning) as well as corresponding approaches (methods and tools) for performing these tasks in seaport terminals; • name and discuss trends regarding planning and scheduling in innovative seaport terminals.
Skills	The students are able to… • recognise functional areas within seaports and within seaport terminals; • define and assess possible operation systems for a container terminal; • conduct static calculations of container terminals regarding capacity requirements based on given conditions; • reliably estimate how certain conditions effect typical logistics metrics in the context of the static planning process of selected seaport terminals.
Personal Competence	
Social Competence	The students are able to… • discuss and organise extensive work packages in groups; • document and present the elaborated results.
Autonomy	The students are able to • research and select technical literature as well as norms and guidelines • to hand in on time and to present an own share of a considerable written scientific work which was compiled in a small team together with other students
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	**Compulsory** **Bonus** **Form** **Description** No 15 % Written elaboration
Examination	Written exam
Examination duration and scale	120 minutes
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory Renewable Energies: Specialisation Wind Energy Systems: Elective Compulsory Naval Architecture and Ocean Engineering: Core qualification: Elective Compulsory Theoretical Mechanical Engineering: Specialisation Maritime Technology: Elective Compulsory Theoretical Mechanical Engineering: Technical Complementary Course: Elective Compulsory

Course L0686: Port Logistics	
Typ	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	SoSe
Content	The outstanding role of maritime transport for international trade requires efficient ports. These must meet numerous requirements in terms of profitability, speed, safety and environment. Recognising this, port logistics contains the planning, management, operation and control of material flows and the corresponding information flows in the system and its interfaces to several actors within and outside the port area. The course “Port Logistics” aims to provide skills to comprehend structures and processes in ports. It focuses on different terminal types, their characteristic layouts, the technical equipment which is used and the interaction between the actors.
Literature	• Brinkmann, Birgitt. Seehäfen: Planung und Entwurf. Berlin Heidelberg: Springer-Verlag, 2005.

Course L1473: Port Logistics	
Typ	Recitation Section (small)
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	SoSe
Content	The exercise lesson focuses on analytical tasks in the field of terminal planning. During the exercise lesson, the students work in small groups on designing terminal layouts under consideration of given conditions. The calculated logistics metrics, respectively the corresponding terminal layouts must be illustrated in 2D and 3D using special planning software.
Literature	• Brinkmann, Birgitt. Seehäfen: Planung und Entwurf. Berlin Heidelberg: Springer-Verlag, 2005.

Module M1012: Technical Logistics Laboratory

Courses

Title	Typ	Hrs/wk	CP
Technical Logistics Laboratory (L1462)	Seminar	4	6

Module Responsible	Prof. Jochen Kreutzfeldt
Admission Requirements	None
Recommended Previous Knowledge	Bachelor degree in logistics
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students will acquire the following knowledge: 1. The students will learn various technical solutions for solving logistical problems in daily practice. 2. The students know the necessary steps to implement a selected technical solution. 3. The students know the approaches and obstacles to implement technical solutions in logistics.
Skills	The students will acquire the following skills: 1. The students are able to select technical solutions for logistical problems of warehousing, conveying, sorting, order picking and identifying and evaluate the implementability of the alternatives. 2. The students are able to implement selected technical solutions in the model scale. 3. The students are able to estimate the implementation costs of selected technical solutions.
Personal Competence	
Social Competence	The students will acquire the following social skills: 1. The students are able to develop technical solutions for logistical problems and implement them on a model scale within a group of students. 2. The technical solutions from the group can be jointly documented and presented to an audience. 3. The students are able to derive new ideas and improvements from the feedback received related to their developed solution proposals.
Autonomy	The students will acquire the following competencies: 1. Students are able, under the guidance of supervisors, to develop and implement independently technical solutions for logistical problems of warehousing, conveying, sorting, order picking and identifying. 2. The students are able to evaluate their technical solutions and discuss the pros and cons.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	None
Examination	Written elaboration
Examination duration and scale	Prototype construction in laboratory with documentation (group work)
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory

Course L1462: Technical Logistics Laboratory	
Typ	Seminar
Hrs/wk	4
CP	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Prof. Jochen Kreutzfeldt
Language	DE
Cycle	SoSe
Content	The aim of the seminar is the practical introduction of students in various technical solutions to logistical problems. Above all, the guided development of own solutions is the core task in the laboratory. The problems and solutions will be drawn from the following logistic topics: (1) warehousing (2) conveying (3) sorting (4) order picking (5) identifying The students develop technical solutions in small groups for selected problems and implement them on a lab scale. The solutions are presented to an audience and advantages and disadvantages are discussed. The recorded feedback is then added to the model solution.
Literature	Dembowski, Klaus (2015): Raspberry Pi - Das technische Handbuch. Konfiguration, Hardware, Applikationserstellung. 2., erw. und überarb. Aufl. 2015. Wiesbaden: Springer Vieweg. Follmann, Rüdiger (2014): Das Raspberry Pi Kompendium. 2014. Aufl. Berlin, Heidelberg: Springer Berlin Heidelberg (Xpert.press). Griemert, Rudolf (2015): Fördertechnik. Auswahl und Berechnung von Elementen und Baugruppen. [S.l.]: Morgan Kaufmann. Hompel, Michael ten; Büchter, Hubert; Franzke, Ulrich (2008): Identifikationssysteme und Automatisierung. [Intralogistik]. Berlin, Heidelberg: Springer. Hompel, Michael ten; Beck, Maria; Sadowsky, Volker (2011): Kommissionierung. Materialflusssysteme 2 - Planung und Berechnung der Kommissionierung in der Logistik. Berlin [u.a.]: Springer. Jodin, Dirk; Hompel, Michael ten (2012): Sortier- und Verteilsysteme. Grundlagen, Aufbau, Berechnung und Realisierung. 2. Aufl. Berlin: Springer Berlin. Martin, Heinrich (2014): Transport- und Lagerlogistik. Planung, Struktur, Steuerung und Kosten von Systemen der Intralogistik. 9., vollst. überarb. u. akt. Aufl. 2014. Wiesbaden: Imprint: Springer Vieweg. Purdum, Jack J. (2014): Beginning C for Arduino. Learn C programming for the Arduino. Second edition.: Springer Berlin. McRoberts, Michael (2014): Beginning Arduino. Second edition.: Springer Berlin.

Module M1100: Railways

Courses

Title	Typ	Hrs/wk	CP
Railways (L1466)	Lecture	2	3
Railways (L1468)	Recitation Section (large)	2	3

Module Responsible	Prof. Carsten Gertz
Admission Requirements	None
Recommended Previous Knowledge	Introduction to railways
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students can... • concieve the entrepreneurial perspective of transport and infrastructure companies • estimate intra- and intermodal competition • understand regulatory and transport policy determinants • reflect megatrends in the transport market • understand the key performance indicators for railway transport market
Skills	Students can... • apply traffic Intermodal perspective • understand strategic challenges, opportunities and issues of companies • recognize the relevance of sustainability and digitization for companies
Personal Competence	
Social Competence	Students can... • discuss and organize task packages in small groups • document and present work results in small groups
Autonomy	Students can... • research and select literature • submit their own shares of an extensive written work in small groups and present it collaborativly within a fixed time frame
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	None
Examination	Written exam
Examination duration and scale	
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory

Course L1466: Railways

Typ	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Rüdiger Grube
Language	DE
Cycle	WiSe
Content	
Literature	

Course L1468: Railways

Typ	Recitation Section (large)
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Rüdiger Grube
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M0994: Information Technology in Logistics

Courses

Title	Typ	Hrs/wk	CP
Informationtechnology in Logsitics (L1197)	Practical Course	6	6

Module Responsible	Prof. Thorsten Blecker
Admission Requirements	None
Recommended Previous Knowledge	Knowledge from the module "Production and Logistics Management"; Interest in new technologies and their application in logistics
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	• on the relationship between logistics and IT, and representation and describtion in depth; • information systems and information management, and the application of information systems and information management to logistical issues; • using information technologies that are currently used in logistics, such as RFID, e-logistics and electronic sourcing.
Skills	• to assess the use of information technology in logistics issues and to implement appropriate technologies; • to be able to deal critically with the current developments in IT and logistics and to assess them critically; • analyse in depth relevant issues arising from the thematic field of "IT in Logistics" at a scientific level; • to independently work on current topics from the field of "IT in Logistics"; • analyse the relationship between logistics and IT; • implementing information technology in logistics successfully • to transfer the theoretical knowledge of information technologies to real situations and to give recommendations of action for solving new tasks; • to solve logistical problems using information technology
Personal Competence	
Social Competence	• to conduct subject-specific and interdisciplinary discussions; • oral and written presentation of results • respectful team work
Autonomy	• work independently on a subject and transfer the acquired knowledge to new problems.
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84
Credit points	6
Studienleistung	None
Examination	Written elaboration
Examination duration and scale	-
Assignment for the Following Curricula	International Management and Engineering: Specialisation I. Electives Management: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory

Course L1197: Informationtechnology in Logsitics

Typ	Practical Course
Hrs/wk	6
CP	6
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84
Lecturer	Prof. Thorsten Blecker
Language	DE
Cycle	WiSe
Content	• In the beginning the students get insight of the functionality of a service-oriented architecture. • Then the students will get a logistic problem to solve in small groups. • The elaborations result shall be one or more programmed services/module that together with the other groups result completes a total application.
Literature	Skripte und Textdokumente, die während der Vorlesung herausgegeben werden

Module M1003: Management Control Systems for Operations

Courses

Title	Typ	Hrs/wk	CP
Management Control Systems for Operations (L1219)	Project-/problem-based Learning	3	4
Management Control Systems for Operations (L1224)	Recitation Section (small)	1	2

Module Responsible	Prof. Wolfgang Kersten
Admission Requirements	None
Recommended Previous Knowledge	Introduction to Business and Management
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students have acquired in depth knowledge in the following areas and can • explain the function and the requirements of management control systems, • explain the targets and the tasks of production and supply chain comtrolling, • understand management control systems for production in an international context, • explain the major aspects of investment planning and control, • explain the major aspects of cost management, • explain and understand the procedures of budgeting, • present and give a detailed explanation of methods and tools of management control systems for production and supply chains.
Skills	Based on the acquired knowledge students are capable of - Applying methods of managerial accounting in production and logistics in an international context, - Selecting sufficient methods of managerial accounting in production and logistics to solve practical problems, - Selecting appropriate methods of managerial accounting in production and logistics also for non-standardized problems, - Making a holistic assessment of areas of decision in management control systems for production and logistics and relevant influence factors.
Personal Competence	
Social Competence	After completion of the module students can - lead discussions and team sessions, - arrive at work results in groups and document them, - develop joint solutions in mixed teams and present them to others, - present solutions to specialists and develop ideas further.
Autonomy	After completion of the module students can - assess possible consequences of their professional activity, - define tasks independently, acquire the requisite knowledge and use suitable means of implementation, - define and carry out research tasks bearing in mind possible societal consequences.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6

Studienleistung	Compulsory	Bonus	Form	Description
	Yes	20 %	Subject theoretical and practical work	

Examination	Written exam
Examination duration and scale	90 min
Assignment for the Following Curricula	International Management and Engineering: Specialisation I. Electives Management: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory

Course L1219: Management Control Systems for Operations	
Typ	Project-/problem-based Learning
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Wolfgang Kersten, Dr. Thomas Kosin
Language	DE
Cycle	WiSe
Content	• Identification of missions and changing requirements on controlling • Differentiating managerial accounting, production management, logistics and supply chain controlling • Considering global dispersed supply chain networks in production management and supply chain controlling • Analyzing investment projects and resulting effects (investment control, risk management in investment) • In depth knowledge in planning, realizing and controlling investments • Developing characteristics of differentiation for cost and activity accounting (aim, purpose, opportunities in structuring etc.) • In depth knowledge in cost management (cost types and units) • Budgeting in practice; Analysis of existing methods • Development of an approach in activity based costing • Application of target costing • Knowing the importance and method of life cycle costing • Applying performance figures in production and logistics • Developing recommendations for problem solving by using problem based learning sessions for case studies; thereby preparing and presenting results in intercultural teams
Literature	Altrogge, G. (1996): Investition, 4. Aufl., Oldenbourg, München Betge, P. (2000): Investitionsplanung: Methoden, Modelle, Anwendungen, 4. Aufl., Vahlen, München. Christopher, M. (2005): Logistics and Supply Chain Management, 3. Aufl., Pearson Education, Edinburgh. Eversheim, W., Schuh, G. (2000): Produktion und Management. Betriebshütte: 2 Bde., 7. Aufl., Springer Verlag, Berlin. Günther, H.-O., Tempelmeier, H. (2005): Produktion und Logistik, 6. Aufl., Springer Verlag, Berlin. Hahn, D. Horváth, P., Frese, E. (2000): Operatives und strategisches Controlling, in: Eversheim, W., Schuh, G. (Hrsg.): Produktion und Management. Betriebshütte: 2 Bde. Springer Verlag, Berlin. Hansmann, K.-W. (1987): Industriebetriebslehre, 2. Aufl., Oldenbourg, München. Hoitsch, H.-J. (1993): Produktionswirtschaft: Grundlagen einer industriellen Betriebswirtschaftslehre, 2. Aufl., Vahlen, München. Horváth, P. (2011): Controlling, 12. Aufl., Vahlen, München. Kruschwitz, L. (2009): Investitionsrechnung, 12. Aufl., Oldenbourg, München. Martinich, J. S. (1997): Production and operations management: an applied modern approach. Wiley. Preißler, P. R. (2000): Controlling. 12. Aufl., Oldenbourg Wissenschaftsverlag, München. Weber, J. (2002): Logistik- und Supply Chain Controlling, 5. Auflage, Schaeffer-Poeschel Verlag, Stuttgart. Wildemann, H. (1987): Strategische Investitionsplanung, Methoden zur Bewertung neuer Produktionstechnologien, Gabler, Wiesbaden. Wildemann, H. (2001): Produktionscontrolling: Systemorientiertes Controlling schlanker Produktionsstrukturen, 4. Aufl. TCW, München.

Course L1224: Management Control Systems for Operations	
Typ	Recitation Section (small)
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Wolfgang Kersten
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M0867: Production Planning & Control and Digital Enterprise

Courses

Title	Typ	Hrs/wk	CP
The Digital Enterprise (L0932)	Lecture	2	2
Production Planning and Control (L0929)	Lecture	2	2
Production Planning and Control (L0930)	Recitation Section (small)	1	1
Exercise: The Digital Enterprise (L0933)	Recitation Section (small)	1	1

Module Responsible	Prof. Hermann Lödding
Admission Requirements	None
Recommended Previous Knowledge	Fundamentals of Production and Quality Management
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students can explain the contents of the module in detail and take a critical position to them.
Skills	Students are capable of choosing and applying models and methods from the module to industrial problems.
Personal Competence	
Social Competence	Students can develop joint solutions in mixed teams and present them to others.
Autonomy	-
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84
Credit points	6
Studienleistung	None
Examination	Written exam
Examination duration and scale	180 Minuten
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Product Development and Production: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Biomedical Engineering: Specialisation Artificial Organs and Regenerative Medicine: Elective Compulsory Biomedical Engineering: Specialisation Implants and Endoprostheses: Elective Compulsory Biomedical Engineering: Specialisation Medical Technology and Control Theory: Elective Compulsory Biomedical Engineering: Specialisation Management and Business Administration: Compulsory Product Development, Materials and Production: Specialisation Product Development: Elective Compulsory Product Development, Materials and Production: Specialisation Production: Compulsory Product Development, Materials and Production: Specialisation Materials: Elective Compulsory Theoretical Mechanical Engineering: Specialisation Product Development and Production: Elective Compulsory Theoretical Mechanical Engineering: Technical Complementary Course: Elective Compulsory

Course L0932: The Digital Enterprise

Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Axel Friedewald
Language	DE
Cycle	WiSe
Content	Due to the developments of Industry 4.0, digitalization and interconnectivity become a strategic advantage for companies in the international competition. This lecture focuses on the relevant modules and enables the participants to evaluate current developments in this context. In particular, knowledge management, simulation, process modelling and virtual technologies are covered. Content: • Business Process Management and Data Modelling, Simulation • Knowledge and Competence Management • Process Management (PPC, Workflow Management) • Computer Aided Planning (CAP) and NC-Programming • Virtual Reality (VR) and Augmented Reality (AR) • Computer Aided Quality Management (CAQ) • Industry 4.0
Literature	Scheer, A.-W.: ARIS - vom Geschäftsprozeß zum Anwendungssystem. Springer-Verlag, Berlin 4. Aufl. 2002 Schuh, G. et. al.: Produktionsplanung und -steuerung, Springer-Verlag. Berlin 3. Auflage 2006 Becker, J.; Luczak, H.: Workflowmanagement in der Produktionsplanung und -steuerung. Springer-Verlag, Berlin 2004 Pfeifer, T; Schmitt, R.: Masing Handbuch Qualitätsmanagement. Hanser-Verlag, München 5. Aufl. 2007 Kühn, W.: Digitale Fabrik. Hanser-Verlag, München 2006

Course L0929: Production Planning and Control	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Hermann Lödding
Language	DE
Cycle	WiSe
Content	• Models of Production and Inventory Management • Production Programme Planning and Lot Sizing • Order and Capacity Scheduling • Selected Strategies of PPC • Manufacturing Control • Production Controlling • Supply Chain Management
Literature	• Vorlesungsskript • Lödding, H: Verfahren der Fertigungssteuerung, Springer 2008 • Nyhuis, P.; Wiendahl, H.-P.: Logistische Kennlinien, Springer 2002

Course L0930: Production Planning and Control	
Typ	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Hermann Lödding
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L0933: Exercise: The Digital Enterprise	
Typ	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Axel Friedewald
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	Siehe korrespondierende Vorlesung See interlocking course

Module M1406: Transport Aircraft Operations

Courses

Title	Typ	Hrs/wk	CP
Airline Operations (L1310)	Lecture	3	3
Airport Operations (L1276)	Lecture	3	3

Module Responsible	Prof. Volker Gollnick
Admission Requirements	None
Recommended Previous Knowledge	Lecture Air Transportation Systems Basic Knowledge in Aviation, logistics, mobility
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Principles of Air Traffic Management and technologies Design and modelling of traffic flows, avionics and sensor systems, cockpit design Principles of Airline organization and business Fleet setup, fleet operation, aircraft selection, maintenance, repair overhaul technologies and business
Skills	• Understanding and application of different interdisciplinary interdependencies • Integration and assessment of new technologies in the air transportation system • Modelling and assessment of flight guidance systems • Airline fleet planning and fleet operation
Personal Competence	
Social Competence	• Working in interdisciplinary teams • Communication
Autonomy	Organization of workflows and -strategies
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84
Credit points	6
Studienleistung	None
Examination	Written exam
Examination duration and scale	90 min
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory

Course L1310: Airline Operations

Typ	Lecture
Hrs/wk	3
CP	3
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42
Lecturer	Prof. Volker Gollnick, Dr. Karl Echtermeyer
Language	DE
Cycle	SoSe
Content	1. Introdution and overview 2. Airline business models 3. Interdependencies in flight planning (network management, slot management, netzwork structures, aircraft circulation) 4. Operative flight preparation (weight & balance, payload/range, etc.) 5. fleet policy 6. Aircraft assessment and fleet planning 7. Airline organisation 8. Aircraft maintenance, repair and overhaul
Literature	Volker Gollnick, Dieter Schmitt: The Air Transport System, Springer Berlin Heidelberg New York, 2014 Paul Clark: Buying the big jets, Ashgate 2008 Mike Hirst: The Air Transport System, AIAA, 2008

Course L1276: Airport Operations	
Typ	Lecture
Hrs/wk	3
CP	3
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42
Lecturer	Prof. Volker Gollnick, Peter Bießlich
Language	DE
Cycle	WiSe
Content	FA-F Flight Operations Flight Operations - Production Infrastructures Operations Planning Master plan Airport capacity Ground handling Terminal operations
Literature	Richard de Neufville, Amedeo Odoni: Airport Systems, McGraw Hill, 2003

Module M0739: Factory Planning & Production Logistics

Courses

Title	Typ	Hrs/wk	CP
Factory Planning (L1445)	Lecture	3	3
Production Logistics (L1446)	Lecture	2	3

Module Responsible	Prof. Jochen Kreutzfeldt
Admission Requirements	None
Recommended Previous Knowledge	Bachelor degree in logistics
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students will acquire the following knowledge: 1. The students know the latest trends and developments in the planning of factories. 2. The students can explain basic procedures of factory planning and are able to deploy these procedures while considering different conditions. 3. The students know different methods of factory planning and are able to deal critically with these methods.
Skills	The students will acquire the following skills: 1. The students are able to analyze factories and other material flow systems with regard to new development and the need for change of these logistical systems. 2. The students are able to plan and redesign factories and other material handling systems. 3. The students are able to develop procedures for the implementation of new and revised material flow systems.
Personal Competence	
Social Competence	The students will acquire the following social skills: 1. The students are able to develop plans for the development of new and improvement of existing material flow systems within a group. 2. The developed planning proposal from the group work can be documented and presented together. 3. The students are able to derive suggestions for improvement from the feedback on the planning proposals and can even provide constructive criticism themselves.
Autonomy	The students will acquire the following independent competencies: 1. The students can plan and re-design material flow systems using existing planning procedures. 2. The students can evaluate independently the strengths and weaknesses of several techniques for factory planning and choose appropriate methods in a given context. 3. The students are able to carry out autonomously new plans and transformations of material flow systems.
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70
Credit points	6
Studienleistung	None
Examination	Written exam
Examination duration and scale	120 min
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Logistics: Elective Compulsory International Management and Engineering: Specialisation II. Product Development and Production: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Theoretical Mechanical Engineering: Technical Complementary Course: Elective Compulsory Theoretical Mechanical Engineering: Specialisation Product Development and Production: Elective Compulsory

Course L1445: Factory Planning	
Typ	Lecture
Hrs/wk	3
CP	3
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42
Lecturer	Prof. Jochen Kreutzfeldt
Language	DE
Cycle	WiSe
Content	The lecture gives an introduction into the planning of factories and material flows. The students will learn process models and methods to plan new factories and improve existing material flow systems. The course includes three basic topics: (1) Analysis of factory and material flow systems (2) Development and re-planning of factory and material flow systems (3) Implementation and realization of factory planning The students are introduced into several different methods and models per topic. Practical examples and planning exercises deepen the methods and explain the application of factory planning. Current trends and issues in the factory planning round off the lecture.
Literature	Bracht, Uwe; Wenzel, Sigrid; Geckler, Dieter (2011): Digitale Fabrik: Methoden und Praxisbeispiele. 1. Aufl.: Springer, Berlin. Helbing, Kurt W. (2010): Handbuch Fabrikprojektierung. Berlin, Heidelberg: Springer Berlin Heidelberg. Lotter, Bruno; Wiendahl, Hans-Peter (2012): Montage in der industriellen Produktion: Optimierte Abläufe, rationelle Automatisierung. 2. Aufl.: Springer, Berlin. Müller, Egon; Engelmann, Jörg; Löffler, Thomas; Jörg, Strauch (2009): Energieeffiziente Fabriken planen und betreiben. Berlin, Heidelberg: Springer Berlin Heidelberg. Schenk, Michael; Müller, Egon; Wirth, Siegfried (2014): Fabrikplanung und Fabrikbetrieb. Methoden für die wandlungsfähige, vernetzte und ressourceneffiziente Fabrik. 2. Aufl. Berlin [u.a.]: Springer Vieweg. Wiendahl, Hans-Peter; Reichardt, Jürgen; Nyhuis, Peter (2009): Handbuch Fabrikplanung: Konzept, Gestaltung und Umsetzung wandlungsfähiger Produktionsstätten. Carl Hanser Verlag.

Course L1446: Production Logistics	
Typ	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Dipl.-Ing. Arnd Schirrmann
Language	DE
Cycle	WiSe
Content	• Introduction: situation, significance and main innovation focuses of logistics in a production company, aspects of procurement, production, distribution and disposal logistics, production and transport networks • Logistics as a production strategy: logistics-oriented method of working in a factory, throughput time, corporate strategy, structured networking, reducing complexity, integrated organization, integrated product and production logistics (IPPL) • Logistics-compatible production and process structuring; logistics-compatible product, material flow, information and organizational structures • Logistics-oriented production control: situation and development tendencies, logistics and cybernetics, market-oriented production planning, control, monitoring, PPS systems and production control, cybernetic production organization and control, production logistics control systems. • Production logistics planning: key performance indicators, developing a production logistics concept, computerized aids to planning production logistics, IPPL functions, economic efficiency of logistics projects • Production logistics controlling: production logistics and controlling, material flow-oriented cost transparency, cost controlling (process cost accounting, costs model in IPPL), process controlling (integrated production system, methods and tools, MEPOT.net method portal)
Literature	Pawellek, G.: Produktionslogistik: Planung - Steuerung - Controlling. Carl Hanser Verlag 2007

Module M1402: Machine Learning in Logistics

Courses

Title	Typ	Hrs/wk	CP
Digitalization in Traffic and Logistics (L2004)	Lecture	1	2
Basics of Machine Learning (L2003)	Lecture	1	2
Machine Learning in Logistics (L2005)	Recitation Section (small)	2	2

Module Responsible	Prof. Carlos Jahn
Admission Requirements	None
Recommended Previous Knowledge	None
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students are able to explain the differences between instance and model based learning approaches and are able to use specific approaches in machine learning on the base of static and incremental growing data. By the use of uncertainty the students can explain how axioms, parameter or structures can be learned. Additional the students learn to develop different cluster techniques. Students should get an introduction in the topic of bid data and the anaylsis for applied problems in the maritime logistics. The focal point will be on problems of maritime logistics. Due to the increasing complexity of supply chains and the increasing digitalization in traffic and logistics the students should work on real life and applied examples.
Skills	Students are able to understand specific procedures of machine learning and to use on real life examples. Students are able to use appropriate procedures for given data. Additionally the students can edit raw data for machine learning procedures. The students should be prepared to evaluate the taught methods regarding its usefulness for real life examples. For example for data mining approaches for the controlling or forecasting approaches for the planning of enterprises.
Personal Competence	
Social Competence	Students are capable of: • Discussing and organizing extensive research tasks in small groups • Jointly describing, differentiating between and evaluating problems
Autonomy	Students are able: • To research and select specialized literature
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Studienleistung	None
Examination	Written exam
Examination duration and scale	90 minutes
Assignment for the Following Curricula	International Management and Engineering: Specialisation II. Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Production and Logistics: Elective Compulsory Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory

Course L2004: Digitalization in Traffic and Logistics	
Typ	Lecture
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	WiSe
Content	The students should get to know the importance of big data and get to know the analysis and processing of these for applied problems in logistics. The focal point will be on maritime logistics. The students should be enabled to use the learned methods in real life questions. The students should be prepared to evaluate the taught methods regarding its usefulness for real life examples. For example for data mining approaches for the controlling or forecasting approaches for the planning of enterprises. Planned content: • Big Data • Data-Mining • Decision Analytics • Forecasting • Information Management
Literature	John D. Kelleher, Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies (MIT Press) Tom M. Mitchell, Machine Learning Kevin P. Murphy, Machine Learning: A Probabilistic Perspective

Course L2003: Basics of Machine Learning	
Typ	Lecture
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Dozenten des SD E
Language	DE
Cycle	WiSe

Content	Students are able to understand specific procedures of machine learning and to use on real life examples. Students are able to use appropriate procedures for given data.
	
	Students are able to explain the differences between instance and model based learning approaches and are able to use specific approaches in machine learning on the base of static and incremental growing data.
	
	By the use of uncertainty the students can explain how axioms, parameter or structures can be learned. Additional the students learn to develop different cluster techniques.
	
	Planned content:
	
	• Supervised Learning:
	  ◦ Regressions
	  ◦ Decision trees
	  ◦ Bayesian networks
	  ◦ K-next neighbors
	  ◦ Logistical regressions
	  ◦ Neuronal Networks
	  ◦ Support Vector Machines
	  ◦ Ensemble Learning
	
	• Unsupervised Learning:
	  ◦ Hierarchical Clustering, K-Mean

Literature	John D. Kelleher, Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies (MIT Press) Tom M. Mitchell, Machine Learning Kevin P. Murphy, Machine Learning: A Probabilistic Perspective

Course L2005: Machine Learning in Logistics	
Typ	Recitation Section (small)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	WiSe
Content	In the exercise the skills which the students acquired in the lectures will be applied to real life examples.
Literature	John D. Kelleher, Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies (MIT Press) Tom M. Mitchell, Machine Learning Kevin P. Murphy, Machine Learning: A Probabilistic Perspective

Thesis

Module M-002: Master Thesis

Courses

Title	Typ	Hrs/wk	CP

Module Responsible	Professoren der TUHH
Admission Requirements	• According to General Regulations §21 (1): At least 60 credit points have to be achieved in study programme. The examinations board decides on exceptions.
Recommended Previous Knowledge	
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	• The students can use specialized knowledge (facts, theories, and methods) of their subject competently on specialized issues. • The students can explain in depth the relevant approaches and terminologies in one or more areas of their subject, describing current developments and taking up a critical position on them. • The students can place a research task in their subject area in its context and describe and critically assess the state of research.
Skills	The students are able: • To select, apply and, if necessary, develop further methods that are suitable for solving the specialized problem in question. • To apply knowledge they have acquired and methods they have learnt in the course of their studies to complex and/or incompletely defined problems in a solution-oriented way. • To develop new scientific findings in their subject area and subject them to a critical assessment.
Personal Competence	
Social Competence	Students can • Both in writing and orally outline a scientific issue for an expert audience accurately, understandably and in a structured way. • Deal with issues competently in an expert discussion and answer them in a manner that is appropriate to the addressees while upholding their own assessments and viewpoints convincingly.
Autonomy	Students are able: • To structure a project of their own in work packages and to work them off accordingly. • To work their way in depth into a largely unknown subject and to access the information required for them to do so. • To apply the techniques of scientific work comprehensively in research of their own.
Workload in Hours	Independent Study Time 900, Study Time in Lecture 0
Credit points	30
Studienleistung	None
Examination	Thesis
Examination duration and scale	According to General Regulations
Assignment for the Following Curricula	Civil Engineering: Thesis: Compulsory Bioprocess Engineering: Thesis: Compulsory Chemical and Bioprocess Engineering: Thesis: Compulsory Computer Science: Thesis: Compulsory Electrical Engineering: Thesis: Compulsory Energy and Environmental Engineering: Thesis: Compulsory Energy Systems: Thesis: Compulsory Environmental Engineering: Thesis: Compulsory Aircraft Systems Engineering: Thesis: Compulsory Global Innovation Management: Thesis: Compulsory Computational Science and Engineering: Thesis: Compulsory Computational Science and Engineering: Thesis: Compulsory Information and Communication Systems: Thesis: Compulsory International Production Management: Thesis: Compulsory International Management and Engineering: Thesis: Compulsory Joint European Master in Environmental Studies - Cities and Sustainability: Thesis: Compulsory Logistics, Infrastructure and Mobility: Thesis: Compulsory Materials Science: Thesis: Compulsory Mathematical Modelling in Engineering: Theory, Numerics, Applications: Thesis: Compulsory Mechanical Engineering and Management: Thesis: Compulsory Mechatronics: Thesis: Compulsory Biomedical Engineering: Thesis: Compulsory Microelectronics and Microsystems: Thesis: Compulsory Product Development, Materials and Production: Thesis: Compulsory

	Renewable Energies: Thesis: Compulsory Naval Architecture and Ocean Engineering: Thesis: Compulsory Ship and Offshore Technology: Thesis: Compulsory Theoretical Mechanical Engineering: Thesis: Compulsory Process Engineering: Thesis: Compulsory Water and Environmental Engineering: Thesis: Compulsory