Technische Hochschule Wildau
Technical University of Applied Sciences

Degree programme
"Technical Management"
Master of Engineering

Programm description

Stand vom: Juli 2019

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Profile

About the degree programme:
The Technical Management degree programme is jointly organised and run by the Industrial Engineering, Logistics and Transportation Systems Technology departments at TH Wildau.
It is primarily aimed at graduates holding bachelor's degrees in these fields, but is also open to all graduates with a degree in any related field.

Study objectives:
The degree programme has a more technical emphasis. It also contains courses on business administration and information systems and gives graduates an integrative and responsible understanding of tasks in technically oriented management roles as well as the interface between engineering sciences and business administration.

Modulmatrix

Module	Sem.	Art	V	Ü	L	P	ges.	PF	CP
Design, Engineering and Management of Companies	1	PM	0.0	4.0	0.0	8.0	12.0	SMP	15.0
Models and Methods for Engineering and Management	1	PM	6.0	2.0	4.0	0.0	12.0	KMP	15.0
Analysis and Design of Transportation Networks	2	WPM	2.0	1.0	1.0	0.0	4.0	KMP	5.0
Cyberphysical Production Systems	2	WPM	2.0	1.0	1.0	0.0	4.0	KMP	5.0
Enhanced Technologies for Mobility	2	WPM	2.0	2.0	0.0	0.0	4.0	FMP	5.0
IT-Systems Implementation Transportation Systems	2	WPM	1.0	1.0	2.0	0.0	4.0	SMP	5.0
IT-Systems Implementation in Logistics	2	WPM	2.0	1.0	1.0	0.0	4.0	SMP	5.0
IT-Systems Implementation in Production	2	WPM	1.0	1.0	2.0	0.0	4.0	SMP	5.0
Mobility Concepts	2	WPM	2.0	2.0	0.0	0.0	4.0	KMP	5.0
Organisation of Transport Companies	2	WPM	2.0	1.0	1.0	0.0	4.0	KMP	5.0
Product Lifecycle Management	2	WPM	2.0	2.0	0.0	0.0	4.0	FMP	5.0
Production Systems and Networks	2	WPM	2.0	1.0	1.0	0.0	4.0	KMP	5.0
Supply Chain Management	2	WPM	2.0	2.0	0.0	0.0	4.0	FMP	5.0
System Dynamics in Production and Logistics	2	WPM	2.0	2.0	0.0	0.0	4.0	KMP	5.0
Transportation Technologies	2	WPM	2.0	2.0	0.0	0.0	4.0	FMP	5.0
Master's Colloquium	3	PM	0.0	0.0	0.0	0.0	0.0	SMP	6.0
Master's Thesis	3	PM	0.0	0.0	0.0	0.0	0.0	SMP	24.0
Summe der Semesterwochenstunden			30	25	13	8	76		
Summe der zu erreichende CP aus WPM									30
Summe der CP aus PM									60
Gesammtsumme CP									90

V - Vorlesung
Ü - Übung
L - Labor
P - Projekt
***** Modul erstreckt sich über mehrere Semester

PF - Prüfungsform
CP - Credit Points
PM - Pflichtmodul
WPM - Wahlpflichtmodul

FMP - Feste Modulprüfung
SMP - Studienbegleitende Modulprüfung
KMP - Kombinierte Modulprüfung

Design, Engineering and Management of Companies

Module: Design, Engineering and Management of Companies	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr. Marcus Ulrich Abramowski & Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 1	**Semester part time:**	**Duration:** 1
Hours per week per semester: 12.0	**Of which L/S/LW/P:** 0.0/4.0/0.0/8.0	**CP according to ECTS:** 15.0
Form of course: Compulsory	**Language:** English	**As of:** 2019-04-30
Compulsory prior knowledge: Desirable Basics from Bachelor-Studies: Basics in Logistics, Quality Management and Project Management		
Recommended prior knowledge: Basics from Module “Models and Methods for Engineering and Management”		
Recognition of external relevant qualification/experience:		
Special regulations: In case of relevant student number, the module will be delivered in two streams. One stream for production and logistics, the other one for transportation aspects.		

Workload distribution	**Hours:**
In class:	180.0
Pre- and post-course work:	100.0
Project:	150.0
Examinations:	10.0
Total:	440

Design, Engineering and Management of Companies

Lerning objectives	Anteil
Subject specific competences	
Knowledge • Decision management in companies can be reflected • Execution and exercise of the Methods from Module „Models and Methods for Engineering and Management” • Development of new concepts and processes regarding the end to end process in producing / transportation companies • Decisions in site and structural matters of organisations • Deflect organisational challenges in IT-and complex solutions • Development of modern management processes and the related management functions • Establish project organisations	40%
Skills • To manage and to solve complex problems in terms of planning, organising, controlling and leading in the context of global companies and organisations • To find and asses alternative solutions and submit proposals for a decision • Define business objectives • Operate in business process reengineering projects • Implement business processes (end to end) in IT-Systems • Working in comprehensive and complex projects Reproduce processes in purchasing, logistics (internal and external), sales and distribution ERP-Solutions as well as transportation aspects in specific IT systems • To control projects with project management tools	40%
Personal competences	
Social competence • Control of comprehensive project teams • Conflict resolution internal and external • Integration in interdisciplinary teams • To manage work tasks in working groups • To perform simple management tasks • Moderation of steering committee and project management meetings Increase of motivation	20%
Autonomy • To develop internal project teams • Leading subprojects • Take responsibility for decisions and Groups • To analyze and evaluate learning and work processes • To design and optimize learning and work	

Design, Engineering and Management of Companies

Content:

1. Strategic alignment of the plant / site / transportation needs and connection • Analyze of the existing processes and incidents • Deflection and assessment of the strategic parameters • Knowledge management in organisations • Evaluation of organisational aspects
2. Development of projects • Project organisation and development of the project organisation • BPMN for processes and their documentation • Milestone Trend Analysis or Earned Value Analysis for controlling • Documentation of projects (open issue lists etc.) • Using strategies for project escalations
3. Applied business process engineering / reengineering • Integrated description processes in organisation and IT (several levels of abstraction) • Compare, select and operate the several methods in BPR • Tools: ARIS / BPML • Harmonization between organisational and IT-Processes
4. Global site strategies • Position of the site in the supply chain • Position of the site in strategy of the company • Position of the site in transportation aspects • Normative processes of the company
5. Solution for a model based company • End to end planning processes • Development of strategic, functional and anticipated processes • Strategic (short and long term) planning scenarios in production and logistics as well transportation • In- and Outsourcing
6. IT-Systems implementation • T-support for strategic, functional and anticipated processes • Realization of ERP-Functions • Go Live • Support after Go Live • Use of der ERP-Systems

Examination format:

Presentation (20%)
Oral exam (80%)

Design, Engineering and Management of Companies

Compulsory reading:
Ruhe, G. (2014). *Software Project Management: Setting the Context*. Springer. **Walter, M.** (2015). *Multi-Project Management with a Multi-Skilled Workforce*. Springer. **Kirchmer, M.** (1998). *Business process oriented implementation of standard software*. Berlin u.a.: Springer. **Anderson, G.** (2009). *SAP Implementation*. SAMS. **Vollmann, T.** (2004). *Manufacturing planning and control for supply chain management*. Boston, Mass. [u.a.]: McGraw-Hill. **Akhtar, J.** (2016). *Production Planning and Control with SAP ERP*. Galileo. **Davim, P.** (2018). *Progress in Lean Manufacturing*. Springer.
Recommended reading:

Models and Methods for Engineering and Management

Module: Models and Methods for Engineering and Management	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 1	**Semester part time:**	**Duration:** 1
Hours per week per semester: 12.0	**Of which L/S/LW/P:** 6.0/2.0/4.0/0.0	**CP according to ECTS:** 15.0
Form of course: Compulsory	**Language:** English	**As of:** 2019-03-22
Compulsory prior knowledge: -		
Recommended prior knowledge: -		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	180.0
Pre- and post-course work:	205.0
Project:	60.0
Examinations:	5.0
Total:	450

Models and Methods for Engineering and Management

Lerning objectives	Anteil
Subject specific competences	
Knowledge • Explain and evaluate advanced process and optimization models and methods • Recognize and unterstand how to transfer different methods to new fields of application • Understand the role of simulation in production, logistics and transportation • Explain queuing systems and their appearance in production, logistics and transportation practice • Characterize objectives and procedure of business process management	50%
Skills • Describe, analyze and modify complex situations in a structured and directed manner • Perform the transfer of various methods to new fields of application. • Be able to apply simulation methodology to practical problems from production, logistics or transportation • Be able to analyse practical problems by means of queuing theory methods • Be able to model, analyse, and (re-)design business processes	30%
Personal competences	
Social competence • Be able to work in teams, organize team work and manage a project team • Be able to critically reflect and self-organize learning processes • Be able to communicate in a team work context and to present resulst	20%
Autonomy • Be able to analyze and work on complex topics autonomously. • Be able to speak freely about technical topics. • Be able to adopt and assess critically specialized, advanced knowledge.	

Models and Methods for Engineering and Management

Content:

1. Project management
   - 1.1. Project organisation
   - 1.2. Project planning
   - 1.3. Network planning techniques
2. Operations Research - model-based problem solving
   - 2.1. Decision theory and decision support
   - 2.2. Problem solving using mathematical programming
     - 2.2.1. Principles of Linear programming
     - 2.2.2. Principles of (Mixed) integer programming
   - 2.3. Advanced models and applications
3. Simulation and Business Process Optimization
   - 3.1. Simulation
     - 3.1.1. Recall: simulation in production, logistics and transportation
     - 3.1.2. Modelling and simulation of queuing systems
   - 3.2. Business process optimization
     - 3.2.1. Introduction to business process management
     - 3.2.2. Business process modelling and analysis
     - 3.2.3. Business process design and re-engineering
4. Procedure Models
   - 4.1. Definition Procedure Model – Problem Solving Process in general
   - 4.2. Demarcation of Model, Method and Algorithm
   - 4.3. Important Models for Innovation and Change Projects
     - 4.3.1. Models for Product Development
     - 4.3.2. Models for Software Development (Agile Development)
     - 4.3.3. Morphological Model for setting Objectives in Factory Planning
     - 4.3.4. Models for Improvement Projects
     - 4.3.5. Hybrid Models

Models and Methods for Engineering and Management

Examination format:
Written exam (40%) Project (50%) Presentation (10%)

Compulsory reading:
Hillier F., Lieberman G., Introduction to Operations Research, 2014 Lock D., The Essentials of Project Management, 2014 VDI Guideline 2206: “Design methodology for mechatronic systems” VDI Guideline 5200, Part 2: “Morphological model of the factory for the setting of objectives in the factory planning”
Recommended reading:

Analysis and Design of Transportation Networks

Module: Analysis and Design of Transportation Networks	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 2	**Semester part time:**	**Duration:** 1
Hours per week per semester: 4.0	**Of which L/S/LW/P:** 2.0/1.0/1.0/0.0	**CP according to ECTS:** 5.0
Form of course: Elective	**Language:** English	**As of:** 2018-08-03
Compulsory prior knowledge: Models and Methods for Engineering and Management		
Recommended prior knowledge:		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	60.0
Pre- and post-course work:	36.0
Project:	50.0
Examinations:	4.0
Total:	150

Analysis and Design of Transportation Networks

Lerning objectives	Anteil
Subject specific competences	
Knowledge • Students will gain an understanding of • decision making processes in logistics and • the process of designing transportation networks • modelling and solving related decision problems.	35%
Skills • Students will be able to solve strategic, tactical and operational decisions • for clustering/covering problems • for assignment problems, • for finding optimal locations of facilities.	35%

Analysis and Design of Transportation Networks

Personal competences	
Social competence • Students should be able to integrate knowledge and face the complexity of making judgements from information which, being incomplete or limited, include reflections on the social and ethical responsibilities linked to the application of their knowledge and judgements. • Students should know how to communicate their conclusions, knowledge and final reasoning that they hold in front of specialist and non-specialist audiences clearly and unambiguously. • Work collaboratively in a group.	30%
Autonomy • Address problems of management and coordination of logistics operations in production, transport and services in a holistic approach, by means of the consistent application of the supply chain management concepts and strategies, taking into account the pertinent aspects of environment, human capital, quality, technology, and economics. • Apply a rigorous and efficient approach to problem solving • Apply quantitative methods and techniques based on optimisation and/or simulation models in order to evaluate the different alternatives and select the most promising solution to be implemented • Demonstrate abilities to document and reflect the problem-solving process in order to extract the lessons learned. • Elaborate solid arguments based on quantitative models and analytical methods in order to convince and motivate decision makers and then plan and coordinate the project to implement the solution. • Face a new problem under a scientific perspective. • Identify the main aspects to be planned in the resolution of a logistic project, specifying the project boundaries, and leading with a solution. • Select and apply the most relevant analytical methodologies, strategies and current technologies for designing solutions to the problems of management and coordination of material, information and financial flows. • Student should possess an ability to learn that enables them to continue studying in a manner which is largely self-supervised or independent.	

Analysis and Design of Transportation Networks

Content:
1. Selected theoretical basics for logistical decisions A. Model building B. Decision making and optimisation C. Optimisation software 2. Clustering Algorithms/Covering problems A C-means algorithms B Fuzzy C-Means algorithm C Set Covering problems D Maximum covering problems 3. Logistical Assignment Problems A The Standard Assignment Problem B Maximum Cardinality Problems C Generalised Assignment Problems 4. Location Problems A Facility Location Problems B Hub Location Problems

Examination format:
Project (50%) Written exam (50%)

Compulsory reading:
Hillier F., Lieberman G.: Introduction to Operations Research, 10th ed., Irwin Industrial Engineering, 2014 Rodrigue, J.-P.: The Geography of Transport Systems, 4th ed., Routledge, New York, 2017.
Recommended reading:
The Transportation Planning Process: Key Issues, U.S. Department of Transportation: Washington DC, 2015.

Cyberphysical Production Systems

Module: Cyberphysical Production Systems	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr.-Ing. Jörg Reiff-Stephan & Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 2	**Semester part time:**	**Duration:** 1
Hours per week per semester: 4.0	**Of which L/S/LW/P:** 2.0/1.0/1.0/0.0	**CP according to ECTS:** 5.0
Form of course: Elective	**Language:** English	**As of:** 2018-09-18
Recommended prior knowledge: Basic educational standards		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	60.0
Pre- and post-course work:	88.0
Project:	0.0
Examinations:	2.0
Total:	150

Cyberphysical Production Systems

Lerning objectives	Anteil
Subject specific competences	
Knowledge • After the course the student will: - understand specific requirements of cyber-physical production systems and their complexity - be able to apply procedure, methods, tools for specifying, selecting, implementing, testing and analysing entities of cyber-physical production systems	40%
Skills • After the course the student will: - be able to evaluate different digital alternatives and select the entities to be implemented - be able to knowing the risk in using of autonomous technical entities (i.e. mobile robots) as well as the importance of rules in social and technical level - elaborate solid arguments to convince and motivate decision makers	40%
Personal competences	
Social competence • The student is able to: - apply a rigorous and efficient approach to problem solving. - address design problems in Logistics Management and Control from a holistic approach. - demonstrate abilities to document and reflect the problem-solving process in order to extract the lessons learned. - present the solution in a sufficient way.	20%
Autonomy • The student is able to: - elaborate solid arguments to convince/motivate decision makers. - evaluate different alternatives and select the Logistics Management and Control solution to be implemented. - face a new problem under a scientific perspective. - identify the main aspects to be planned in the resolution of a logistic project, specifying the project boundaries, and leading with a solution - select and apply the right methodologies and strategies to specify and formalise the requirements of a Logistics Management and Control system. • Student should possess an ability to learn that enables them to continue studying in a manner which is largely self-supervised or independent	

Cyberphysical Production Systems

Content:
1. Concept formation/ definitions 2. Control architecture of automated systems 3. Technical entities and closed loop controls for cyber-physical production 4. Methods and tools of a cyber-physical production system 5. Information flow horizontally and vertically: methods and examples 6. Human/Machine/Factory interaction 7. Multi-agent, multi-vendor systems 8. Human-robot collaboration/Middleware/Real-time systems

Examination format:
Written exam (25%) Project (50%) Presentation (25%)

Compulsory reading:
List of literature will given in first lesson
Recommended reading:
Cevikcan, E. & Ustundag, A. (2018). *Industry 4.0: Managing The Digital Transformation*. Cham: Springer. Zhang, L.; Fallah, Y. P.; Jihene, R.: Cyber-Physical Systems: Computation, Communication, and Control. In: International Journal of Distributed Sensor Networks, vol. 2013, Article ID 475818, 2 pages, 2013. doi:10.1155/2013/475818 VDI 4499 Blatt 1: Digitale Fabrik. Berlin: Beuth Verlag, 2008 Bullinger, H.-J. (Hrsg.): Fokus Technologie - Chancen erkennen, Leistungen entwickeln. München: Carl Hanser Verlag, 2008 Bauernhansl, T.; ten Hompel, M.; Vogel-Heuser, B.: Industrie 4.0 in Produktion, Automatisierung und Logistik. Wiesbaden: Springer, 2014 Dorst, W.; Glohr, C.; Hahn, H.; Knafla, F.; Loewen, U.; Rosen, R.; Schiemann, T.; Vollmar, F.; Winterhalter, C.: Umsetzungsstrategie Industrie 4.0-Ergebnisbericht der Plattform Industrie 4.0. Frankfurt am Main: BITKOM e.V., VDMA e.V. & ZWEI e.V., 2015

Enhanced Technologies for Mobility

Module: Enhanced Technologies for Mobility	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr.-Ing. Marius Schlingelhof & Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 2	**Semester part time:**	**Duration:** 1
Hours per week per semester: 4.0	**Of which L/S/LW/P:** 2.0/2.0/0.0/0.0	**CP according to ECTS:** 5.0
Form of course: Elective	**Language:** English	**As of:** 2019-04-05
Recommended prior knowledge:		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	60.0
Pre- and post-course work:	18.0
Project:	70.0
Examinations:	2.0
Total:	150

Enhanced Technologies for Mobility

Lerning objectives	Anteil
Subject specific competences	
Knowledge • Vehicle sensors and oientation in the 2D-/3D surrounding space • Conditions for movements of vehicles (usable tracks, obstacles, etc.) • Collaboration of onboad and offboard sensors, computers and networks	30%
Skills • Using test facilities as well as hard- and software systems for systems developments and evaluatios • Researching strategies in vehicle control and traffic management • Elaboration of research and test reports	30%
Personal competences	
Social competence • Facilitating the collaboration and coordination of projects teams • Communication on different social and knowledge levels	40%
Autonomy • Capability for self-reliant work and searching for support and litearture • Evolution of a structured work flow within a project	

Content:
1. Conduct an R&D project within small project teams concerning actual topics such as autonomous driving, traffic management, traffic sensor or C2X networks

Examination format:
Presentation Additional rules: Final project presentation with individual work packages

Compulsory reading:
Recommended reading:

IT-Systems Implementation in Logistics

Module: IT-Systems Implementation in Logistics	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr. Marcus Ulrich Abramowski & Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 2	**Semester part time:**	**Duration:** 1
Hours per week per semester: 4.0	**Of which L/S/LW/P:** 2.0/1.0/1.0/0.0	**CP according to ECTS:** 5.0
Form of course: Elective	**Language:** English	**As of:** 2018-09-25
Compulsory prior knowledge: Basics from Module		
Recommended prior knowledge: Basics from Module “Models and Methods for Engineering and Management”		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	60.0
Pre- and post-course work:	40.0
Project:	40.0
Examinations:	10.0
Total:	150

IT-Systems Implementation in Logistics

Lerning objectives	Anteil
Subject specific competences	
Knowledge • Methods for software selections can be reflected • Development of the correct implementation strategy in IT-Projects (Big Bang / vs phased) • Decisions in structural matters of IT-Implementations • Deflect challenges in IT-solutions • To manage and align the implementation of IT-solutions in complex and high automized warehouses	40%
Skills • To find and asses alternative solutions and submit proposals for the of the correct IT-level and the corresponding software selection • Operate in warehouse management projects • Define the correct grade of automisation • Implement logistic processes in IT-Systems • Implement business processes (end to end) in IT-Systems • To decide between individual and standard software • To decide between organisational and IT-related changes	40%
Personal competences	
Social competence • Integration in interdisciplinary teams • To manage work tasks in working groups • To perform IT-related management tasks • Moderation of decision meetings	20%
Autonomy • To develop internal project teams • Take responsibility for integrated technical and IT decisions • To analyze and evaluate learning and work processes • To design and optimize learning and work	

IT-Systems Implementation in Logistics

Content:

1. Basics in IT-related logistic processes and harmonization between logistics and IT-processes
2. IT-Systems I Supply Chain Managmenent (SCM) / Enterprise Ressource Planning / Warehouse Management Systems (WMS)
3. IT-Systems II Material Flow Control (MFC) / Programmable Logic Control (PLC) / Automization
4. IT-Systems III Interfer and selection of the correct control level for tasks between SCM / ERP / WMS / MFC and PLC
5. Individual vs. standard software Relationship between standardization and automation level
6. Implementation strategies (Big Bang and Phased Projects)
7. Global Templates and standardization of logistical approaches
8. Change Request Management
9. Project phases
10. Test procedures Fuctional tests / Integration tests / stress tests / cross system tests / regression tests
11. Acceptance procedures Site Acceptance Test (SAT) / Factory Acceptance Tests (FAT)
12. Methods for training and go live in logistic systems Knowledge management
13. Systems maintenance and service contracts
14. IT-implementation as a main part of complex logistics projects

Examination format:

Written exam (25%)
Presentation (75%)

IT-Systems Implementation in Logistics

Compulsory reading:
Lange, J. (2013). *Warehouse Management mit SAP® EWM*. Bonn [u.a.]: Galileo Press. **Mende, U.** (1999). *Software development for SAP R/3*. Berlin [u.a.]: Springer. **Martin, R.** (2003). *Agile software development*. Upper Saddle River, N.J.: Pearson Education. **Murray, M.** (2016). *Warehouse Management with SAP ERP (SAP WM): Functionality and Technical Configuration*. Rheinwerk. **Regh, J.** (2008). *Programmable Logic Controllers*. Pearson. **Anderson, G.** (2009). *SAP Implementation*. SAMS. **Kappauf, J. & Lauterbach, B. & Koch, M.** (2011). *Logistic core operations with SAP*. Berlin: Springer. **Kirchmer, M.** (1998). *Business process oriented implementation of standard software*. Berlin u.a.: Springer. **Ruhe, G.** (2014). *Software Project Management: Setting the Context*. Springer.
Recommended reading:

IT-Systems Implementation in Production

Module: IT-Systems Implementation in Production	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr. Marcus Ulrich Abramowski & Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 2	**Semester part time:**	**Duration:** 1
Hours per week per semester: 4.0	**Of which L/S/LW/P:** 1.0/1.0/2.0/0.0	**CP according to ECTS:** 5.0
Form of course: Elective	**Language:** English	**As of:** 2018-09-25
Compulsory prior knowledge: Basics from Module		
Recommended prior knowledge: Basics from Module “Models and Methods for Engineering and Management”		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	60.0
Pre- and post-course work:	40.0
Project:	40.0
Examinations:	10.0
Total:	150

IT-Systems Implementation in Production

Lerning objectives	Anteil
Subject specific competences	
Knowledge • Methods for software selections can be reflected • Development of the correct implementation strategy in IT-Projects (Big Bang / vs phased) • Decisions in structural matters of IT-Implementations • Deflect challenges in IT-solutions • To manage and align the implementation of IT-solutions in complex and high automized production systems	40%
Skills • To find and asses alternative solutions and submit proposals for the of the correct IT-level and the corresponding software selection • Operate in manufacturing execution projects • Define the correct grade of automisation • Implement production processes in IT-Systems • Implement business processes (end to end) in IT-Systems • To decide between individual and standard software • To decide between organisational and IT-related changes	40%
Personal competences	
Social competence • Integration in interdisciplinary teams • To manage work tasks in working groups • To perform IT-related management tasks • Moderation of decision meetings	20%
Autonomy • To develop internal project teams • Take responsibility for integrated technical and IT decisions • To analyze and evaluate learning and work processes • To design and optimize learning and work	

IT-Systems Implementation in Production

Content:

1. Basics in IT-related logistic processes and harmonization between production and IT-processes
2. IT-Systems I Supply Chain Managmenent (SCM) / Enterprise Ressource Planning (ERP) / Manufacturing Execution Systems (MES)
3. IT-Systems II Operating Data (MFC) / Programmable Logic Control (PLC) / Automization
4. IT-Systems III Interfer and selection of the correct control level for tasks between SCM / ERP / MES and PLC
5. Individual vs. standard software Relationship between standardization and automation level
6. Implementation strategies (Big Bang and Phased Projects)
7. Global Templates and standardization of logistical approaches
8. Change Request Management
9. Project phases
10. Test procedures Fuctional tests / Integration tests / stress tests / cross system tests / regression tests
11. Acceptance procedures Site Acceptance Test (SAT) / Factory Acceptance Tests (FAT)
12. Methods for training and go live in logistic systems Knowledge management
13. Systems maintenance and service contracts
14. IT-implementation as a main part of complex site reorganisation projects

Examination format:

Written exam (25%)
Presentation (75%)

IT-Systems Implementation in Production

Compulsory reading:
?no, T. (1988). *Toyota production system*. Cambridge, MA: Productivity Press. **Ake, K. & Clemons, J. & Cubine, M.** (2004). *Information technology for manufacturing*. Boca Raton [u.a.]: St. Lucie Press. **Akhtar, J.** (2016). *Production Planning and Control with SAP ERP*. Galileo. **Anderson, G.** (2009). *SAP Implementation*. SAMS. **Kappauf, J. & Lauterbach, B. & Koch, M.** (2011). *Logistic core operations with SAP*. Berlin: Springer. **Kirchmer, M.** (1998). *Business process oriented implementation of standard software*. Berlin u.a.: Springer. **Kletti, J.** (2007). *Manufacturing Execution System - MES*. Springer. **Martin, R.** (2003). *Agile software development*. Upper Saddle River, N.J.: Pearson Education. **Mende, U.** (1999). *Software development for SAP R/3*. Berlin [u.a.]: Springer. **Regh, J.** (2008). *Programmable Logic Controllers*. Pearson. **Ruhe, G.** (2014). *Software Project Management: Setting the Context*. Springer. **Scholten, B.** (2009). *MES Guide for Executives: Why and How to Select, Implement, and Maintain a Manufacturing Execution System*. International Society of Automation.
Recommended reading:

IT-Systems Implementation Transportation Systems

Module: IT-Systems Implementation Transportation Systems	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr. Martin Lehnert & Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 2	**Semester part time:**	**Duration:** 1
Hours per week per semester: 4.0	**Of which L/S/LW/P:** 1.0/1.0/2.0/0.0	**CP according to ECTS:** 5.0
Form of course: Elective	**Language:** English	**As of:** 2019-04-04
Recommended prior knowledge: introduction in transport system engineering		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	60.0
Pre- and post-course work:	85.0
Project:	0.0
Examinations:	5.0
Total:	150

IT-Systems Implementation Transportation Systems

Lerning objectives	Anteil
Subject specific competences	
Knowledge • Students will be able to explain how applications of IT systems in transport work and interact with systems from the same and neighbouring domains.	40%
Skills • Students can develop concepts for solving IT-related issues in the transport sector. • Students can apply industry-specific software and reflect results obtained. • They can run largely self-directed IT-related projects in transportation.	40%
Personal competences	
Social competence • Students can exchange ideas with each other, work together in small groups cooperatively and autonomously to solve subject-specific problems. • They can present subject-specific problems and solutions to a target group and represent them in an argumentative manner to experts.	20%
Autonomy • Students can analyze and work on complex topics autonomously. • Thes elaborate solid arguments to convince/motivate decision makers and can speak freely about technical topics.	

Content:
1. systematisation of IT-systems in transportation 2. advanced technologies for IT-systems in individual transport - models, implementation, examples 3. traffic flow simulation on different levels 4. rail traffic operation simulation and IT-systems in the public transport environment 5. modern communication technologies in passenger information – chances, risks and new traffic data resource 6. harmonised data models and data formats for data exchange between applications

IT-Systems Implementation Transportation Systems

Examination format:
programming exercises and tests during the semester (60%) examination at the end of the semester (40%) Additional rules: All partial tests must at least be passed.

Compulsory reading:
Recommended reading:
Hansen, I. (2014). *Railway timetabling & operations*. Hamburg: Eurailpress. Scholz, G. (2016). IT-Systems in Public Transport - Information Technology for Transport Operators and Authorities. Heidelberg: dpunkt-Verl.. ISBN Print: 978-3-86490-430-1 **Scholz, G.** (2012). *IT-Systeme für Verkehrsunternehmen*. Heidelberg: dpunkt-Verl.. **Girnau, G.** (2001). *Telematik im ÖPNV in Deutschland*. Düsseldorf: Alba Fachverl.. several handbooks and documentations for the used software tools (as announced in the lessons)

Mobility Concepts

Module: Mobility Concepts	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr. rer. nat. Christian Liebchen & Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 2	**Semester part time:**	**Duration:** 1
Hours per week per semester: 4.0	**Of which L/S/LW/P:** 2.0/2.0/0.0/0.0	**CP according to ECTS:** 5.0
Form of course: Elective	**Language:** English	**As of:** 2019-04-30
Recommended prior knowledge: Models and Methods for Engineering and Management		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	60.0
Pre- and post-course work:	29.0
Project:	59.0
Examinations:	2.0
Total:	150

Mobility Concepts

Lerning objectives	Anteil
Subject specific competences	
Knowledge • Knowledge of the relevant stakeholders in the transportations market • Knowledge of the relevant parameters for transportation systems, including shared mobility	30%
Skills • Ability to locate some particular transportation service in the general map of transportation services according to its relevant features • Combining the relevant data in order to set up a transportation model, including features for shared mobility	30%
Personal competences	
Social competence • Manage work tasks in working groups • Interacting with external partners	40%
Autonomy • Collecting the relevant information about transportation services • Collecting the relevant data to set up a transportation model (demand, network), including features for shared mobility • Distilling key facts of scientific studies and interpreting them	

Content:

1. Flavors of shared mobility on a scale between motorized individual traffic and public transport
2. How selected types of shared mobility emerge from the past towards future
3. Stakeholders in shared mobility (operators, authorities, users)
4. Commercial aspects of mobility
5. Quality aspects of mobility
6. Recent scientific studies regarding shared mobility
7. Selected methods for managing mobility
8. Aggregator companies to consolidate billing of users (optional)
9. Case study

Mobility Concepts

Examination format:
The actual examination procedures can be found in the examination plan, which is provided by the lecturer within the first two weeks of lectures. (100%)

Compulsory reading:
Recommended reading:
Matthias Finger and Maxime Audouin, "The Governance of Smart Transportation Systems", Springer, https://doi.org/10.1007/978-3-319-96526-0 Gereon Meyer and Susan Shaheen, "Disrupting Mobility", Springer, 2017, https://doi.org/10.1007/978-3-319-51602-8

Organisation of Transport Companies

Module: Organisation of Transport Companies	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr. rer. nat. Christian Liebchen & Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 2	**Semester part time:**	**Duration:** 1
Hours per week per semester: 4.0	**Of which L/S/LW/P:** 2.0/1.0/1.0/0.0	**CP according to ECTS:** 5.0
Form of course: Elective	**Language:** English	**As of:** 2019-04-30
Recommended prior knowledge: Models and Methods for Engineering and Management		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	60.0
Pre- and post-course work:	39.0
Project:	49.0
Examinations:	2.0
Total:	150

Organisation of Transport Companies

Lerning objectives	Anteil
Subject specific competences	
Knowledge • Know and understand selected basic theories relevant to the field of leadership, and practical applications and concepts used in organizations of all sizes • Know and understand the key responsibilities of entrepreneurs in transportation companies, and techniques to implement these within the company's organization	40%
Skills • Make use of selected quantitative decision making software tools	30%
Personal competences	
Social competence • The students are able to expediently communicate with others and reach goals together • The students make some personal experience during active exercises such as generation of ideas (creative techniques), decision making, and short role plays (occasionally)	30%
Autonomy • Autonomously search for material, critically analyze texts and achieve reasonable results.	

Content:

1. Responsibility in Transportation Companies (Financial, Safety, ECM)
2. Processes and Organisation (Safety, Service & Operations Planning, Qualification, Documentation, Flexibility)
3. Controlling (Finance, Resources, Market Division, Transparency, KPIs)
4. Leadership (Obligations, Motivation, Employees' Rights)
5. Selected Decision Making Tools and Techniques
6. Interfaces to typical External Partners

Examination format:

The actual examination procedures can be found in the examination plan, which is provided by the lecturer within the first two weeks of lectures. (100%)

Organisation of Transport Companies

Compulsory reading:
Recommended reading:
Dimitris Bertsimas and Robert Freund, "Data, Models, and Decisions", Dynamic Ideas, ISBN 978-0975914601 **Stippler, M.** (2011). *Leadership - approaches, developments, trends*. Gütersloh: Verl. Bertelsmann-Stiftung.

Product Lifecycle Management

Module: Product Lifecycle Management	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr. Marcus Ulrich Abramowski & Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 2	**Semester part time:**	**Duration:** 1
Hours per week per semester: 4.0	**Of which L/S/LW/P:** 2.0/2.0/0.0/0.0	**CP according to ECTS:** 5.0
Form of course: Elective	**Language:** English	**As of:** 2018-08-31
Recommended prior knowledge: Basics from Module “Models and Methods for Engineering and Management”		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	60.0
Pre- and post-course work:	40.0
Project:	40.0
Examinations:	10.0
Total:	150

Product Lifecycle Management

Lerning objectives	Anteil
Subject specific competences	
Knowledge • Methods for product developments can be reflected • Development of a target oriented ramp up stratey • Reflection of the relationship between complex product development projects, product data management and ERp-Systems • Deflect the complexity of the release strategy of configurable materials in the logistic chain	40%
Skills • Evaluate the use of PLM-System in different industry sectors • Operate in product lifecycle management projects • Define the strategy for configuration- release and change management • Implement PLM processes between CAD and ERP • Reflect the use of document management systems	40%
Personal competences	
Social competence • Integration in interdisciplinary teams • To manage work tasks in working groups • Moderation of decision meetings	20%
Autonomy • To develop internal project teams • Take responsibility for integrated technical and IT decisions • To analyze and evaluate learning and work processes • To design and optimize learning and work	

Product Lifecycle Management

Content:
1. Product development strategies 2. Management methods (=> Collaborative Engineering, Simultaneous Engineering) 3. Methods for product development and construction 4. Product lifecycle from the development until the “end of life” 5. Ramp up management 6. Product change management and release strategies 7. Configuration management 8. Product classification 9. Correlation between configuration- release and change management SAP Example with high product complexity 10. History of Product Data Management systems 11. Distinction CAD, DMU, Rapid Prototyping, PDM and PLM 12. PLM-Systems (Siemens / SAP) 13. Use of PLM-Systems 14. PLM system implementation 15. PLM in several Industries Food industry vs. discrete manufacturing

Examination format:
Written exam

Compulsory reading:
Stark, J. (2015). *Product Lifecycle Management, Volume 1. 21st Century Paradigm for Product Realisation*. Springer International Publishing. **Stark, J.** (2016). *Decision Engineering*. Springer International Publishing. **Saaksvouri, A.** (2018). *Product Lifecycle Management*. Springer. **Hirz, M.** (2013). *Integrated Computer-Aided Design in Automotive Development*. Springer. **Vila, C.** (2009). *Project-Based Collaborative Engineering Design and Manufacturing Learning with PLM Tools*. Springer.
Recommended reading:

Production Systems and Networks

Module: Production Systems and Networks	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr. Marcus Ulrich Abramowski & Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 2	**Semester part time:**	**Duration:** 1
Hours per week per semester: 4.0	**Of which L/S/LW/P:** 2.0/1.0/1.0/0.0	**CP according to ECTS:** 5.0
Form of course: Elective	**Language:** English	**As of:** 2019-04-30
Compulsory prior knowledge: Desirable Basics from Bachelor-Studies: Basics in Production, Logistics and Quality Management		
Recommended prior knowledge: Basics from Module “Models and Methods for Engineering and Management”		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	60.0
Pre- and post-course work:	80.0
Project:	0.0
Examinations:	10.0
Total:	150

Production Systems and Networks

Lerning objectives	Anteil
Subject specific competences	
Knowledge • Decision management in companies can be reflected; • Development of new concepts and processes regarding horizontal and vertical integration of companies • Decisions in site and structural matters of organisation networks • Deflect challenges in SCM-Systems • Understand modern management processes and the related management functions	40%
Skills • To manage and to solve complex problems in terms of virtual organisations • Define business objectives • Implement overall business processes (end to end) in IT-Systems • Working in comprehensive and complex projects	40%
Personal competences	
Social competence • To manage work tasks in working groups • To perform simple management tasks	20%
Autonomy • To develop overall project teams • Take responsibility for decisions and Groups • To analyze and evaluate learning and work processes • To design and optimize learning and work	

Production Systems and Networks

Content:
1. Basics From Taylorism to Virtiual Factories / Production Strategies / Lean Production 2. Planning for Manufacture and Assembly I 3. Planning for Manufacture and Assembly II 4. Flexibility, Modularity and Transformability of Production Systems 5. Production Networks 6. Strategic Network Planning 7. Supply Chain Collaboration 8. Added Value in Cooperative Networks 9. Controlling of Production Networks 10. Coordinated product & supply chain design 11. Innovation and Upgrading in Supply Chains 12. Global Available to Promise 13. Software solutions for Production Networks From EDI to SCM-Systems 14. Digital Plant Planning and Simulation

Examination format:
Written exam (60%) Project (40%)

Production Systems and Networks

Compulsory reading:
Ong, S. (2004). *Virtual and augmented reality applications in manufacturing*. London: Springer. **Smith, H. & Fingar, P.** (2007). *Business process management*. Tampa, Fla.: Meghan-Kiffer Press. **Hammer, M. & Champy, J.** (2004). *Reengineering the Corporation*. New York: HarperBusiness Essentials. **Walker, W.** (2005). *Supply chain architecture*. Boca Raton [u.a.]: CRC Press. **Davim, P.** (2018). *Progress in Lean Manufacturing*. Springer. **Kirchmer, M.** (1998). *Business process oriented implementation of standard software*. Berlin u.a.: Springer. **Vollmann, T.** (2004). *Manufacturing planning and control for supply chain management*. Boston, Mass. [u.a.]: McGraw-Hill. **Walter, M.** (2015). *Multi-Project Management with a Multi-Skilled Workforce*. Springer. **?no, T.** (1988). *Toyota production system*. Cambridge, MA: Productivity Press. **Schuh, G. & Millarg, K. & Göransson, Å.** (1998). *Virtuelle Fabrik*. München [u.a.]: Hanser. **Wiendahl, H. & Reichardt, J. & Nyhuis, P.** (2009). *Handbuch Fabrikplanung*. München [u.a.]: Hanser.
Recommended reading:

Supply Chain Management

Module: Supply Chain Management	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr.-Ing. Thorsten Brandes & Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 2	**Semester part time:**	**Duration:** 1
Hours per week per semester: 4.0	**Of which L/S/LW/P:** 2.0/2.0/0.0/0.0	**CP according to ECTS:** 5.0
Form of course: Elective	**Language:** English	**As of:** 2018-09-09
Recommended prior knowledge:		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	60.0
Pre- and post-course work:	30.0
Project:	58.0
Examinations:	2.0
Total:	150

Supply Chain Management

Lerning objectives	Anteil
Subject specific competences	
Knowledge • Overview of contemporary concepts related to SCM • IT applications and functions within the enterprise application architecture relevant for SCM purposes • Aquisition of basic knowledge for the use of SCM functionality within SAP ERP	20%
Skills • Ability to select SCM concepts appropriate to challenges in an enterprise environment • Ability to adapt and enhance SCM concepts according to business requirements • Understanding of systems dynamics in supply networks	60%
Personal competences	
Social competence • Ability to develop a road map for challenges given within a SCM context • Ability to deliver a significant contribution in team work • Ability to perceive individual agendas related o SCM projects	20%
Autonomy • Ability to develop a road map for challenges given within a SCM context	

Content:

1. SCM as a management concept vs. category of enterprise software
2. Subjects covered may include but are not restricted to: - Understanding of systems dynamics (e.g. by utilizing a management game) - Contemporary management concepts associated with SCM (MRP I, MRP II, VMI, SMI, CPFR, Pearl Chain, Postponement, Lean SCM etc.)
3. Subjects will be delivered by a combination of lectures and case studies; whenever possible the course will work on real life challenges from industry partners

Examination format:

Written exam

Supply Chain Management

Compulsory reading:
Depending on specifics of case studies or real life projects within the individual semester.
Recommended reading:

System Dynamics in Production and Logistics

Module: System Dynamics in Production and Logistics	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr.-Ing. Gaby Neumann & Prof. Dr.-Ing. Thomas Masurat	

Semester: 2	**Semester part time:**	**Duration:** 1
Hours per week per semester: 4.0	**Of which L/S/LW/P:** 2.0/2.0/0.0/0.0	**CP according to ECTS:** 5.0
Form of course: Elective	**Language:** English	**As of:** 2018-12-17
Recommended prior knowledge:		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	60.0
Pre- and post-course work:	28.0
Project:	60.0
Examinations:	2.0
Total:	150

Lerning objectives	**Anteil**
Subject specific competences	
Knowledge • understand the needs for networked/system thinking • understand chances and opportunities from scenario management	25%

System Dynamics in Production and Logistics

Skills • model, analyse, manage complex socio-economic systems • apply scenario management procedure, methods, tools for planning, managing and controlling implementation and launching of logistics systems • make decisions in complex situations • elaborate solid arguments to convince and motivate decision makers • select the proper partners and then plan and coordinate the project to implement the solution	50%
Personal competences	
Social competence • communicate conclusions, knowledge and final reasoning in front of specialist and non-specialist audiences clearly and unambiguously • work collaboratively in a group	25%
Autonomy • face a new problem under a scientific perspective • ability to learn enabling them to continue studying in a manner which is largely self-supervised or independent • integrate knowledge and face the complexity of making judgements from incomplete or limited information • reflect on the social and ethical responsibilities linked to the application of knowledge and judgements	

Content:

1. Introduction: System Thinking in Logistics and Supply Chain Management
2. Scenario Management
   - 2.1. Introduction
   - 2.2. Scenario techniques
     - 2.2.1. Basics
     - 2.2.2. Preparation
     - 2.2.3. Scenario field analysis
     - 2.2.4. Scenario prognostics
     - 2.2.5. Scenario development
     - 2.2.6. Information based for scenario development
     - 2.2.7. Transfer of scenarios

System Dynamics in Production and Logistics

3. System dynamics modelling and simulatio
   - 3.1. Introduction, terminology, motivation for complex system thinking
   - 3.2. Structure and behaviour of dynamic systems
   - 3.3. Modelling process
     - 3.3.1. Steps of the modelling process
     - 3.3.2. Formulating a dynamic hypothesis
     - 3.3.3. Formulating a simulation model
     - 3.3.4. Validation and model testing
     - 3.3.5. Policy design and evaluation
   - 3.4. Stocks and flows
     - 3.4.1. Causal loop diagrams
     - 3.4.2. Stocks, flows, and accumulation
     - 3.4.3. Dynamics of stocks and flows
   - 3.5. Dynamics of simple structures
     - 3.5.1. Path dependence and positive feedback
     - 3.5.2. Delays
     - 3.5.3. Co-flows and aging chains
   - 3.6. Modelling decision making, human behaviour, expectation formation
   - 3.7. Manufacturing and labour supply chains as dynamic systems

Examination format:
Presentation (15%) Project (30%) Project (30%) Presentation (25%)

Compulsory reading:
Recommended reading:
Sterman, J. (2000). *Business Dynamics. Systems Thinking and Modeling for a Complex World*. Mc Graw Hill Education.

Transportation Technologies

Module: Transportation Technologies	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 2	**Semester part time:**	**Duration:** 1
Hours per week per semester: 4.0	**Of which L/S/LW/P:** 2.0/2.0/0.0/0.0	**CP according to ECTS:** 5.0
Form of course: Elective	**Language:** English	**As of:** 2018-08-03
Compulsory prior knowledge: -		
Recommended prior knowledge: -		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	60.0
Pre- and post-course work:	30.0
Project:	56.0
Examinations:	4.0
Total:	150

Transportation Technologies

Lerning objectives	Anteil
Subject specific competences	
Knowledge • Knowledge of relevant engine technologies • Knowledge of emission calculation • Understand and calculate emissions in certain usage scenarios • Explain the role of different technologies in a worldwide context	30%
Skills • Describe, analyze and modify complex calculation schemes in a structured and directed manner • Perform the transfer of various methods to new fields of application. • Be able to direct the search for worldwide data sources and extract relevant information. • Be ablte to structure a complex new task, divide it into subtrasks and priorize these tasks.	50%
Personal competences	
Social competence • Be able to work in teams, organize team work and manage a project team • Be able to critically reflect and self-organize learning processes • Be able to communicate in a team work context and to present results	20%
Autonomy • Be able to analyze and work on complex topics autonomously. • Be able to speak freely about technical topics. • Be able to adopt and assess critically specialized, advanced knowledge.	

Transportation Technologies

Content:
1. Overview of engine technologies for cars, busses and trucks 1.1. Combustion engines 1.2. LNG engines 1.3. Hydrogen engines 1.4. Electric engines 2. Importance/dispersion of technologies, trends and future developments 2.1. Worldwide market situation 2.2. Trends related on engine technology 3. Emission situation 3.1. Analysis of product lifecycle 3.2. Emission analysis during driving situations 3.3. Production emissions 4. Case study - cep use cases

Examination format:
Presentation

Compulsory reading:
Rodrigue, J. & Comtois, C. & Slack, B. (2017). *The geography of transport systems*. London: Routledge.
Recommended reading:

Master's Colloquium

Module: Master's Colloquium	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 3	**Semester part time:**	**Duration:** 1
Hours per week per semester: 0.0	**Of which L/S/LW/P:** 0.0/0.0/0.0/0.0	**CP according to ECTS:** 6.0
Form of course: Compulsory	**Language:** English	**As of:** 2018-12-17
Compulsory prior knowledge: Master's thesis		
Recommended prior knowledge:		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	0.0
Pre- and post-course work:	0.0
Project:	179.0
Examinations:	1.0
Total:	180

Master's Colloquium

Lerning objectives	Anteil
Subject specific competences	
Knowledge • Students can • - identify and present the main contents and results of their master thesis. • - apply technical and methodological knowledge to explain or justify their work.	20%
Skills • Students can • - prepare the essential contents and results of their master thesis in a structured, comprehensible and descriptive way in the form of a presentation. • - design the scope of the presentation according to the specified time fund.	40%
Personal competences	
Social competence • Students can • - present the essential contents and results of their master thesis in a focused, comprehensible and understandable manner. • - answer specialist questions about your master's thesis and its methodological environment in a factual manner. • - discuss factual contexts.	40%
Autonomy • Students can • - critically reflect on their work, their approach and their results.	

Content:
1. Contents, procedure, results, findings of the master thesis

Examination format:
Oral exam (100%) Additional rules: 15 minutes presentation, 30 minutes questions and discussion

Master's Colloquium

Compulsory reading:
Recommended reading:

Master's Thesis

Module: Master's Thesis	
Degree programme: Technical Management	**Degree:** Master of Engineering
Responsible for the module: Prof. Dr. rer. pol. Jens Wollenweber	

Semester: 3	**Semester part time:**	**Duration:** 1
Hours per week per semester: 0.0	**Of which L/S/LW/P:** 0.0/0.0/0.0/0.0	**CP according to ECTS:** 24.0
Form of course: Compulsory	**Language:** English	**As of:** 2018-12-17
Recommended prior knowledge:		
Recognition of external relevant qualification/experience:		
Special regulations:		

Workload distribution	**Hours:**
In class:	0.0
Pre- and post-course work:	0.0
Project:	720.0
Examinations:	0.0
Total:	720

Lerning objectives	**Anteil**
Subject specific competences	
Knowledge	20%

Master's Thesis

Skills • Students can conduct scientific work in accordance with established scientific standards.	60%
Personal competences	
Social competence • Students are empowered to indenpendently work on a conrete problem, which as far as possible corresponds to their personal interest, and develop their own solutions. The offered and chosen topics should reflect on current problems and focus on practical applications.	20%
Autonomy • Students will work on their master's thesis for a restricted time period of 20 weeks during their third semester. The master's thesis is part of the academic record. Students demonstrate their ability to independently work on a specific problem within their fields of study according to established scientific standards.	

Content:
1. Tasks, problems and actions in science and practice

Examination format:
Paper (100%)

Compulsory reading:
Recommended reading: