

Module Manual

Bachelor of Science (B.Sc.)

Engineering and Management - Major in Logistics and Mobility Dual study program

Cohort: Winter Term 2023

Updated: 20th April 2023

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Program description

Content

Economic development with its rapid change in products and processes has also led, among other things, to a considerable restructuring of the intercompany division of labor. Today, this division of labor is characterized by cross-company value chains in which complex production processes have to be planned, sustainably designed and controlled. Logistics and its basic functions, transport, handling and warehousing, play a central role in this. Mobility is understood in the sense of social participation and opportunities for movement. Successful, socially and ecologically compatible economic activity under such conditions is made possible by the interaction of innovative technical systems, information and communication technologies, and management strategies.

The bachelor's degree program "Engineering and Management - Major in Logistics and Mobility" prepares graduates for professional activities in this interdisciplinary field. Extensive, interdisciplinary basic knowledge from the natural and engineering sciences and from business administration is taught. The effects on society as a whole are always included. By working on a wide range of tasks from various application areas of logistics and mobility, students also learn how to deal with specific issues, thus acquiring a meaningful mix of practical and scientific skills.

In addition to the foundational curriculum taught at TUHH, seminars on developing personal skills are integrated into the dual study programme, in the context of transfer between theory and practice. These seminars correspond to the modern professional requirements expected of an engineer, as well as promoting the link between the two places of learning.

The intensive dual courses at TUHH integrating practical experience consist of an academic-oriented and a practice-oriented element, which are completed at two places of learning. The academic-oriented element comprises study at TUHH. The practice-oriented element is coordinated with the study programme in terms of content and time, and consists of practical modules and phases spent in an affiliate company during periods when there are no lectures.

Career prospects

Graduates of the program can enter directly into professions in the field of logistics or transportation planning. The degree program prepares them for independent and joint activities in responsible positions.

Possible employers include, for example, companies in the logistics sector, trading companies, manufacturing companies, engineering and planning offices, transport companies, construction companies, infrastructure operators and the public sector.

At Hamburg University of Technology, graduates have the opportunity, among other things, to follow the bachelor's degree program in "Engineering and Management - Major in Logistics and Mobility" with a master's degree in "Logistics, Infrastructure, and Mobility" or in "International Management and Engineering".

In addition, students acquire basic professional and personal skills as part of the dual study programme that enable them to enter professional practice at an early stage and to go on to further study. Students also gain practical work experience through the integrated practical modules. Graduates of the dual course have broad foundational knowledge, fundamental skills for academic work and relevant personal competences.

Learning target

The bachelor's degree program in "Engineering and Management - Major in Logistics and Mobility" prepares students both for a professional career and for a relevant master's degree program. The basic methodological knowledge required for this is acquired during the course of study. The learning outcomes of the program are achieved through an interplay of basic and advanced modules from the fields of logistics, engineering and business administration and can be specialized in one of three specializations. The learning objectives are divided below into the categories of knowledge, skills, social competence and independence.

Knowledge

Knowledge is constituted by facts, principles and theories and is acquired in the Bachelor's program "Engineering and Management - Major in Logistics and Mobility" in the following areas:

- 1. Graduates are able to explain the basic methods, procedures and interrelationships of engineering sciences, in particular mathematics, engineering mechanics and computer science.
- 2. Graduates will be able to explain the basic methods, procedures and interrelationships of economics, business administration and management.
- 3. Graduates will be able to explain the methods, procedures and interrelationships of logistics and transportation planning and provide an overview of their subject and the interrelationships between the sub-disciplines of logistics.
- 4. Graduates are able to place their subject in the overall societal, social and economic context.

Skills

The ability to apply acquired knowledge in order to solve specific problems is supported in many ways in the degree program "Engineering and Management - Major in Logistics and Mobility":

- 1. Graduates are able to solve technical problems, as well as design new technical systems of logistics and transportation systems.
- 2. Graduates are able to evaluate technical systems of logistics and transport systems economically and ecologically.
- 3. Graduates are able to analyze, plan, design and control the flow systems (goods, people, information, money) necessary for the production of goods or the provision of services and to apply their theoretical knowledge in practical problems. Due to their holistic and analytical thinking, graduates are also able to penetrate and optimize networked processes.

Social competence

Social competence comprises the individual ability and willingness to work together with others in a goal-oriented manner, to understand the interests of others, to communicate and to help shape the working and living environment.

- 1. Graduates can integrate themselves into professionally homogeneous teams, organize themselves in these teams, take on specific subtasks and reflect on their own contribution.
- 2. Graduates are able to integrate themselves into heterogeneous teams, to organize themselves in these teams, to take on specific subtasks and to reflect on their own contribution.
- 3. Graduates are able to communicate about the contents of logistics and mobility as well as the results of their own work in an appropriate manner with both experts and laypersons.
- 4. Graduates are able to classify the social and ecological effects of logistics and transport systems on society and the environment.

Self-reliance

Personal competencies include not only the competence to act independently, but also the system and solution competencies to represent general problems as specific sub-problems as well as the selection and mastery of suitable methods and procedures for problem solving.

- 1. Graduates are able to realistically assess their competencies and work on deficits independently.
- 2. Graduates have the ability to formulate their findings precisely in writing and orally.
- 3. Graduates are able to independently work on sub-projects in more complex logistics and transport planning projects on the basis of the knowledge and skills they have acquired during their studies.
- 4. Graduates can reliably apply methods of scientific work and are thus also qualified to work in research or to deepen their competencies in a more

advanced course of study.

By continually switching places of learnings throughout the dual study programme, it is possible for theory and practice to be interlinked. Students reflect theoretically on their individual professional practical experience, and apply the results of their reflection to new forms of practice. They also test theoretical elements of the course in a practical setting, and use their findings as a stimulus for theoretical debate.

Program structure

The curriculum of the Bachelor's degree program "Engineering and Management - Major in Logistics and Mobility" is structured as follows:

- Core qualification, 24 compulsory modules, 3 compulsory elective modules, 162 LP, 1st-5th semester.
- Consolidation, 3 compulsory modules, 3 compulsory elective modules, 36 LP, 4th semester onwards
- Bachelor thesis, 12 LP, 6th semester

This results in a total of 210 LP.

In the core qualification, students are taught the fundamentals of mathematics, engineering, business administration, logistics and mobility, primarily in the first four semesters. In addition, there is a compulsory elective module in applied business administration, a freely selectable technical and a freely selectable non-technical supplementary module. A student research project in the fifth semester prepares students for their final thesis.

Starting in the 4th semester, students choose one of the three specializations:

- · Transport planning and systems
- Production management and processes
- Information Technology

A specialization consists of three compulsory modules and three elective modules.

The fifth semester is kept as free as possible due to the high number of elective modules. This makes it possible to complete the fifth semester abroad.

The sixth semester is devoted to writing the bachelor's thesis.

The structural model of the dual study programme follows a module-differentiating approach. Given the practice-oriented element, the curriculum of the dual study programme is different compared to a standard Bachelor's course. Five practical modules are completed at the dual students' partner company as part of corresponding practical terms during lecture-free periods

Core Qualification

Students gain basic knowledge as well as deepend skills in mathematics and business administration.

	dations of Management	22255 44		
Courses				
Title		Typ	Hrs/wk	СР
Management Tutorial (L0882) Introduction to Management (L088	0)	Recitation Section (small) Lecture	2 3	3
Module Responsible				-
Admission Requirements	None			
Recommended Previous	Basic Knowledge of Mathematics and Business			
Knowledge				
Educational Objectives	After taking part successfully, students have reac	hed the following learning results		
Professional Competence				
Knowieage	After taking this module, students know the impo and Organisation to Marketing and Innovation, an	•	_	_
	 explain the relevance of planning and duncertainty, and explain some basic method 	agement d goals in Management and name the most ctions as production, procurement and so ement, information management, innovation lecision making in Business, esp. in situal ds from mathematical Finance	important aspe ourcing, supply management ar	ects of entreprneurial chain management, nd marketing
Skills	 state basics from accounting and costing a Students are able to analyse business units with out an Entrepreneurship project in a team. In part 	respect to different criteria (organization, ob	jectives, strateg	ies etc.) and to carry
	 analyse Management goals and structure t analyse organisational and staff structures apply methods for decision making under r analyse production and procurement syste analyse and apply basic methods of marke select and apply basic methods from math apply basic methods from accounting, cost 	of companies nultiple objectives, under uncertainty and ur ms and Business information systems ting ematical finance to predefined problems	der risk	
Personal Competence				
Social Competence	Students are able to			
	work successfully in a team of students to apply their knowledge from the lecture t to communicate appropriately and to cooperate respectfully with their fellow s		herent report or	n the project
Autonomy	Students are able to			
	work in a team and to organize the team th to write a report on their project.	nemselves		
	Independent Study Time 110, Study Time in Lectu	ire 70		
Credit points Course achievement				
	Subject theoretical and practical work			
	several written exams during the semester			
scale	-			
Assignment for the	General Engineering Science (German program, 7			
Following Curricula		, ,		
	Civil- and Environmental Engineering: Specialisati	·	sory	
	Civil- and Environmental Engineering: Specialisati Bioprocess Engineering: Core Qualification: Comp			
	Computer Science: Core Qualification: Compulsor	•		
	Data Science: Core Qualification: Compulsory			
	Electrical Engineering: Core Qualification: Compul	sory		
	Computer Science in Engineering: Core Qualification			
	Integrated Building Technology: Core Qualification	• •		
	Logistics and Mobility: Core Qualification: Compul Mechanical Engineering: Core Qualification: Comp	•		
	Mechatronics: Specialisation Naval Engineering: C			
	Mechatronics: Specialisation Electrical Systems: C			
	Mechatronics: Specialisation Dynamic Systems ar			
	Mechatronics: Core Qualification: Compulsory			
	Mechatronics: Specialisation Robot- and Machine-	Systems: Compulsory		

Mechatronics: Specialisation Medical Engineering: Compulsory
Orientation Studies: Core Qualification: Elective Compulsory
Orientation Studies: Core Qualification: Elective Compulsory
Naval Architecture: Core Qualification: Compulsory
Technomathematics: Core Qualification: Compulsory
Process Engineering: Core Qualification: Compulsory
Engineering and Management - Major in Logistics and Mobility: Core Qualification: Compulsory

Course L08	382: Management Tutorial
Тур	Recitation Section (small)
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Christoph Ihl, Katharina Roedelius
Language	DE
Cycle	WiSe/SoSe
Content	In the management tutorial, the contents of the lecture will be deepened by practical examples and the application of the discussed tools. If there is adequate demand, a problem-oriented tutorial will be offered in parallel, which students can choose alternatively. Here, students work in groups on s selected projects that focus on the elaboration of an innovative business idea from the point of view of an established company or a startup. Again, the busin knowledge from the lecture should come to practical use. The group projects are guided by a mentor.
Literature	Relevante Literatur aus der korrespondierenden Vorlesung.

Course L0880: Introduction t	o Management	
Тур	Lecture	
Hrs/wk	3	
СР	3	
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42	
Lecturer	Prof. Christoph Ihl, Prof. Christian Lüthje, Prof. Christian Ringle, Prof. Cornelius Herstatt, Prof. Kathrin Fischer, Prof. Matthias Meyer,	
	Prof. Thomas Wrona, Prof. Thorsten Blecker, Prof. Wolfgang Kersten	
Language	DE	
Cycle	WiSe/SoSe	
Content	Introduction to Business and Management, Business versus Economics, relevant areas in Business and Management	
	Important definitions from Management,	
	Developing Objectives for Business, and their relation to important Business functions	
	Business Functions: Functions of the Value Chain, e.g. Production and Procurement, Supply Chain Management, Innovation	
	Management, Marketing and Sales	
	Cross-sectional Functions, e.g. Organisation, Human Ressource Management, Supply Chain Management, Information Management	
	Definitions as information, information systems, aspects of data security and strategic information systems	
	Definition and Relevance of innovations, e.g. innovation opporunities, risks etc.	
	Relevance of marketing, B2B vs. B2C-Marketing	
	different techniques from the field of marketing (e.g. scenario technique), pricing strategies	
	important organizational structures	
	basics of human ressource management	
	 Introduction to Business Planning and the steps of a planning process 	
	Decision Analysis: Elements of decision problems and methods for solving decision problems	
	Selected Planning Tasks, e.g. Investment and Financial Decisions	
	Introduction to Accounting: Accounting, Balance-Sheets, Costing	
	Relevance of Controlling and selected Controlling methods	
	Important aspects of Entrepreneurship projects	
Literature	Bamberg, G., Coenenberg, A.: Betriebswirtschaftliche Entscheidungslehre, 14. Aufl., München 2008	
	Eisenführ, F., Weber, M.: Rationales Entscheiden, 4. Aufl., Berlin et al. 2003	
	Heinhold, M.: Buchführung in Fallbeispielen, 10. Aufl., Stuttgart 2006.	
	Kruschwitz, L.: Finanzmathematik. 3. Auflage, München 2001.	
	Pellens, B., Fülbier, R. U., Gassen, J., Sellhorn, T.: Internationale Rechnungslegung, 7. Aufl., Stuttgart 2008.	
	Schweitzer, M.: Planung und Steuerung, in: Bea/Friedl/Schweitzer: Allgemeine Betriebswirtschaftslehre, Bd. 2: Führung, 9. Aufl., Stuttgart 2005.	
	Weber, J., Schäffer, U.: Einführung in das Controlling, 12. Auflage, Stuttgart 2008.	
	Weber, J./Weißenberger, B.: Einführung in das Rechnungswesen, 7. Auflage, Stuttgart 2006.	

Module M0850: Math	ematics I			
Courses				
Title Mathematics I (L2970) Mathematics I (L2971)		Typ Lecture Recitation Section (large)	Hrs/wk 4 2	CP 4 2
Mathematics I (L2972)		Recitation Section (large)	2	2
Module Responsible	Prof. Anusch Taraz			
Admission Requirements				
Recommended Previous Knowledge				
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence				
Knowledge Skills	 Students can name the basic concepts in anal examples. Students can discuss logical connections betwee the help of examples. They know proof strategies and can reproduce 	een these concepts. They are capable		
Skiiis	 Students can model problems in analysis and I they are capable of solving them by applying e Students are able to discover and verify further For a given problem, the students can develor results. 	stablished methods. logical connections between the conce	ots studied in the	course.
Personal Competence Social Competence				
Autonomy	 Students are capable of checking their underst precisely and know where to get help in solving Students have developed sufficient persistenc problems. 	them.		
Workload in Hours	Independent Study Time 128, Study Time in Lecture 1	12		
Credit points				
Course achievement		scription		
	Yes 10 % Excercises			
Examination	Written exam			<u>-</u>
Examination duration and scale	120 min			
Assignment for the				
Following Curricula		, -		
	Bioprocess Engineering: Core Qualification: Compulsor			
	Chemical and Bioprocess Engineering: Core Qualification: Core			
	Digital Mechanical Engineering: Core Qualification: Co Electrical Engineering: Core Qualification: Compulsory			
	Green Technologies: Energy, Water, Climate: Core Qua			
	Computer Science in Engineering: Core Qualification:	• •		
	Integrated Building Technology: Core Qualification: Co	• •		
	Logistics and Mobility: Core Qualification: Compulsory	• •		
	Mechanical Engineering: Core Qualification: Compulso			
	Mechatronics: Core Qualification: Compulsory			
	Orientation Studies: Core Qualification: Elective Comp	ulsory		
	Naval Architecture: Core Qualification: Compulsory			
	Process Engineering: Core Qualification: Compulsory	Machilles Core Oscalification Co.		
	Engineering and Management - Major in Logistics and	Mobility: Core Qualification: Compulsory	1	

Course L2970: Mathematics	
Тур	Lecture
Hrs/wk	4
СР	4
Workload in Hours	Independent Study Time 64, Study Time in Lecture 56
Lecturer	Prof. Anusch Taraz
Language	DE
Cycle	WiSe
Content	Mathematical Foundations:
	sets, statements, induction, mappings, trigonometry
	Analysis: Foundations of differential calculus in one variable
	natural and real numbers
	convergence of sequences and series
	continuous and differentiable functions
	mean value theorems
	Taylor series
	• calculus
	error analysis
	fixpoint iteration
	Linear Algebra: Foundations of linear algebra in R ⁿ
	 vectors: rules, linear combinations, inner and cross product, lines and planes
	• systems of linear equations: Gauß elimination, linear mappings, matrix multiplication, inverse matrices, determinants
	 orthogonal projection in R^n, Gram-Schmidt-Orthonormalization
Literature	
Literature	• T. Arens u.a. : Mathematik, Springer Spektrum, Heidelberg 2015
	W. Mackens, H. Voß: Mathematik I für Studierende der Ingenieurwissenschaften, HECO-Verlag, Alsdorf 1994
	 W. Mackens, H. Voß: Aufgaben und Lösungen zur Mathematik I für Studierende der Ingenieurwissenschaften, HECO-Verlag, Alsdorf 1994
	G. Strang: Lineare Algebra, Springer-Verlag, 2003
	G. und S. Teschl: Mathematik für Informatiker, Band 1, Springer-Verlag, 2013

Course L2971: Mathematics	I
Тур	Recitation Section (large)
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Anusch Taraz, Dr. Dennis Clemens, Dr. Simon Campese
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L2972: Mathematics	I
Тур	Recitation Section (small)
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Anusch Taraz
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M1802: Engin	eering Mechanics I (Stereostatics)			
Courses				
Title		Тур	Hrs/wk	СР
Engineering Mechanics I (Statics) (I	L1001)	Lecture	2	3
Engineering Mechanics I (Statics) (I	L1003)	Recitation Section (large)	1	1
Engineering Mechanics I (Statics) (I	L1002)	Recitation Section (small)	2	2
Module Responsible	Prof. Benedikt Kriegesmann			
Admission Requirements	None			
Recommended Previous	Solid school knowledge in mathematics and physics.			
Knowledge				
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence				
Knowledge	The students can			
	describe the axiomatic procedure used in med	nanical contexts;		
	explain important steps in model design;			
	 present technical knowledge in stereostatics. 			
Skills	The students can			
	 explain the important elements of mathemati 	cal / mechanical analysis and model forn	nation, and appl	v it to the context of
	their own problems;	cui, , inceriameur analysis ana model iom	ideion, dira appi	y it to the context of
	apply basic statical methods to engineering pr	ohlems:		
	estimate the reach and boundaries of statical		le to wider probl	em sets
	- estimate the reach and boundaries of statical	methods and extend them to be applicab	ic to wider probi	cm sees.
Personal Competence				
Social Competence	The students can work in groups and support each of	ther to overcome difficulties.		
Autonomy	Students are capable of determining their own streng	gths and weaknesses and to organize thei	r time and learn	ing based on those.
Workload in Hours	Independent Study Time 110, Study Time in Lecture	70		
Credit points	6			
Course achievement	None			
Examination	Written exam			
Examination duration and	90 min			
scale				
Assignment for the	General Engineering Science (German program, 7 se	mester): Core Qualification: Compulsory		
Following Curricula	Civil- and Environmental Engineering: Core Qualificat	ion: Compulsory		
	Bioprocess Engineering: Core Qualification: Compulso	ory		
	Chemical and Bioprocess Engineering: Core Qualifica	tion: Compulsory		
	Data Science: Specialisation II. Application: Elective (Compulsory		
	Electrical Engineering: Core Qualification: Elective Co	mpulsory		
	Green Technologies: Energy, Water, Climate: Core Qu	ualification: Compulsory		
	Computer Science in Engineering: Specialisation II. M	athematics & Engineering Science: Electi	ve Compulsory	
	Integrated Building Technology: Core Qualification: C	ompulsory		
	Mechanical Engineering: Core Qualification: Compuls	ory		
	Mechatronics: Core Qualification: Compulsory			
	Orientation Studies: Core Qualification: Elective Com	pulsory		
	Naval Architecture: Core Qualification: Compulsory			
	Process Engineering: Core Qualification: Compulsory			
	Engineering and Management - Major in Logistics and	d Mobility: Core Qualification: Compulsory		

Course L1001: Engineering Mechanics I (Statics)		
Тур	Lecture	
Hrs/wk	2	
СР	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Prof. Benedikt Kriegesmann	
Language	DE	
Cycle	WiSe	
Content	 Tasks in Mechanics Modelling and model elements Vector calculus for forces and torques Forces and equilibrium in space Constraints and reactions, characterization of constraint systems Planar and spatial truss structures Internal forces and moments for beams and frames Center of mass, volumn, area and line Computation of center of mass by intergals, joint bodies Friction (sliding and sticking) Friction of ropes 	
Literature	K. Magnus, H.H. Müller-Slany: Grundlagen der Technischen Mechanik. 7. Auflage, Teubner (2009).	
	D. Gross, W. Hauger, J. Schröder, W. Wall: Technische Mechanik 1. 11. Auflage, Springer (2011).	

Course L1003: Engineering M	fechanics I (Statics)
Тур	Recitation Section (large)
Hrs/wk	1
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Benedikt Kriegesmann
Language	DE
Cycle	WiSe
Content	Forces and equilibrium
	Constraints and reactions
	Frames
	Center of mass
	Friction
	Internal forces and moments for beams
Literature	K. Magnus, H.H. Müller-Slany: Grundlagen der Technischen Mechanik. 7. Auflage, Teubner (2009).
	D. Gross, W. Hauger, J. Schröder, W. Wall: Technische Mechanik 1. 11. Auflage, Springer (2011).

Course L1002: Engineering N	lechanics I (Statics)
Тур	Recitation Section (small)
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Benedikt Kriegesmann
Language	DE
Cycle	WiSe
Content	Forces and equilibrium
	Constraints and reactions
	Frames
	Center of mass
	Friction
	Internal forces and moments for beams
Literature	K. Magnus, H.H. Müller-Slany: Grundlagen der Technischen Mechanik. 7. Auflage, Teubner (2009).
	D. Gross, W. Hauger, J. Schröder, W. Wall: Technische Mechanik 1. 11. Auflage, Springer (2011).

MODIFICA					
Module M1918: Introd	duction to Logis	tics and Mobility			
Courses					
Title			Тур	Hrs/wk	СР
Introduction to Scientific Work (L04			Lecture	1	2
Freight Traffic and Logistics (L0390			Lecture Project-/problem-based Le	2 earning 2	2
Freight Traffic and Logistics (L0391	ſ		Froject-/problem-based Le	earriing 2	2
Module Responsible					
Admission Requirements Recommended Previous	None				
Knowledge	none				
	After taking part succe	essfully students have reache	d the following learning results		
Professional Competence	Arter taking part succe	salary, students have reache	d the following learning results		
•	Students can				
Knowieuge	Students can				
	 describe the his 	torical development of logistic	CS .		
		functions of logistics			
			concepts, mobility management and	systems analysis	
			d traffic and spatial development		
	estimate the er	vironmental impact of logistic	al decisions		
Skills	Students can				
		cepts and methods of logistics	•		
			ive logistics concepts to improve the	sustainability of c	ompanies
	 solve problems 	systematically			
Barranal Commistance					
Personal Competence Social Competence	Students can				
30ciai competence	Students can				
	 collaborate in g 	roups to reach and record wor	k outcomes		
	 give appropriat 	e feedback and deal construct	ively with feedback on their work		
Autonomy	Students can				
		n learning progress	and and a second stands are a second second		
			ependently and cite them properly	ant	
	_	work independently	lently in terms of both time and conto	ziii.	
	• produce writter	work independently			
Workload in Hours	Independent Study Tir	ne 110, Study Time in Lecture	70		
Credit points	6				
Course achievement	Compulsory Bonus	Form	Description		
	Yes 2.5 %	Written elaboration			
	Yes 2.5 %	Presentation			
	Yes 2.5 %	Excercises			
	Yes 2.5 %	Written elaboration			
	Written exam				
			ch: Excerpt (1 page), homework in	group (approx. 2	20 pages), presentation
			on in JiTT-questions (10 weeks)		
Assignment for the	Engineering and Mana	gement - Major in Logistics an	d Mobility: Core Qualification: Compu	ulsory	
Following Curricula					

Course L0474: Introduction to	o Scientific Work
Тур	Lecture
Hrs/wk	1
СР	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Dr. Meike Schröder
Language	DE
Cycle	WiSe
Content	 Introduction to research and science Finding a topic Literature review (finding, organizing and analyzing literature, databanks) Correct citing (adequate behavior with regard to literature, plagiarism, citation types, citation programs) Structuring a scientific work (organizing material, research questions, exposée, arguments, structure) Formating and layout (grouping, foot notes, formating in word) Writing of an excerpt for the term paper and written exam Discussing possible questions of the exam
Literature	 Beinke, Christiane; Brinkschulte, Melanie; Bunn, Lothar; Thürmer, Stefan (2011): Die Seminararbeit. Schreiben für den Leser. 2., völlig überarb. Aufl. Konstanz: UVK-Verlagsgesellschaft. Bitterlich, Axal; Bünting, Karl-Dieter; Pospiech, Ulrike (2007): Schreiben im Studium: mit Erfolg. Ein Leitfaden. 7. Aufl. Berlin: Cornelsen Scriptor. Boeglin, Martha (2011): Wissenschaftlich arbeiten Schritt für Schritt. Gelassen und effektiv studieren. 2., Aufl. Paderborn, Paderborn: UTB; Fink, Wilhelm. Brink, Alfred (2013): Anfertigung wissenschaftlicher Arbeiten. Wiesbaden: Springer Fachmedien Wiesbaden. Hirsch-Weber, Andreas; Scherer, Stefan (2016): Wissenschaftliches Schreiben und Abschlussarbeit in Naturwissenschaften und Ingenieurwissenschaften. Grundlagen - Praxisbeispiele - Übungen. Stuttgart: Verlag Eugen Ulmer. Kollmann, Tobias; Kuckertz, Andreas; Stöckmann, Christoph (2016): Das 1 x 1 des Wissenschaftlichen Arbeitens. Wiesbaden: Springer Fachmedien Wiesbaden. Niederhauser, Jürg (2015): Die schriftliche Arbeit kompakt. Von der Ideenfindung bis zur fertigen Arbeit. Für Schule, Hochschule und Universität. 2., aktualisierte und überarb. Aufl. Berlin: Dudenverlag. Oehlrich, Marcus (2015): Wissenschaftliches Arbeiten und Schreiben. Berlin, Heidelberg: Springer Berlin Heidelberg. Rost, Friedrich (2012): Lern- und Arbeitstechniken für das Studium. Wiesbaden: VS Verlag für Sozialwissenschaften. Sesink, Werner (2012): Einführung in das wissenschaftliche Arbeiten. Inklusive E-Learning, Web-Recherche, digitale Präsentation u.a. 9., aktualisierte Aufl. München: Oldenbourg. Sommer, Roy (2006): Schreibkompetenzen. Erfolgreich wissenschaftlich schreiben. Stuttgart: Klett Lernen und Wissen. Spoun, Sascha (2011): Erfolgreich studieren. 2., aktualisierte Aufl. München: Pearson Studium. Theisen, Manuel René (2013): Wissenschaftliches Arbeiten: Erfolgreich bei Bachelor- und Masterarbeit. 16., vollständig überarbeitete Auf

Course L0390: Freight Traffic	and Logistics
Тур	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	The course gives an introductory overview of the basics of supply chain management and logistics and their interaction with
	freight traffic and thus the significance of traffic planning for business activities. In addition, examples of ecologically and
	economically sustainable best practice are discussed. The following subject areas are covered:
	Historical development of logistics
	Systemic thinking in logistics
	Concepts, trends and strategies in the field of
	Procurement logistics
	Production logistics
	Distribution logistics
	Reverse logistics
	Storage logistics
	Transport logistics
	Handling logistics
	Basics of the connection between logistical decisions and traffic
	Introduction to traffic policy
	Scope for design of (sustainable) freight traffic and logistics
	The course contents will be consolidated by means of online surveys, Wiki entries by students and special practice sessions and
	illustrated by means of excursions.
Literature	ARNOLD, D., ISERMANN, H., KUHN, A., TEMPELMEIER, H. (Hrsg.) (2008): Handbuch Logistik. Berlin, Heidelberg, Springer-Verlag
	Berlin 3. neu bearb. Auflage.
	IHDE, G. B. (2001): Transport, Verkehr, Logistik, Gesamtwirtschafliche Aspekte und einzelwirtschaftliche Handhabung. München,
	Verlag Franz Vahlen, 3. völlig überarbeitete und erweiterte Auflage.
	PFOHL, HC. (2010): Logistiksysteme - Betriebswirtschaftliche Grundlagen. Berlin, Heidelberg, New York, Springer-Verlag, 8. neu
	bearb. Und aktualisierte Auflage.

Course L0391: Freight Traffic	c and Logistics
Тур	Project-/problem-based Learning
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M1755: Linkir	ng theory and practice (dual study program, Bachelor's degree)
Module Responsible	Dr. Henning Haschke
Admission Requirements	None
Recommended Previous	none
Knowledge	
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Dual students
	can describe and classify selected classic and modern theories, concepts and methods
	related to self-management, and organising work and learning
	self-competence and
	social skills
	and apply them to specific situations, projects and plans in a personal and professional context.
Skills	Dual students
	 anticipate typical difficulties, positive and negative effects, as well as success and failure factors in the engineering sector, evaluate them and consider promising strategies and courses of action.
Personal Competence	
Social Competence	Dual students
	 work together in a problem-oriented and interdisciplinary manner as part of expert and work teams. are able to assemble and lead working groups. present complex, subject-related solutions to problems to experts and stakeholders and can develop these further
	together.
Autonomy	Dual students
	 define, reflect and evaluate goals for learning and work processes. design their learning and work processes independently and sustainably at the university and company. take responsibility for their learning and work processes. are able to consciously think through their ideas or actions and relate them to their self-image to develop conclusions for future action based on this.
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84
Credit points	6
Course achievement	None
Examination	Written elaboration
Examination duration and scale	Studienbegleitende und semesterübergreifende Dokumentation: Die Leistungspunkte für das Modul werden durch die Anfertigung eines digitalen Lern- und Entwicklungsberichtes (E-Portfolio) erworben. Dabei handelt es sich um eine fortlaufende Dokumentation
564.6	und Reflexion der Lernerfahrungen und der Kompetenzentwicklung im Bereich der Personalen Kompetenz.

Тур	Seminar
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Henning Haschke, Heiko Sieben
Language	DE
Cycle	WiSe/SoSe
Content	 Key qualifications for professional success Personality and self-image Personality profiles Emotional competence Needs structure models Motivation theories and models Communication basics, communication problems Conflict management Constructive communication and language cultures Resilience Transfer skills and (self-)reflection Intercultural competence and business etiquette Documenting and reflecting on learning experiences
Litoraturo	Seminarapparat

Course L2884: Self-Managem	nent, Organising Work and Learning in Engineering (for Dual Study Program)
Тур	Seminar
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Henning Haschke, Heiko Sieben
Language	DE
Cycle	WiSe/SoSe
Content	 Learning to learn Instruments and methods for time and self-management Personality and work style/behaviour (DISC model); inner drivers/motivation Goal setting and planning techniques (SMART, GROW); for short-, medium- and long-term planning Creativity techniques Stress management, resilience (Self-)reflection throughout the learning and work process Structuring/connecting learning and work processes within different learning environments Factors influencing learning transfer/transfer skills Documenting and reflecting on learning experiences
Literature	Seminarapparat

Course L2886: Social-Compe	tence: Team Development and Communication in Engineering (for Dual Study Program)
Тур	Seminar
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Henning Haschke, Heiko Sieben
Language	DE
Cycle	WiSe/SoSe
Content	 Forms, conditions and processes of working groups and leadership relationships Social skills: theories and models Communication and discussion techniques Empathy and motivation in teamwork, the way teams work Critical ability Team development: ways of developing working and project groups Insights into day-to-day leadership: theories and models, leadership tasks, leadership styles, situational leadership, basics of change management Documenting and reflecting on learning experiences
Literature	Seminarapparat

Module M1750: Pract	ical module 1 (dual study program, Bachelor's degree)
Courses	
Title	Typ Hrs/wk CP
Practical term 1 (dual study progra	m, Bachelor's degree) (L2879) 0 6
Module Responsible	Dr. Henning Haschke
Admission Requirements	None
Recommended Previous	A: Self-management, organising work and learning in engineering (for dual study program)
Knowledge	
	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Dual students
	 describe their employer's organisation (company) and the associated regulations that relate to how tasks competences are distributed, as well as how work processes are handled. understand the structure and objectives of the dual study programme and the increasing requirements throughout course of study.
Skills	Dual students
	 use equipment and resources professionally in accordance with the assigned work areas and tasks, and desc operational processes and procedures with regard to the intended work results/objectives. implement the university's application recommendations in relation to their current tasks.
Personal Competence	
Social Competence	Dual students
	 have familiarised themselves with their new working environment (learning environment) and the associatasks/processes/working relationships. know their central points of contact and company colleagues, and exchange ideas with them constructively. coordinate work tasks with their professional supervisor and ask for support as needed. help shape the work in the assigned work area and offer their colleagues support to complete their work. work together with others in smaller work teams in a result-oriented manner.
Autonomy	Dual students
	 structure their work and learning processes within the company independently in line with their responsibilities authorisations, and coordinate them with their professional supervisor. complete work tasks/assignments with the support of colleagues. coordinate the practical phase with any individual preparation required for the examination phase at TUHH. document and reflect on how their foundational subjects link with their work as an engineer.
Workload in Hours	Independent Study Time 180, Study Time in Lecture 0
Credit points	
Course achievement	
Examination	
Examination duration and	Documentation accompanying studies and across semesters: Module credit points are earned by completing a digital learning
scale	development report (e-portfolio). This documents and reflects individual learning experiences and skills development relating
	interlinking theory and practice, as well as professional practice. In addition, the partner company provides proof to
	dual@TUHH Coordination Office that the dual student has completed the practical phase.
Assignment for the	
Following Curricula	
	Chemical and Bioprocess Engineering: Core Qualification: Compulsory Computer Science: Core Qualification: Compulsory
	Data Science: Core Qualification: Compulsory
	Electrical Engineering: Core Qualification: Compulsory
	Engineering Science: Core Qualification: Compulsory
	Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory
	Computer Science in Engineering: Core Qualification: Compulsory
	Mechanical Engineering: Core Qualification: Compulsory
	Mechatronics: Core Qualification: Compulsory
	Naval Architecture: Core Qualification: Compulsory
	Technomathematics: Core Qualification: Compulsory
	Engineering and Management - Major in Logistics and Mobility: Core Qualification: Compulsory

Typ Hrs/wk 0 CP 6 Workload in Hours Independent Study Time 180, Study Time in Lecture 0 Lecturer Dr. Henning Haschke Language DE Cycle WiSe Content Company onboarding process • Assigning initial work areas (supervisor, colleagues) • Assigning a contact person within the company (usually the HR department) • Assigning a professional mentor in the work area (relating to practical application)	
CP 6 Workload in Hours Independent Study Time 180, Study Time in Lecture 0 Lecturer Dr. Henning Haschke Language DE Cycle WiSe Content Company onboarding process • Assigning initial work areas (supervisor, colleagues) • Assigning a contact person within the company (usually the HR department)	
Workload in Hours Independent Study Time 180, Study Time in Lecture 0 Lecturer Dr. Henning Haschke Language DE Cycle WiSe Content Company onboarding process • Assigning initial work areas (supervisor, colleagues) • Assigning a contact person within the company (usually the HR department)	
Lecturer Dr. Henning Haschke Language DE Cycle WiSe Content Company onboarding process • Assigning initial work areas (supervisor, colleagues) • Assigning a contact person within the company (usually the HR department)	
Language DE Cycle WiSe Content Company onboarding process • Assigning initial work areas (supervisor, colleagues) • Assigning a contact person within the company (usually the HR department)	
Cycle WiSe Content Company onboarding process Assigning initial work areas (supervisor, colleagues) Assigning a contact person within the company (usually the HR department)	
Content Company onboarding process Assigning initial work areas (supervisor, colleagues) Assigning a contact person within the company (usually the HR department)	
 Assigning initial work areas (supervisor, colleagues) Assigning a contact person within the company (usually the HR department) 	
Assigning a contact person within the company (usually the HR department)	
Assigning a contact person within the company (usually the HR department)	
Assigning a professional mentor in the work area melating to practical application.	
Responsibilities and authorisations of the dual student within the company	
Supporting/working with colleagues	
Scheduling the relevant practical modules with initial work tasks	
Theory/practice transfer options	
Scheduling the examination phase/subsequent study semester	
Operational knowledge and skills	
Company-specific: organisational structure, corporate strategy, business and work areas, work procedures and pro-	sses,
operational levels	
Process and procedure options within the labour-market-relevant field of engineering	
Operational equipment and resources	
 Implementing the university's application recommendations (theory-practice transfer) in corresponding work and tasl across the company 	ıreas
Sharing/reflecting on learning	
Creating an e-portfolio	
Relevance of foundational subjects when working as an engineer	
Comparing the learning and working processes of different learning environments with regard to their results and effective comparing the learning and working processes of different learning environments with regard to their results and effective comparing the learning and working processes of different learning environments with regard to their results and effective comparing the learning and working processes of different learning environments with regard to their results and effective comparing the learning and working processes of different learning environments with regard to their results and effective comparing the learning environments.	čs
Literature • Studierendenhandbuch	
Betriebliche Dokumente	
Hochschulseitige Anwendungsempfehlungen zum Theorie-Praxis-Transfer	

Module M1004: Logis	tics Management			
Courses				
Title		Тур	Hrs/wk	СР
Introduction into Production Logisti	ics (L1222)	Lecture	2	2
Logistics Economics (L1221)		Project-/problem-based Learning	3	4
Module Responsible	Dr. Meike Schröder			
Admission Requirements	None			
Recommended Previous	Introduction to Business and Management			
Knowledge				
-1 1011				
	After taking part successfully, students have reached	the following learning results		
Professional Competence	Charlests will be able			
Knowledge	Students will be able			
	to differentiate between production logistics an	d logistics services,		
	 to describe internal and external areas of produ 	ction and logistics management,		
	 understand the difference between the differen 	t roles in a supply chain,		
	to describe and explain the actual challenges of	f production and Logistics management		
Skills	Based on the acquired knowledge students are capabl	e of		
	Analysisa lasistica nychlosa and inflyance focts			
	Analysing logistics problems and influence factor Selecting appropriate methods for solving pract	·		
	Applying methods and tools of logistics manage	•		
	, pp.y.ing mentous and cools of rogistics manage	menero scanda dizea prosicinsi		
Personal Competence				
Social Competence	Students can			
	actively participate in discussions and team ses	sions		
	arrive at work results in groups and document t			
	develop joint solutions in mixed teams and pres			
Autonomy	Students are able to			
Autonomy	- perform work steps for solving problems of business	logistics independently with the aid of poir	iters	
	- assess their own state of learning in specific terms a	nd to define further work steps on this basi	s guided by tea	chers.
Workload in Hours	Independent Study Time 110, Study Time in Lecture 7	0		
Credit points				
Course achievement		scription		
	No 20 % Subject theoretical and			
Evamination	practical work Written exam			
Examination Examination and				
examination duration and scale	120 11111			
Assignment for the	Data Science: Specialisation II. Application: Elective Co	ompulsory		
Following Curricula	1	pa		
. cciming carricula	Orientation Studies: Core Qualification: Elective Comp	ulsory		
	Engineering and Management - Major in Logistics and	•		
	L			

	nto Production Logistics		
Тур	Lecture		
Hrs/wk	2		
СР	2		
Workload in Hours	ndependent Study Time 32, Study Time in Lecture 28		
	Dr. Yong Lee		
Language			
Cycle			
Content	In the era of time-competition production and logistics need to be considered as a combined strategic competitive advantage.		
	"Introduction in to production logistics" gives an overview over the different disciplinces of production logistics:		
	- Development from cost-, quality to time-competitiion,		
	- fundamentals of production and logistics,		
	- phase-oriented and functional subsystems of production logistics,		
	- planning and steering,		
	- analysis and optimization (focus: Lean Management),		
	- production logistics controlling and supply-chain management in production network		
	Theory is complented by case studies and guest presentations.		
Literature	Der Vorlesung zugrunde liegende Literatur (Auswahl):		
	- Beer, Stafford (1988): Diagnosing the system for organizations. John Wiley & Sons. Chichester, New York, Brisba		
	Toronto 1988.		
- Ferdows, Kasra; De Meyer, Arnoud (1990): Lasting Improvements in Manufacturing Performance In Se			
	Theory. In: Journal of Operations Management, Vol. 9 (2), 1990, S. 365-384.		
	- Gudehus, Timm (2010): Logistik. Grundlagen - Strategien - Anwendungen 4. aktual. Aufl. Springer Ve		
	Heidelberg/Berlin 2010.		
	- Günther, Hans-Otto/Tempelmeier, Horst (2012): Produktion und Logistik. 9., akt. u. erw. Aufl. Springer Ver Berlin/Heidelberg 2012.		
	- Hayes, Robert H.; Schmenner, Roger (1978): How Should You Organize Ma-nufacturing?. In: Harvard Business Review, 56 (1), 1978, S. 105-118.		
	- Krafcik, John F. (1988): Triumph of the lean production system. In: Sloan Management Review, Vol. 30 (1), S. 41-52. - Maskell, Brian H. (1989a): Performance Measurement for World Class Manufacturing. Part I. Manufacturing Systems, Vo		
	1989, S. 62-64.		
	- Pawellek, Günther (2007): Produktionslogistik - Planung - Steuerung - Controlling. Carl Hanser Verlag. München 2007.		
	- Nyhuis, Peter (2008): Beiträge zu einer Theorie der Logistik. Springer Verlag. Berlin/Heidelberg 2008.		
	- Pfohl, Hans-Christian (2010): Logistiksysteme. Betriebswirtschaftliche Grundlagen. 8., neu bearb. u. aktual. Aufl. Spri Verlag. Berlin/Heidelberg 2010.		
	- Schuh, Günther (1988): Gestaltung und Bewertung von Produktvarianten. Ein Beitrag zur systematischen Planung Serienprodukten. Dissertation. RWTH Aachen 1988.		
	- Takeda, Hitoshi (2012): Das synchrone Produktionssystem. Just-in-time für das ganze Unternehmen. 7. Aufl. Verlag Fr Vahlen. München 2012.		
	- Ten Hompel, Michael/Sadowsky, Volker/Beck, Maria (2011): Kommissionierung. Materialflusssysteme 2 - Planung Berechnung der Kommissionierung in der Logistik. Springer Verlag. Berlin/Heidelberg 2011.		
	- Wannenwetsch, Helmut (2007): Integrierte Materialwirtschaft und Logistik. Beschaffung, Logistik, Materialwirtschaft Produktion.3., akt. Aufl. Springer Verlag. Berlin/Heidelberg 2007.		
	- Wiendahl, Hans-Peter/Reichardt, Jürgen/Nyhuis, Peter (2014): Handbuch Fabrikplanung. Konzept, Gestaltung		
	Umsetzung wandlungsfähiger Produktionsstätten. 2., überarb. u. erw. Aufl. Carl Hanser Verlag. München/Wien 2014. - Wildemann, Horst (1997): Fertigungsstrategien - Reorganisation für eine schlanke Produktion und Zulieferung. 3. Aufl.		
	Transfer-Centrum-Verlag. München 1997. - Wildemann, Horst (2008): Produktionssysteme. Leitfaden zur methoden-gestützten Reorganisation der Produktion. 6.		
	2008, TCW München. - Wildemann, Horst (2009): Logistik Prozeßmanagement. 4. Aufl. TCW Transfer-Centrum-Verlag. München 2009.		
	- Zäpfel, Günther (2001): Grundzüge des Produktions- und Logistikmanagement. 2., unwesentlich veränd. Auf		

Course L1221: Logistics Econ	nomics
Тур	Project-/problem-based Learning
Hrs/wk	3
СР	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Dr. Meike Schröder
Language	DE
Cycle	SoSe
Content	 Explanation of basic concepts of logistics and outline of the scope of the logistics business, identification of global logistics networks and relationships Stakeholder: Introduction to the different kinds of logistics service providers, characterization of services of consulting firms for logistics companies Strategy: Influence of the business strategies on business logistics Outsourcing: Decision processes, possibilities and risks of outsourcing of logistics services Market: Logistics in Germany, relevance of logistics for the city of Hamburg Research: Outlook on current issues in academic research, as well as an outline of supplementary management methods for logistics
Literature	 Arnold, D.; Isermann, H.; Kuhn, A.; Tempelmeier, H. (2008): Handbuch Logistik, Berlin: Springer, 2008, ISBN: 3-540-72928-3 Ballou, R. H. (2004): Business logistics, supply chain management: planning, organizing, and controlling the supply chain, 5. ed., internat. ed., Upper Saddle River, NJ: Pearson Prentice Hall, 2004, ISBN: 0-13-123010-7 Bretzke, WR. (2008): Logistische Netzwerke, Springer, Berlin, 2008 Gleißner, H.; Femerling, C. (2008): Logistik - Grundlagen, Übungen, Fallbeispiele, Wiesbaden: Gabler, 2008, ISBN: 978-3-8349-0296-2 Kersten, W.; Hohrath, P.; Koch, J. (2007): Innovative logistics services: Advantage and Disadvantages of Outsourcing Complex Service Bundles, in: Key Factors for Successful Logistics, Berlin: Erich Schmidt Verlag GmbH & Co. KG, 2007 Kersten, W.; Koch, J. (2007): Motive für das Outsourcing komplexer Logistikdienstleistungen, in: Handbuch Kontraktlogistik: Management komplexer Logistikdienstleistungen, Weinheim Schulte, C. (2009): Logistik: Wege zur Optimierung der Supply Chain, 5. überarb. und erw. Aufl., München: Vahlen, 2009, ISBN: 3-8006-3516-X Wildemann, H. (1997): Logistik Prozessmanagement - Organisation und Methoden, München: TCW Transfer-Centrum Verlag, 1997, ISBN: 3-931511-17-0

Module M0851: Math	ematics II			
Courses				
Title Mathematics II (L2976) Mathematics II (L2977)		Typ Lecture Recitation Section (large)	Hrs/wk 4 2	CP 4 2
Mathematics II (L2978)		Recitation Section (small)	2	2
Module Responsible	Prof. Anusch Taraz			
Admission Requirements	None			
Recommended Previous Knowledge	Mathematics I			
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence				
Knowledge Skills	Students can name further concepts in analy examples. Students can discuss logical connections between the help of examples. They know proof strategies and can reproduce	een these concepts. They are capable		
Skiis	 Students can model problems in analysis and I they are capable of solving them by applying e Students are able to discover and verify further For a given problem, the students can develor results. 	stablished methods. logical connections between the conce	ots studied in the	course.
Personal Competence Social Competence		ots according to the needs of their coop		-
Autonomy	 Students are capable of checking their underst precisely and know where to get help in solving Students have developed sufficient persistenc problems. 	them.		
Workload in Hours	Independent Study Time 128, Study Time in Lecture 1	12		
Credit points				
Course achievement		scription		
	Yes 10 % Excercises			
Examination	Written exam			
Examination duration and scale	120 min			
Assignment for the				
Following Curricula		, -		
	Bioprocess Engineering: Core Qualification: Compulsor			
	Chemical and Bioprocess Engineering: Core Qualification: Digital Mechanical Engineering: Core Qualification: Co			
	Electrical Engineering: Core Qualification: Compulsory			
	Green Technologies: Energy, Water, Climate: Core Qua			
	Computer Science in Engineering: Core Qualification:			
	Integrated Building Technology: Core Qualification: Co			
	Logistics and Mobility: Core Qualification: Compulsory			
	Mechanical Engineering: Core Qualification: Compulso	ry		
	Mechatronics: Core Qualification: Compulsory			
	Orientation Studies: Core Qualification: Elective Comp	ulsory		
	Naval Architecture: Core Qualification: Compulsory			
	Process Engineering: Core Qualification: Compulsory	Mobility Core Qualification Committee	,	
	Engineering and Management - Major in Logistics and	Mobility. Core Qualification: Compulsory	•	

Course L2976: Mathematics	П
Тур	Lecture
Hrs/wk	4
СР	4
Workload in Hours	Independent Study Time 64, Study Time in Lecture 56
Lecturer	Prof. Anusch Taraz
Language	DE
Cycle	SoSe
Content	Analysis:
	 power series and elementary functions interpolation integration (proper integrals, fundamental theorem, integration rules, improper integrals, parameter dependent integrals applications of integration (volume and surface of bodies of revolution, lines and arc length, line integrals numerical quadrature periodic functions Linear Algebra: general vector spaces: subspaces, Euclidean vector spaces linear mappings: basis transformation, orthogonal projection, orthogonal matrices, householder matrices linear regression: normal equations, linear discrete approximation eigenvalues: diagonalising matrices, normal matrices, symmetric and Hermite matrices system of linear differential equations matrix factorizations: LR-decomposition, QR-decomposition, Schur decomposition, Jordan normal form, singular value decomposition
Literature	 T. Arens u.a.: Mathematik, Spektrum Akademischer Verlag, Heidelberg 2009 W. Mackens, H. Voß: Mathematik I für Studierende der Ingenieurwissenschaften, HECO-Verlag, Alsdorf 1994 W. Mackens, H. Voß: Aufgaben und Lösungen zur Mathematik I für Studierende der Ingenieurwissenschaften, HECO-Verlag, Alsdorf 1994 G. Strang: Lineare Algebra, Springer-Verlag, 2003 G. und S. Teschl: Mathematik für Informatiker, Band 1, Springer-Verlag, 2013

Course L2977: Mathematics	ırse L2977: Mathematics II		
Тур	Recitation Section (large)		
Hrs/wk	2		
СР	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Anusch Taraz		
Language	DE		
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		

Course L2978: Mathematics	ourse L2978: Mathematics II		
Тур	Recitation Section (small)		
Hrs/wk	2		
СР	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Anusch Taraz		
Language	DE		
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		

	ical Logistics					
Courses						
Title				Тур	Hrs/wk	СР
Technical Logistics (L1746)				Lecture	3	3
Technical Logistics (L1747)	Recitation Section (small) 2 3					3
Module Responsible	Prof. Jochen Kreutzfeldt					
,	None					
	Successful completion of the	e modules "Introdu	iction into logistics	and mobility", "Technical m	echanics 1", "Mat	thematics 1"
Knowledge						
Educational Objectives	After taking part successfull	y, students have re	eached the following	ng learning results		
Professional Competence						
	The students will acquire the following skills: 1. The students know technical solutions for solving logistical problems in the areas of warehousing, conveying, sorting, order picking and identifying.					
	The students know appro-	aches to introducir	ng a selected techi	nical solution.		
	3. The students know praction	cal examples of the	e presented techn	ical solutions.		
	The students will acquire the following skills: 1. The students can select different technical solutions for logistic problems of warehousing, conveying, sorting, order picking and identifying.					
	2. The students are able to evaluate critically the presented technical solutions with respect to their applicability for diff logistical problems and compare different alternatives.			licability for different		
	3. The students are able to a	assess the impact	of selected solutio	ns.		
Personal Competence						
,	The students will acquire the 1. The students will be able picking and identifying and	to sketch technic	al solutions for sol	ving logistical problems of w	arehousing, conv	veying, sorting, order
	2. The technical solutions from	om the group are j	ointly documented	l and presented.		
	3. The students are able to puthe feedback.	present their techr	ical solutions to a	n audience and they can der	ive new ideas and	d improvements from
-	The students will acquire the following competencies: 1. The students are able to sketch autonomously, but under supervision, technical solutions to logistical problems of warehousing, conveying, sorting, order picking and identifying.					
	2. The students are able to e	evaluate their tech	nical solutions and	d discuss the pros and cons.		
Workload in Hours	Independent Study Time 11	0, Study Time in Le	ecture 70			
Credit points	6					
	CompulsoryBonusFormNo10 %Exce	rcises	Description Bonuspunkta	ufgaben in Maple		
Examination	Written exam					
Examination duration and scale	90 min					
Assignment for the	Logistics and Mobility: Core	Qualification: Com	pulsory			
Following Curricula	Engineering and Manageme	nt - Major in Logist	ics and Mobility: C	ore Qualification: Compulsor	У	

Course L1746: Technical Log	istics
Тур	Lecture
Hrs/wk	3
СР	3
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42
Lecturer	Prof. Jochen Kreutzfeldt
Language	DE
Cycle	SoSe
Content	The lecture gives an introduction in solutions and approaches of technical logistics. Five main topics will be addressed:
	(1) warehousing
	(2) conveying
	(3) sorting
	(4) order picking
	(5) identifying
	For each topic, various technical solutions are presented and discussed under consideration of advantages and disadvantages. This content is supplemented by practical examples that can be complemented by inviting guest lecturers.
	In the exercises selected technical solutions will be presented and discussed for certain problems and practiced by the students.
Literature	Griemert, Rudolf (2015): Fördertechnik. Auswahl und Berechnung von Elementen und Baugruppen. [S.I.]: Morgan Kaufmann. Hompel, Michael ten; Schmidt, Thorsten; Nagel, Lars (2007): Materialflusssysteme. Förder- und Lagertechnik. 3. Aufl. Berlin: Springer.
	Hompel, Michael ten; Büchter, Hubert; Franzke, Ulrich (2008): Identifikationssysteme und Automatisierung. [Intralogistik]. Berlin, Heidelberg: Springer.
	Hompel, Michael ten; Schmidt, Thorsten (2010): Warehouse Management. Organisation und Steuerung von Lager- und Kommissioniersystemen. 4. Aufl. Berlin: 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.
	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.

Course L1747: Technical Logistics		
Тур	Recitation Section (small)	
Hrs/wk	2	
СР	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Prof. Jochen Kreutzfeldt	
Language	DE	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	

Module M1681: Techr	nical drawing and CAD			
Courses				
Title Introduction to CAD (L2808)		Typ Recitation Section (small)	Hrs/wk	CP 3
Fundamentals of Technical Drawing		Lecture	1	1
Fundamentals of Technical Drawing		Recitation Section (large)	1	2
Module Responsible				
Admission Requirements				
Recommended Previous	Basic internship			
Knowledge	After taking part successfully, students have reached th	on following learning recults		
Professional Competence	After taking part successfully, students have reached th	le following learning results		
Knowledge Skills Personal Competence	Students will learn how to generate technical dra Students will become acquainted with the va representations) Students will learn how to insert the dimensions Students will acquire the skills to render data in surface specifications) Use of a CAD system for the 3D design of simple Perfom dimensions using a CAD system, creation Integration of standard parts into the 3D design Further processing of the 3D design for 3D printing Students are capable to construct simple technice Students are capable to strengthen the spatial sees Students will be able to operate a CAD system are	rious types of views in drawings (pr in technical drawings detailed drawings according to norms (and more complex components of assemblies, creation of technical dr ing, basic knowledge of the main 3D pri all drawings, considering tolerances and	e.g. tolerance di awings from the nting techniques	mensioning, fits and 3D design
Social Competence				
Autonomy	 They work on their homework by their own and get feedback in their particular interdisciplinary basis group to evaluate their actual knowledge. Students are capable to self-reliantly gather information from subject related, professional publications and relate that information to the context of the lecture, e.g. preparing of technical drawings or choosing of a construction material for applications in the field of logistics and mobility. 			
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points				
Course achievement	No 10 % Subject theoretical and practical work No 5 % Excercises	ription		
Examination				
Examination duration and	120 min			
scale	Legisline and Makilline Cons C. 110 111 C.			
Assignment for the Following Curricula	Logistics and Mobility: Core Qualification: Compulsory Engineering and Management - Major in Logistics and M	Aphility: Caro Qualification: Compulses		
rollowing Curricula	Lingineering and Management - Major in Logistics and M	lobility. Core Qualification: Compulsory		

Course L2808: Introduction t	o CAD
Тур	Recitation Section (small)
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Dr. Marko Hoffmann
Language	DE
Cycle	WiSe
Content	
	 Presentation of a CAD system for the 3D design of simple and more complex components Perfom dimensions using a CAD system, creation of assemblies, creation of technical drawings from the 3D design Integration of standard parts into the 3D design Further processing of the 3D design for 3D printing, basic knowledge of the main 3D printing techniques.
Literature	 Hoischen, Hans; Fritz, Andreas (Hrsg.): "Hoischen/Technisches Zeichnen: Grundlagen, Normen, Beispiele, Darstellende Geometrie", 35. überarbeitete und aktualisierte Auflage, Cornelsen Verlag, Berlin, 2016. Fritz, Andreas; Hoischen, Hans; Rund, Wolfgang (Hrsg.): "Praxis des Technischen Zeichnens Metall / Erklärungen, Übungen, Tests", 17. überarbeitete Auflage; Cornelsen Verlag, Berlin, 2016. Labisch, Susanna; Weber, Christian: "Technisches Zeichnen: Selbstständig lernen und effektiv üben", 4. überarbeitete und erweiterte Auflage, Springer Vieweg Verlag, Wiesbaden, 2013. Kurz, Ulrich; Wittel, Herbert: "Böttcher/Forberg Technisches Zeichnen: Grundlagen, Normung, Übungen und Projektaufgaben", 26. überarbeitete und erweiterte Auflage, Springer Vieweg Verlag, Wiesbaden, 2014. Klein, Martin; Alex, Dieter u.a.; DIN: Deutsches Institut für Normung e.V. (Hrsg.): "Einführung in die DIN-Normen"; 14. neubearbeitete Auflage, Teubner u.a., Stuttgart u.a., 2008.

Course L1741: Fundamentals	of Technical Drawing
Тур	Lecture
Hrs/wk	1
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Marko Hoffmann
Language	DE
Cycle	SoSe SoSe
Content	 Technical drawing basics (contents, kinds of drawings and generation of drawings according to relevant standards) Projective geometry (basics, orthographic projections, isometric projections, cuts, developed views, penetration views)
Literature	 Hoischen, Hans; Fritz, Andreas (Hrsg.): "Hoischen/Technisches Zeichnen: Grundlagen, Normen, Beispiele, Darstellende Geometrie", 35. überarbeitete und aktualisierte Auflage, Cornelsen Verlag, Berlin, 2016. Fritz, Andreas; Hoischen, Hans; Rund, Wolfgang (Hrsg.): "Praxis des Technischen Zeichnens Metall / Erklärungen, Übungen, Tests", 17. überarbeitete Auflage; Cornelsen Verlag, Berlin, 2016. Labisch, Susanna; Weber, Christian: "Technisches Zeichnen: Selbstständig lernen und effektiv üben", 4. überarbeitete und erweiterte Auflage, Springer Vieweg Verlag, Wiesbaden, 2013. Kurz, Ulrich; Wittel, Herbert: "Böttcher/Forberg Technisches Zeichnen: Grundlagen, Normung, Übungen und Projektaufgaben", 26. überarbeitete und erweiterte Auflage, Springer Vieweg Verlag, Wiesbaden, 2014. Klein, Martin; Alex, Dieter u.a.; DIN: Deutsches Institut für Normung e.V. (Hrsg.): "Einführung in die DIN-Normen"; 14. neubearbeitete Auflage, Teubner u.a., Stuttgart u.a., 2008.

Course L1742: Fundamentals of Technical Drawing	
Тур	Recitation Section (large)
Hrs/wk	1
СР	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Dr. Marko Hoffmann
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Module M1803: Engin	eering Mechanics II (Elastostatics)				
Courses					
Title Engineering Mechanics II (Elastosta Engineering Mechanics II (Elastosta		Typ Lecture Recitation Section (large)	Hrs/wk 2 2	CP 2 2	
Engineering Mechanics II (Elastosta		Recitation Section (small)	2	2	
Module Responsible	Prof. Christian Cyron				
Admission Requirements	None				
Recommended Previous	Engineering Mechanics I, Mathematics I (basic kno	wledge of rigid body mechanics such	as balance o	f linear and ang	ular
Knowledge	momentum, basic knowledge of linear algebra like v	ector-matrix calculus, basic knowledge	of analysis suc	ch as differential	and
	integral calculus)				
Educational Objectives	After taking part successfully, students have reached t	he following learning results			
Professional Competence					
Knowledge	Having accomplished this module, the students know and understand the basic concepts of continuum mechanics and elastostatics, in particular stress, strain, constitutive laws, stretching, bending, torsion, failure analysis, energy methods and stability of structures.				
Skills	Having accomplished this module, the students are able to - apply the fundamental concepts of mathematical and mechanical modeling and analysis to problems of their choice - apply the basic methods of elastostatics to problems of engineering, in particular in the design of mechanical structures - to educate themselves about more advanced aspects of elastostatics				
Personal Competence					
Social Competence	Ability to communicate complex problems in elastost communicate these solutions.	atics, to work out solution to these pro	blems togethe	r with others, and	d to
Autonomy	Self-discipline and endurance in tackling independen knowledge.	tly complex challenges in elastostatics	; ability to lea	rn also very absti	ract
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84				
Credit points	6				
Course achievement	None				
Examination	Written exam				
Examination duration and	90 min				
scale					
Assignment for the	General Engineering Science (German program, 7 sem	ester): Core Qualification: Compulsory			
Following Curricula	Civil- and Environmental Engineering: Core Qualification				
	Bioprocess Engineering: Core Qualification: Compulsor	•			
	Chemical and Bioprocess Engineering: Core Qualification				
	Electrical Engineering: Core Qualification: Elective Com				
	Green Technologies: Energy, Water, Climate: Core Qua	• •			
	Integrated Building Technology: Core Qualification: Co Mechanical Engineering: Core Qualification: Compulsor	•			
	Mechatronics: Core Qualification: Compulsory	7			
	Orientation Studies: Core Qualification: Elective Compu	ulsory			
	Naval Architecture: Core Qualification: Compulsory				
	Technomathematics: Specialisation III. Engineering Sci	ence: Elective Compulsory			
	Process Engineering: Core Qualification: Compulsory				
	Engineering and Management - Major in Logistics and	Mobility: Core Qualification: Compulsory			

Course L0493: Engineering Mechanics II (Elastostatics)		
Тур	Lecture	
Hrs/wk	2	
СР	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Christian Cyron	
Language	DE	
Cycle	SoSe	
	The lecture Engineering Mechanics II introduces the fundamental concepts of stress and strain and explains how these can be used to characterize and compute elastic deformations of mechanical bodies under loading. The focus of the lecture lies on: • basis of continuum mechanics: stress, strain, constitutive laws • truss • torsion bar • beam theory: bending, moment of inertia of area, transverse shear • energy methods: Maxwell-Betti reciprocal work theorem, Castigliano's second theorem, theorem of Menabrea • strength of materials: maximum principle stress criterion, yield criteria according to Tresca and von Mises • stability of mechanical structures: Euler buckling strut	
Literature	 Gross, D., Hauger, W., Schröder, J., Wall, W.A.: Technische Mechanik 1, Springer Gross, D., Hauger, W., Schröder, J., Wall, W.A.: Technische Mechanik 2 Elastostatik, Springer 	

Course L1691: Engineering N	ourse L1691: Engineering Mechanics II (Elastostatics)	
Тур	Recitation Section (large)	
Hrs/wk	2	
СР	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Christian Cyron	
Language	DE	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L0494: Engineering Mechanics II (Elastostatics)	
Тур	Recitation Section (small)
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Christian Cyron
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Module M1751: Pract	ical module 2 (dual study program, Bachelor's degre	ee)
Courses		
Title	Тур	Hrs/wk CP
Practical term 2 (dual study progra	m, Bachelor's degree) (L2880)	0 6
Module Responsible	Dr. Henning Haschke	
Admission Requirements	None	
Recommended Previous	Successful completion of practical module 1 as part of the dual Bachel	or's source
Knowledge	 Successful completion of practical module 1 as part of the dual Bachel course A from the module on interlinking theory and practice as part of 	
Educational Objectives	After taking part successfully, students have reached the following learning r	esults
Professional Competence		
Knowledge	Dual students	
	 describe their employer's organisational structure (company) and d to how tasks and competences are distributed, as well as how work pr understand the structure and objectives of the dual study prograr course of study. 	ocesses are handled.
Skills	Dual students	
	use equipment and resources professionally in accordance wit operational processes and procedures with regard to the intended wor implement the university's application recommendations in relation	k results/objectives.
Personal Competence		
Social Competence	Dual students	
	 have familiarised themselves with their new working enviro tasks/processes/working relationships. know their central points of contact and colleagues, and are integra coordinate work tasks with their professional supervisor and justify help shape the work in the assigned work area and offer their c support based on their needs. work together with others in interdisciplinary work teams in a result 	ted into the designated tasks and work areas. procedures and intended results. colleagues support to complete their work or ask for
Δutonomy	Dual students	
, actions in	structure their work and learning processes within the company authorisations, and coordinate them with their professional supervisor complete work tasks/assignments independently and/or with the su coordinate the practical phase with any individual preparation requi document and reflect on how their foundational subjects link with the supervisor of the s	pport of colleagues. red for the examination phase at TUHH.
Workload in Hours	Independent Study Time 180, Study Time in Lecture 0	
Credit points	6	
Course achievement	None	
Examination	Written elaboration	
	Documentation accompanying studies and across semesters: Module credit development report (e-portfolio). This documents and reflects individual lea interlinking theory and practice, as well as professional practice. In addual@TUHH Coordination Office that the dual student has completed the pra	arning experiences and skills development relating to dition, the partner company provides proof to the
Assignment for the	General Engineering Science (German program, 7 semester): Core Qualificat	on: Compulsory
Following Curricula	Civil- and Environmental Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Computer Science: Core Qualification: Compulsory Data Science: Core Qualification: Compulsory Electrical Engineering: Core Qualification: Compulsory Engineering Science: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Computer Science in Engineering: Core Qualification: Compulsory Mechanical Engineering: Core Qualification: Compulsory Mechatronics: Core Qualification: Compulsory Naval Architecture: Core Qualification: Compulsory	
	Technomathematics: Core Qualification: Compulsory Engineering and Management - Major in Logistics and Mobility: Core Qualifica	ation: Compulsory

Course L2880: Practical term	2 (dual study program, Bachelor's degree)
Тур	
Hrs/wk	0
СР	6
Workload in Hours	Independent Study Time 180, Study Time in Lecture 0
Lecturer	Dr. Henning Haschke
Language	DE
Cycle	SoSe
Content	Company onboarding process
	 Assigning work areas (supervisor, colleagues) Assigning a contact person within the company (usually the HR department) Assigning a professional mentor in the work area (relating to practical application) Responsibilities and authorisations of the dual student within the company Supporting/working with colleagues Scheduling the relevant practical modules with work tasks Theory/practice transfer options Scheduling the examination phase/subsequent study semester Operational knowledge and skills Company-specific: organisational structure, corporate strategy, business and work areas, work procedures and processes, operational levels Process and procedure options within the labour-market-relevant field of engineering Operational equipment and resources Implementing the university's application recommendations (theory-practice transfer) in corresponding work and task areas across the company
	Sharing/reflecting on learning
	 Creating an e-portfolio Relevance of foundational subjects when working as an engineer Comparing the learning and working processes of different learning environments with regard to their results and effects
Literature	Studierendenhandbuch Betriebliche Dokumente Hochschulseitige Anwendungsempfehlungen zum Theorie-Praxis-Transfer

Module M1674: Technology Regulations)	nical Complementary Course for Logistics and Mobility (according to Subject Speci
Courses	
Title	Typ Hrs/wk CP
Module Responsible	Prof. Heike Flämig
Admission Requirements	None
Recommended Previous	
Knowledge	
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	
Skills	
Personal Competence	
Social Competence	
Autonomy	
Workload in Hours	Depends on choice of courses
Credit points	6
Assignment for the	Logistics and Mobility: Core Qualification: Compulsory
Following Curricula	Engineering and Management - Major in Logistics and Mobility: Core Qualification: Compulsory

Module M1671: Introd	duction to Economics			
Courses				
Title		Тур	Hrs/wk	СР
Introduction to Economics (L2712)		Lecture	2	3
Introduction to Economics (L2713)		Recitation Section (large)	2	3
Module Responsible	Prof. Timo Heinrich			
Admission Requirements	None			
Recommended Previous	None.			
Knowledge				
Educational Objectives	After taking part successfully, students have reached t	the following learning results		
Professional Competence				
Knowledge	The students know			
	 topics and issues in microeconomics and macro 	economics.		
	the functioning of a market economy and difference			
	important economic parameters and			
	possibilities of economic policy interventions.			
Skills	On the basis of the acquired knowledge, students are a	able to		
	understand economic models and apply them to	economic policy issues,		
	reduce complex relationships to essential mechanisms and evaluate their practical relevance and			
	evaluate economic policy decisions and apply be	asic methods of economic analysis.		
Personal Competence				
Social Competence	The students are able to			
	address the taught content argumentatively and	d discuss current economic topics,		
	grasp complex issues and formulate systematic	solutions and		
	recognize the functioning of real markets with the second control of the second con	heir opportunities and risks.		
Autonomy	The students are able to			
	deal with basic economic concepts and indepen	dently communicate their own analyse	s on this basis, as	s well as
	analyze and evaluate micro- and macroeconomic	ic policy measures against the backgro	und of the variou	s models.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 5	6		
Credit points	6			
Course achievement	None			
Examination	Written exam			
Examination duration and	60 min			
scale				
Assignment for the	Logistics and Mobility: Core Qualification: Compulsory			
Following Curricula	Engineering and Management - Major in Logistics and	Mobility: Core Qualification: Compulsor	у	

Course L2712: Introduction t	o Economics
Тур	Lecture
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Timo Heinrich
Language	EN
Cycle	WiSe
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
Literature	 Mankiw/Taylor: Economics, Cengage, 5th ed., 2020 The CORE Team: Economy, Society and Public Policy, Oxford University Press, 2019

$\label{thm:module Manual B.Sc.} \begin{tabular}{ll} Module Manual B.Sc. \\ "Engineering and Management - Major in Logistics and Mobility" \\ \end{tabular}$

Course L2713: Introduction to Economics	
Тур	Recitation Section (large)
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Timo Heinrich
Language	EN
Cycle	WiSe
Content	
Literature	

Modifity						
Module M1692: Comp	uter Science fo	r Engineers -	Introduction ar	nd Overview		
Courses						
Title				Тур	Hrs/wk	СР
Computer Science for Engineers - I	ntroduction and Overviev	v (L2685)		Lecture	3	3
Computer Science for Engineers - I	ntroduction and Overviev	v (L2686)		Recitation Section (small)	2	3
Module Responsible	Prof. Görschwin Fey					
Admission Requirements	None					
Recommended Previous	Elementary knowledge	e of programming a	s taught in the "Introdu	iction to Programming" bridg	ge course or schoo	l.
Knowledge						
Educational Objectives	After taking part succ	essfully, students ha	ave reached the followi	ng learning results		
Professional Competence						
Knowledge	The module provides	prospective engine	eers with an overview	of computer science as a	discipline and of	the fundamentals of
	programming. The air	m is to facilitate th	ne exchange between	engineers and computer so	ientists and to sh	now possibilities and
	limitations of program	mable systems.				
	Basic knowledge is lea	arned about				
	 approaches for 	estimating runtime	and memory requirem	ents		
	 computer archi 	tecture				
	 automata theor 	ry				
	simple data str	uctures like lists and	d fields			
	 sorting algorith 	ms				
	 programming 					
	 modeling for so 	oftware				
	 unit testing test 	ting and debugging				
Skills	Basic programming sk	kills are learned. Stu	idents can			
	describe basic components of a computer					
	select appropriate data structures for a problem solution					
	design and implement simple programs					
	apply unit testing					
	estimate the runtime and memory requirements of simple algorithms					
Personal Competence						
Social Competence	Students are able to d	levelop and commu	nicate computer scienc	e solutions in small multidis	ciplinary project te	eams.
Autonomy	Students can independently create small programs to solve simple problems and validate their correctness.					
Workload in Hours	Independent Study Tir	me 110, Study Time	e in Lecture 70			
Credit points	6					
Course achievement	Compulsory Bonus	Form	Description			
	No 10 %	Attestation	Testate finde	n semesterbegleitend statt.		
Examination	Written exam					
Examination duration and	90 min					
scale						
Assignment for the			-	re Qualification: Compulsory	′	
Following Curricula						
	_		ate: Core Qualification:	Compulsory		
			alification: Compulsory			
	Logistics and Mobility:	-	. ,			
	Mechanical Engineering	-	, ,			
	Mechatronics: Core Qu		-			
	Orientation Studies: C					
	Naval Architecture: Co					
	Engineering and Mana	agement - Major in L	ogistics and Mobility: C	Core Qualification: Compulso	ry	

Course L2685: Computer Sci	ence for Engineers - Introduction and Overview
Тур	Lecture
Hrs/wk	3
СР	3
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42
Lecturer	Prof. Görschwin Fey
Language	DE/EN
Cycle	WiSe
Content	
Literature	 Informatik Helmut Herold, Bruno Lurz, Jürgen Wohlrab, Matthias Hopf: Grundlagen der Informatik, 3. Auflage, 816 Seiten, Pearson Studium, 2017. C++ Bjarne Stroustrup, Einführung in die Programmierung mit C++, 479 Seiten, Pearson Studium, 2010. > in der englischen Version bereits eine neuere Auflage! Jürgen Wolf: Grundkurs C++: C++-Programmierung verständlich erklärt, Rheinwerk Computing, 3. Auflage, 2016.

$\label{thm:module Manual B.Sc.} \begin{tabular}{ll} Module Manual B.Sc. \\ "Engineering and Management - Major in Logistics and Mobility" \\ \end{tabular}$

ourse L2686: Computer Science for Engineers - Introduction and Overview		
Тур	Recitation Section (small)	
Hrs/wk	2	
СР	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Prof. Görschwin Fey	
Language	DE/EN	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Module M1887: Trans	portation Planning and Traffic Engineering		
Courses			
Title	Тур	Hrs/wk	СР
Transport Planning and Traffic Engi	neering (L0997) Project-/problem-based Learning	4	6
Module Responsible	Prof. Carsten Gertz		
Admission Requirements	None		
Recommended Previous	None		
Knowledge			
Educational Objectives	After taking part successfully, students have reached the following learning results		
Professional Competence			
Knowledge	Students are able to		
	understand the facts, contexts and objectives of transport planning.		
	correctly apply definitions and concepts of transport planning.		
	reproduce basic concepts of transport modelling.		
	explain the fundamentals of traffic engineering and transport infrastructure construction.		
Skills	Students are able to		
	analyse transport supply based on key metrics.		
	estimate transport demand using key metrics.		
	design transport networks, links and junctions.		
	calculate traffic signal plans.		
	assess transport concepts.		
Personal Competence			
Social Competence	Students are able to		
	get together in groups and constructively discuss and analyse set problems.		
	in a group agree on solutions and document them.		
Autonomy	Students are able to		
	produce reports on group work.		
	structure the tasks and timing for working out a set problem.		
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56		
Credit points	6		
Course achievement	Compulsory Bonus Form Description		
	No 5 % Excercises		
Examination	Subject theoretical and practical work		
Examination duration and	Project report in four work packages, in small groups, during the semester		
scale			
Assignment for the	Civil- and Environmental Engineering: Specialisation Traffic and Mobility: Compulsory		
Following Curricula	Civil- and Environmental Engineering: Specialisation Water and Environment: Compulsory		
	Civil- and Environmental Engineering: Specialisation Civil Engineering: Elective Compulsory		
	Engineering and Management - Major in Logistics and Mobility: Core Qualification: Compulsory		

Course L0997: Transport Pla	nning and Traffic Engineering
Тур	Project-/problem-based Learning
Hrs/wk	4
СР	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Prof. Carsten Gertz
Language	DE
Cycle	WiSe
Content	The course provides an introductory overview over the fundamentals of urban and regional transport planning, including the subtopic traffic engineering. The following subject areas are covered: • objectives of transport planning, • key mobility metrics, • measuring and predicting demand, • designing and planning transport infrastructure, • fundamentals of traffic engineering and • an introduction to transport concepts and planning processes.
Literature	Bosserhoff, Dietmar (2000) Integration von Verkehrsplanung und räumlicher Planung. Schriftenreihe der Hessischen Straßen- und Verkehrsverwaltung, Heft 42. Hessisches Landesamt für Straßen- und Verkehrswesen. Wiesbaden. Lohse, Dieter; Schnabel, Werner (2011) Grundlagen der Straßenverkehrstechnik und der Verkehrsplanung: Band 1; Straßenverkehrstechnik. Beuth Verlag. Berlin. Forschungsgesellschaft für Straßen- und Verkehrswesen (2006) Richtlinien für die Anlage von Stadtstraßen - RASt 06. FGSV-Verlag. Köln (FGSV, 200). Vallée, Dirk; Engel, Barbara; Vogt, Walter (2021) Stadtverkehrsplanung Band 3, Springer Verlag. Berlin.

Module M1740: Proje	ct Management and Accounting			
Courses				
Title		Тур	Hrs/wk	СР
Foundations of cost and activity ac	counting (L2832)	Lecture	2	3
Foundations of project managemen	_	Lecture	2	3
Module Responsible	Prof. Matthias Meyer			
Admission Requirements	None			
Recommended Previous	No previous experience required.			
Knowledge				
Educational Objectives	After taking part successfully, students have rea	iched the following learning results		
Professional Competence				
Knowledge	The students know			
	 common procedure models for project ma 	anagement.		
	 forms of project organization. 			
	 success factors in project management. 			
	Types of project controlling.			
	 strategies for risk analysis and avoidance 			
Skills	Students are able to			
	 independently deal with a new project and 	d divide it into appropriate work packag	es.	
	manage and control a project during its execution.			
	react appropriately in case of project risks.			
	analyze strategic issues and interpret and present the results.			
Personal Competence				
Social Competence	The students can			
	 solve complex tasks in a team and docum 	nent them accordingly.		
	 perform different roles during teamwork a 	and give themselves appropriate feedba	ck within the team.	
	 present and represent the relevant result 	s of their work in front of experts.		
Autonomy	Students are able to			
	independently obtain necessary informati	on for planning a project.		
	to structure themselves and their project	over a longer period of time.		
	to analyze the progress of the project independent of the project inde	ependently and to intervene in a control	lling manner.	
Workload in Hours	Independent Study Time 124, Study Time in Lec	ture 56		
Credit points	6			
Course achievement	None			
Examination	Written exam			
Examination duration and	90 min			
scale				
Assignment for the	Logistics and Mobility: Core Qualification: Compu	ulsory		
Following Curricula	Engineering and Management - Major in Logistic	s and Mobility: Core Qualification: Comp	oulsory	

Course L2832: Foundations of	Course L2832: Foundations of cost and activity accounting		
Тур	Lecture		
Hrs/wk	2		
СР	3		
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28		
Lecturer	Prof. Matthias Meyer		
Language	DE		
Cycle	WiSe		
Content			
Literature			

Course L2831: Foundations	of project management
Тур	Lecture
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Ann-Kathrin Lange
Language	DE
Cycle	WiSe
Content	In this lecture the contents of the project management are explained. The technical contents are accompanied by a continuous exercise to deepen the methods and to promote independent work. The students learn the most important contents of the different phases of a project.
Literature	Deutschen Gesellschaft für Projektmanagement e. V. (GPM 2019), Kompetenzbasiertes Projektmanagement (PM4) PMI 2017, A Guide to the Project Management Body of Knowledge(PMBoK Guide®) Patzak und Rattay (2018), Projektmanagement - Projekte, Projektportfolios, Programme und projektorientierte Unternehmen Timingers (2017), Modernes Projektmanagement

Module M1752: Pract	ical module 3 (dual study program, Bachelor's degree)		
Courses			
Title	Тур	Hrs/wk	СР
Practical term 3 (dual study progra	m, Bachelor's degree) (L2881)	0	6
Module Responsible	Dr. Henning Haschke		
Admission Requirements	None		
Recommended Previous	Successful completion of practical module 2 as part of the dual Bachelor's course		
Knowledge	course B from the module on interlinking theory and practice as part of the dual Bar	chelor's course	
	, , ,		
Educational Objectives	After taking part successfully, students have reached the following learning results		
Professional Competence			
Knowledge	Dual students		
	• understand the company's strategic orientation, as well as the functions and	organisation of cent	ral departments with
	their decision-making structures, network relationships.		
	understand the requirements of the engineering profession and correctly estima	te the resulting respo	onsibility.
	combine their knowledge of facts, principles, theories and methods gained from	om previous study c	ontent with acquired
	practical knowledge - in particular their knowledge of practical professional proced	dures and approache	s, in the current field
	of activity.		
Skills	Dual students		
	apply technical theoretical knowledge to current problems in their own area or	f work and evaluate	work processes and
	results.	. Work, and evaluate	work processes and
	use technology, equipment and resources in accordance with the assigned world	k areas and tasks. ar	nd assess operational
	processes and procedures with regard to the intended work results/objectives.		
	implement the university's application recommendations in relation to their curr	ent tasks.	
Personal Competence			
Social Competence	Dual students		
	plan work processes cooperatively, including across work areas.		
	communicate professionally with operational stakeholders and present comp	lex issues in a struc	ctured, targeted and
	convincing manner.		
Autonomy	Dual students		
Autonomy	buai students		
	assume responsibility for work assignments and areas.		
	document and reflect on the relevance of subject modules and specialisations	for work as an eng	ineer, as well as the
	implementation of the university's application recommendations and the associ	ated challenges of a	positive transfer of
	knowledge between theory and practice.		
Workload in Hours	Independent Study Time 180, Study Time in Lecture 0		
Credit points	6		
	Written elaboration		
Examination duration and	Documentation accompanying studies and across semesters: Module credit points are ea	rned by completing a	a digital learning and
scale	development report (e-portfolio). This documents and reflects individual learning exper		
	interlinking theory and practice, as well as professional practice. In addition, the	partner company pr	ovides proof to the
	dual@TUHH Coordination Office that the dual student has completed the practical phase.		
Assignment for the	General Engineering Science (German program, 7 semester): Core Qualification: Compuls	ory	
Following Curricula	Civil- and Environmental Engineering: Core Qualification: Compulsory		
	Chemical and Bioprocess Engineering: Core Qualification: Compulsory		
	Computer Science: Core Qualification: Compulsory		
	Data Science: Core Qualification: Compulsory		
	Electrical Engineering: Core Qualification: Compulsory		
	Engineering Science: Core Qualification: Compulsory		
	Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory		
	Computer Science in Engineering: Core Qualification: Compulsory		
	Mechanical Engineering: Core Qualification: Compulsory Mechatronics: Core Qualification: Compulsory		
	Naval Architecture: Core Qualification: Compulsory		
	Technomathematics: Core Qualification: Compulsory		
	Engineering and Management - Major in Logistics and Mobility: Core Qualification: Compu	Isory	
	J. J. J. Latter and J. Layer in Layer and Flooring's core quanticution compu	J	

Course L2881: Practical term	a 3 (dual study program, Bachelor's degree)		
Тур			
Hrs/wk	0		
СР	6		
Workload in Hours	Independent Study Time 180, Study Time in Lecture 0		
Lecturer	Dr. Henning Haschke		
Language	DE		
Cycle	WiSe		
Content	Company onboarding process		
	Assigning work area(s)		
	Extending responsibilities and authorisations of the dual student within the company		
	Independent work tasks and areas		
	Participating in project teams		
	Scheduling the relevant practical modules with work tasks		
	Theory/practice transfer options		
	Scheduling the examination phase/subsequent study semester		
	perational knowledge and skills		
	Company-specific: strategic direction, organisation of central business and work areas, departments, decision-making		
	structures, network relationships and internal communication		
	Linking facts, principles and theories with practical knowledge		
	 Process and procedure options within the labour-market-relevant field of engineering 		
	Operational technology, equipment and resources		
	 Implementing the university's application recommendations (theory-practice transfer) in corresponding work and task area across the company 		
	Sharing/reflecting on learning		
	E-portfolio		
	Relevance of subject modules and specialisations when working as an engineer		
	University application recommendations for transferring knowledge between theory and practice		
Literature	Studierendenhandbuch		
	Betriebliche Dokumente Hackachulasitica Asuvandungsannfahlungan gum Thaoria Bravia Transfar		
	Hochschulseitige Anwendungsempfehlungen zum Theorie-Praxis-Transfer		

MODILLY	Mobility			
Module M0831: Intro	duction to Operations Research an	d Statistics		
Courses				
Title		Tun	Hrs/wk	СР
Introduction to Operations Research	-h (10004)	Typ Lecture	2	2
Introduction to Statistics (L0883)	.ii (L0004)	Lecture	2	2
	tativo Mothods in Logistics (LOSSE)		2	
Module Responsible				
Admission Requirements				
-				
Recommended Previous Knowledge				
,		and the following learning results		
,	After taking part successfully, students have reach	ned the following learning results		
Professional Competence				
Knowledge	The students know			
	different methods from the field of descripting	ve statistics and can explain them and the	ir importance for	Logistics:
	selected discrete and continuous distributio			
			and their areas o	г аррисацоп,
	the laws of probability theory and can explain			
	different methods of inferential statistics - e		ı;	
	the history and relevance of Operations Res			
	 linear programming methods for solving pla 			
	 selected methods of transportation and net 	work optimization, e.g. methods for finding	a shortest path;	
	 models and methods for the travelling sales 	sman and the vehicle routing problem;		
	 appropriate software for solving these problem 	ems.		
Skills	Students are able to			
	 collect data by appropriate methods, to agg 			results;
	recognize different distribution functions an	d to apply them in the solution of Logistics	problems;	
	apply laws of probability to construct solution	ons for Business problems;		
	 use appropriate methods of inferential statistics, apply them to Business problems and evaluate the results of their analysis; construct appropriate quantitative - linear or integer - models for Business planning situations; apply methods from linear programming and interpret the results; apply methods from transport and network planning and interpretthe results; solve TSPs and vehicle routing problems by heuristic methods; carry out a sensitivity analysis and evaluate the results; critically judge the different methods and their applicability; 			sults of their analysis;
	apply appropriate software for solving the p			
	apply appropriate software for solving the p	TOBIETTS.		
Personal Competence				
Social Competence	Students are able to			
	work successfully and respectfully in a team		;	
	engage in scientific discussions on topics from			
	present the results of their work to others in	n an understandable way.		
Autonomy	Students are able to			
	carry out data analyses for given tasks inde	nendently individually or in a team:		
			icing appropriate	coftwaro:
	solve complex Business planning problems solve in the area independently			suitwaie;
	gather knowledge in the area independently aritically and last are the growths of the investor		sorving;	
	critically reflect on the results of their work.			
Workload in Hours	Independent Study Time 96, Study Time in Lecture	2 84		
Course achievement				
Course achievement				
Examination Examination and	Written exam			
scale				
	Logistics and Mobility: Core Qualification: Compuls	sory		
-	Engineering and Management - Major in Logistics	•	v	
3	1 5 5	,	<u>- </u>	

Course L0884: Introduction t	o Operations Research
Тур	Lecture
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Kathrin Fischer
Language	DE
Cycle	SoSe
Content	1. Introduction to Operations Research
	2. Linear Programming and Applications
	3. Transportation Problems
	4. Network Problems (e.g. Shortest Paths)
	5. Travelling Salesman Problems and Vehicle Routing
Literature	D.R. Anderson / D.J. Sweeney / T.A. Williams / Martin: Quantitative Methods for Business. 11th Edition, Thomson, South Western 2008.
	W. Domschke / A. Drexl: Einführung in Operations Research, 7. Auflage, Springer, Berlin et al. 2007.
	F.S. Hillier/ G.J. Lieberman: Introduction to Operations Research. 8th Edition, McGraw-Hill, 2005.
	L. Suhl / T. Mellouli: Optimierungssysteme. Springer Verlag. Berlin et al. 2006.

Course L0883: Introduction t	o Statistics				
	Lecture				
Hrs/wk	2				
СР	2				
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28				
Lecturer	Prof. Kathrin Fischer				
Language	E				
Cycle	SoSe				
Content	1. Introduction to statistics				
	2. Basics of descriptive statistics				
	3. Methods of descriptive statistics				
	4. Probabilities				
	Discrete probability distributions and their applications				
	6. Continuous probability distrbutions and their application				
	7. Introduction to confidence intervals				
	8. Introduction to hypothesis testing				
	9. Linear regression				
Literature	Bluman, Alan G.: Elementary Statistics - A brief version. Third Edition, McGrawHill 2006.				
	Bowerman, Bruce L. and O'Connell, Richard T.: Business Statistics in Practice, 4 th edition, McGraw-Hill 2007. Fahrmeir, L., Künstler, R., Pigeot, I., Tutz, G.: Statistik - Der Weg zur Datenanalyse. 6. Auflage. Berlin, Heidelberg 2007. Quatember, A.: Statistik ohne Angst vor Formeln. 2. Auflage. Pearson Verlag 2008. Schira, J.: Statistische Methoden der VWL und BWL - Theorie und Praxis. 2. Auflage, Pearson Verlag 2005.				

Course L0885: Exercises to I	ntroduction in Quantitative Methods in Logistics		
Тур	Recitation Section (small)		
Hrs/wk	2		
СР	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Kathrin Fischer		
Language	E		
Cycle	oSe		
Content	Interactive sessions for discussion and application of the contents of "Introduction to Statistics" and "Introduction to OR".		
Literature	Literaturangaben siehe Vorlesungen		
	Übungsblätter und weitere Informationen werden in der Übung verteilt.		

Module M1261: Mana	gement			
Courses				
Title		Тур	Hrs/wk	СР
Finance and Investment (L1707) Foundations of Management (L170)	6)	Lecture Lecture	2	3
Module Responsible	Prof. Thomas Wrona	Lecture	2	3
Admission Requirements	None			
Knowledge	busies of business studies			
	After taking part successfully, students have read	hed the following learning results		
Professional Competence	31	<u> </u>		
•	Students will accumulate extensive knowledge ab	out different aspects of management	after having participat	ed in this module.
Skills	 Students are able to give an overview of the activities of management and describe processes and content of management. Students are able to identify the features and procedures by which a modern organization can be managed. Students are able to explain and analyze relationships between management activities. Students are able to describe and apply methods of finance and accounting. Students are able to develop procedures and basic approaches in the context of investment and financing decisions for the company. The students are able to recognize and evaluate important skills for management. The students are able to develop their own understanding of successful leadership in organizations and evaluate strategies accordingly. The Students are able to differentiate between different environmental contingencies and asses the underlying risk potentials. 			
	Students are able to utilize models and methods of	of accounting and apply it from a busi	ness perspective.	
Personal Competence	After attending the module students will be able to	•		
Suciai Competence	After attending the module students will be able t	U		
	 lead and take part in strategy-related discu 			
	 present results, both in written and verbal to 	form		
	work respectful with others in a team.			
Autonomy	The students are able to gather, analyze, and criti	ically reflect on information and data	and convert it into man	ageable summaries.
Workload in Hours	Independent Study Time 124, Study Time in Lectu	ıre 56		
Credit points	, , ,			
Course achievement				
Examination	Written exam			
Examination duration and	90 min			
scale				
Assignment for the	Logistics and Mobility: Core Qualification: Compul	sory		
Following Curricula	Engineering and Management - Major in Logistics	and Mobility: Core Qualification: Com	pulsory	

Course L1707: Finance and I	nvestment
Тур	Lecture
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Ulrich Pape
Language	DE
Cycle	SoSe
Content	Introduction to the theory and practice of finance and accounting:
	The focus will be on basic principles of capital budgeting, finance and accounting and the underlying various methods of accounting.
Literature	Wird zu Veranstaltungsbeginn bekannt gegeben.

Course L1706: Foundations of	of Management
Тур	Lecture
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Thomas Wrona
Language	DE
Cycle	SoSe
Content	Introduction to the theory and practice of management:
	The fundamentals of corporate governance will be taught, as well as an in-depth perspective on activities, characteristics and methods of management.
Literature	Wird zum Veranstaltungsbeginn bekannt gegeben.

Module M1672: IT app	plications for logistics and mobility	1			
Courses					
Title			Тур	Hrs/wk	СР
Introduction to Geoinformation Scie	ence (L2465)		Project-/problem-based Learning	3	3
IT applications for logistics and mol	bility (L2827)		Lecture	1	1
IT applications for logistics and mol	bility (L2828)		Recitation Section (small)	2	2
Module Responsible	Dr. Jutta Wolff				
Admission Requirements	None				
Recommended Previous	Introduction to logistics and mobility				
Knowledge					
Educational Objectives	After taking part successfully, students have reach	ed the followin	ig learning results		
Professional Competence					
Knowledge	The students acquire the following knowledge:				
	The students know the basic types of IT syst	ems in logistic	S.		
	The students know different techniques for be	ousiness proce	ss modeling.		
	The students know technological solutions for			5.	
CI:III-	The short and a section by a fall and a section of the still a				
SKIIIS	The students acquire the following specialist skills:				
	The students can describe and evaluate basis	ic IT processes	in logistics.		
	The students can basically operate various I	T systems in Io	gistics.		
	The students can describe and evaluate the	differences be	tween different basic technolog	ies.	
Personal Competence					
•	The students acquire the following social skills:				
	The students are able to explain the basic principles of information technology to other students.				
				idents.	
	The students can help other students to find The students are able to present their result:				
	The students are able to present their result.	.s iii iioiit oi aii	addience.		
Autonomy	The students acquire the following skills:	The students acquire the following skills:			
	The students familiarize themselves indepen	ndently with ur	nknown IT systems.		
	 The students familiarize themselves independently with unknown IT systems. The students are able to independently find a suitable modeling technique for a process. 				
	Based on the given task, the students can design a simple application in a basic technology.				
				-	
	Independent Study Time 96, Study Time in Lecture	e 84			
Credit points					
Course achievement					
Examination duration and	120 min				
scale					
Assignment for the		-	0 1151 11 0 1		
Following Curricula	Engineering and Management - Major in Logistics a	and Mobility: Co	ore Qualification: Compulsory		

Course L2465: Introduction t	Course L2465: Introduction to Geoinformation Science		
Тур	oject-/problem-based Learning		
Hrs/wk	3		
СР	3		
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42		
Lecturer	Yohannis Tadesse		
Language	JE		
Cycle	oSe		
Content	 Theoretical basics of Geo-Information-Systems Data models, geographical coordinates, geo-referencing, map-views Data mining and -analyses of geo-data Analysis techniques 		
Literature			

Course L2827: IT applications	s for logistics and mobility
Тур	Lecture
Hrs/wk	1
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Jutta Wolff
Language	DE
Cycle	SoSe
	The course covers the basics of information technology in relation to logistics systems. The course is divided into five subject areas: (1) Planning of IT systems in logistics, (2) data acquisition systems, (3) communication systems, (4) IT-supported processing, (5) basic technological developments in information technology. The course consists of a basic lecture with connected exercise units.
	Becker, J.; Mathas, C.; Winkelmann, A. (2009): Geschäftsprozessmanagement. Berlin [u. a.]: Springer Finkenzeller, K.; Gebhart, M. (2015): RFID-Handbuch. Grundlagen und praktische Anwendungen von Transpondern, kontaktlosen Chipkarten und NFC. 7. Auflage, München: Hanser Hausladen, I. (2016): IT-gestützte Logistik.3. akt. und erw. Auflage, Wiesbaden: Springer-Gabler Pfohl, HC. (2018): Logistiksysteme. Betriebswirtschaftliche Grundlagen. 9. Auflage, Berlin, Heidelberg: Springer Vieweg ten Hompel, M.; Schmidt, T.; Dregger, J. (2018): Materialflusssysteme. Förder- und Lagertechnik. 4. Auflage, Berlin [u. a.]: Springer Vieweg (VDI-Buch). ten Hompel, M.; Wolf, O.; Nettsträter, A.; Ebel, D.; Geissen, T.; Kraft, V.; Mertens, C.; Pott, C.; Schoneboom, J.; Witthaut, M. (2013): IT in der Logistik 2013/2014. Stuttgart: Fraunhofer-Verlag

Course L2828: IT applications for logistics and mobility				
Тур	Typ Recitation Section (small)			
Hrs/wk	2			
СР	2			
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28			
Lecturer	Dr. Jutta Wolff			
Language	DE			
Cycle	SoSe			
Content	See interlocking course			
Literature	See interlocking course			

Module M1753: Pract	ical module 4 (dual study program, Bachelor's degree)				
Courses					
Title	Typ Hrs/wk CP				
Practical term 4 (dual study progra	••				
Module Responsible	Dr. Henning Haschke				
Admission Requirements	None				
Recommended Previous					
Knowledge	Successful completion of practical module 3 as part of the dual Bachelor's course				
	 course B from the module on interlinking theory and practice as part of the dual Bachelor's course 				
Educational Objectives	After taking part successfully, students have reached the following learning results				
Professional Competence	Arter taking part successfully, stations have reached the following learning results				
•	Port Andrews				
Knowieage	Dual students				
	understand the company's strategic orientation, as well as the functions and organisation of central departments with				
	their decision-making structures, network relationships, and relevant company communication.				
	have developed an understanding of the requirements and responsibilities of the engineering profession, know the scope				
	and limits of the professional field of activity.				
	can combine their knowledge of facts, principles, theories and methods gained from previous study content with acquired				
	practical knowledge - in particular their knowledge of practical professional procedures and approaches, in the current field				
	of activity.				
Skills	Dual students				
	apply technical theoretical knowledge to current problems in their own field of work, and evaluate work processes and				
	results, taking into account different possible courses of action.				
	 use technology, equipment and resources in accordance with the assigned work areas and tasks, and can assess 				
	operational processes and procedures with regard to the intended work results/objectives.				
	 implement the university's application recommendations in relation to their current tasks. 				
Personal Competence					
Social Competence	Dual students				
	are able to plan work processes cooperatively, across work areas and in heterogeneous groups.				
	 communicate professionally with operational stakeholders and present complex issues in a structured, targeted and 				
	convincing manner.				
Autonomy	Dual students				
Autonomy	Substitution in the substitution of the substi				
	assume responsibility for work assignments and areas, and coordinate the associated work processes.				
	document and reflect on the relevance of subject modules and specialisations for work as an engineer, as well as the				
	implementation of the university's application recommendations and the associated challenges of a positive transfer o				
	knowledge between theory and practice.				
Mandaad In II-	Independent Study Time 100 Study Time in Lecture 0				
	Independent Study Time 180, Study Time in Lecture 0				
Credit points					
Course achievement					
Examination	Written elaboration				
Examination duration and	Documentation accompanying studies and across semesters: Module credit points are earned by completing a digital learning and				
scale	development report (e-portfolio). This documents and reflects individual learning experiences and skills development relating to				
	interlinking theory and practice, as well as professional practice. In addition, the partner company provides proof to the				
	dual@TUHH Coordination Office that the dual student has completed the practical phase.				
Assignment for the	General Engineering Science (German program, 7 semester): Core Qualification: Compulsory				
Following Curricula	Civil- and Environmental Engineering: Core Qualification: Compulsory				
	Chemical and Bioprocess Engineering: Core Qualification: Compulsory				
	Computer Science: Core Qualification: Compulsory				
	Data Science: Core Qualification: Compulsory				
	Electrical Engineering: Core Qualification: Compulsory				
	Engineering Science: Core Qualification: Compulsory				
	Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory				
	Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory				
	Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Computer Science in Engineering: Core Qualification: Compulsory				
	Computer Science in Engineering: Core Qualification: Compulsory				
	Computer Science in Engineering: Core Qualification: Compulsory Mechanical Engineering: Core Qualification: Compulsory				
	Computer Science in Engineering: Core Qualification: Compulsory Mechanical Engineering: Core Qualification: Compulsory Mechatronics: Core Qualification: Compulsory				

Course L2882: Practical term	1 4 (dual study program, Bachelor's degree)
Тур	
Hrs/wk	0
СР	6
Workload in Hours	Independent Study Time 180, Study Time in Lecture 0
Lecturer	Dr. Henning Haschke
Language	DE
Cycle	SoSe
Content	Company onboarding process
	 Assigning work area(s) Extending responsibilities and authorisations of the dual student within the company Independent work tasks and areas Participating in project teams Scheduling the relevant practical module Theory/practice transfer options Scheduling the examination phase/subsequent study semester Operational knowledge and skills Company-specific: strategic direction, organisation of central business and work areas, departments, decision-making structures, network relationships and internal communication Linking facts, principles and theories with practical knowledge Process and procedure options within the labour-market-relevant field of engineering Operational technology, equipment and resources Implementing the university's application recommendations (theory-practice transfer) in corresponding work and task areas across the company
	Sharing/reflecting on learning
	 E-portfolio Relevance of subject modules and specialisations when working as an engineer University application recommendations for transferring knowledge between theory and practice
Literature	 Studierendenhandbuch Betriebliche Dokumente Hochschulseitige Anwendungsempfehlungen zum Theorie-Praxis-Transfer

 $\label{thm:module Manual B.Sc.} \begin{tabular}{ll} Module Manual B.Sc. \\ "Engineering and Management - Major in Logistics and Mobility" \\ \end{tabular}$

Module M1735: Ethics	and Technology - Respons	sible Innovation				
Courses						
Title		Тур	Hrs/wk	СР		
Ethics and Technology - Responsible	e Innovation (L2830)	Lecture	4	4		
Module Responsible	NN					
Admission Requirements	None					
Recommended Previous						
Knowledge						
Educational Objectives	After taking part successfully, students	After taking part successfully, students have reached the following learning results				
Professional Competence						
Knowledge						
Skills						
Personal Competence						
Social Competence						
Autonomy						
Workload in Hours	Independent Study Time 64, Study Time	e in Lecture 56				
Credit points	4					
Course achievement	None					
Examination	Subject theoretical and practical work					
Examination duration and	noch zu definieren					
scale						
Assignment for the	Logistics and Mobility: Core Qualificatio	n: Compulsory				
Following Curricula	Engineering and Management - Major ir	n Logistics and Mobility: Core Qualification: Comp	oulsory			

Course L2830: Ethics and Te	ourse L2830: Ethics and Technology - Responsible Innovation		
Тур	Lecture		
Hrs/wk	4		
СР	4		
Workload in Hours	Independent Study Time 64, Study Time in Lecture 56		
Lecturer	NN		
Language	DE		
Cycle	WiSe		
Content			
Literature			

Module M1704: Gamin	ication of Strategic Thinking				
Courses					
Title		Тур	Hrs/wk	СР	
Gamification of Strategic Thinking (L2708)	Seminar	4	6	
Module Responsible	Prof. Matthias Meyer				
Admission Requirements	None				
Recommended Previous	None				
Knowledge					
Educational Objectives	After taking part successfully, students have reached the	following learning results			
Professional Competence Knowledge	recognize and analyze relationships and interdepe understand problem-related terms, theories and m		-	practical situations	
Skills	 make well-founded decisions in realistic settings by drawing on the business administration knowledge consider in parallel and balance several relevant factors when making business-related decisions (e.g. financial situation, behavior of competitors, production capacities) critically analyze decisions in hindsight and deduce consequences for future decisions from this analysis analyze and explain economic and strategic phenomena by drawing on business administration theories and methods 				
Personal Competence Social Competence	 form stable work groups with fellow students, ever arrive at a consensus as a team when making ma achieving the consensus adequately present the situation of a (fictitious) or 	nagement decisions and, if n	ecessary, to solve conflic	ts along the way to	
Autonomy	 make and justify decisions in simulated profession. reflect their own actions in hindsight and arrive at critically depict and reflect situations in a structure make transfers from theory into practice 	suggestions for improvement	•		
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56				
Credit points	6				
Course achievement	None				
	Subject theoretical and practical work				
Examination duration and scale	Different achievements (single/team) - learning diary, pre	esentations, reflections, essay			
Assignment for the	Logistics and Mobility: Core Qualification: Elective Compu	llsory			
Following Curricula	Engineering and Management - Major in Logistics and Mo	bility: Core Qualification: Elec	tive Compulsory		

Course L2708: Gamification	of Strategic Thinking
Тур	Seminar
Hrs/wk	4
СР	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Prof. Matthias Meyer, Thorsten Kodalle
Language	DE
Cycle	WiSe
Content	The seminar "Gamification of Strategic Thinking" is offered as part of the elective course of studies "Logistics and Mobility" and currently offers space for 25 students. In cooperation with the German Armed Forces Command and Staff College, the seminar aims to teach strategic methods within the framework of a wargaming approach. For this purpose, the course consists of two blocks, which take place parallel to each other throughout the semester. In the theoretical block, students are taught the basics of various methods for strategy development and management (including SWOT analysis, SCRUM or Kanban). In the second block, the students apply the methods they have learned on the basis of the board game "Sycthe". For this, the students are divided into five groups with five members each. Each of these groups plays a "party" of the board game and is supposed to develop a strategy with the help of the learned methods that helps the respective team to win. Afterwards, the experiences will be reflected upon by means of a written elaboration and a proposal for an own business wargame will be developed.
Literature	Green, K. C. (2005), "Game theory, simulated interaction, and unaided judgment for forecasting decisions in conflicts," International Journal of Forecasting, 21, 463-472. Romeike. F., Spitzner, J. (2013): Von Szenarioanalyse bis Wargaming, Betriebswirtschaftliche Simulationen im Praxiseinsatz, Wiley-VCH Sabin, P. (2012), Simulating War - Studying Conflict through Simulation Games, Part 1, Bloomsbury Press, London.

Module M0622: Busin	ess Administration and Enterprise Re	esource Planning: CER	RMEDES AG			
Courses						
Title		Тур	Hrs/wk	СР		
	orise Resource Planning: CERMEDES AG (L0330)	Seminar	2	3		
Business Administration and Enterp	orise Resource Planning: CERMEDES AG (L1785)	Lecture	2	3		
Module Responsible	Prof. Christian Ringle					
Admission Requirements	None					
	Basic knowledge in business administration.					
Knowledge						
Educational Objectives	After taking part augagafullu atudanta haya yanahadi	the fellowing learning recults				
Educational Objectives Professional Competence	After taking part successfully, students have reached	the following learning results				
•	The students are able to					
Knowieuge	The stadents are able to					
	 describe an internationally active company; 					
	 describe complex and interrelated business pro 	cesses along the supply chain;				
	 present important aspects of the project management 	gement of enterprise resource pla	anning software implem	entations;		
	 name rules and processes for the implementation 	on of business processes in SAP;				
	 explain the functioning and use of enterprise re 	source planning software along	the supply chain;			
	 conduct business processes in SAP on their own 	1;				
	present the integrative role of enterprise resour	rce planning systems.				
Skills	The students are able to					
	a man the design of business pressess along the	a supply shain of a firm.				
	map the design of business processes along the implement business processes in an enterprise					
	·	implement business processes in an enterprise resource planning software;				
	use an internationally used enterprise resource planning software in a daily routine; existingly evaluate the enterprise resource planning software along the theoretical requirements for entimally designing a					
	critically evaluate the enterprise resource planning software along the theoretical requirements for optimally designing a					
	business process.					
Personal Competence						
Social Competence	The students are able to					
	 direct fruitful and professional discussions; 					
	 work in teams on exercises; 					
	 present and defend results of their work; 					
	communicate and collaborate successfully and	respectfully with others in teams				
	- communicate and composite successivity and	respectivity with others in teams				
Autonomy	The students will be able to acquire knowledge in a	specific context independently	and to map this knowle	edge onto other ne		
,	complex problem fields.		•			
Workload in Hours	Independent Study Time 124, Study Time in Lecture 5	6				
Credit points	6					
Course achievement	None					
Examination	Subject theoretical and practical work					
Examination duration and	Case studies, Mini-Challenges, Presentations					
scale	_					
Assignment for the	Logistics and Mobility: Core Qualification: Elective Con	npulsory				
Following Curricula	Engineering and Management - Major in Logistics and	•	tive Compulsory			

Course L0330: Business Adm	ninistration and Enterprise Resource Planning: CERMEDES AG
Тур	Seminar
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Christian Ringle
Language	EN
Cycle	WiSe
Content	The course involves two main parts:
	During the first part of the course, participants are provided with insights into the market for ERP-Software and are provided with knowledge on how ERP-implementation projects proceed and how these projects should ideally be managed from a theoretical and practical perspective. In addition, participants are provided with an understanding of business functions and processes by means of visiting the TUHH model factory. In the model factory, participants and are solving special business cases on the basis of group-specific tasks. Finally, participants are introduced into the basic functioning of ERP-Software referring to the most common system (SAP). Participants gain a basic understanding of implementing organizational data, master data and processes into the system. During the second phase of this course, the students work independently in groups on deepening challenges, which conceptually build up on the executed case studies from phase one. Using the knowledge from phase one, the students are able to transfer the theoretical knowledge on the practical execution of the challes in SAP. The results of the group work will be presented in phase two.
Literature	Participants will be provided with a course handout in the form of pptslides which can be downloaded in advance. Further literature references regarding the theoretical concepts are not provided (as this is part of the challenge in writing the thesis); literature references with regard to the ERP-System used are as follows: • Agrawal, A. (2009): Customizing Materials Management Processes in SAP ERP Operations, Galileo Press: Boston. • Arif, N./Tauseef, S. (2010): Integrating SAP ERP Financials, Galileo Press: Boston. • Chudy, M./Castedo, L. (2015): Sales and Distribution in SAP ERP - Practical Guide, Galileo Press: Boston. • Dickersback, J. T./Keller, G. (2010): Production Planning and Control with SAP ERP, 2e, Galileo Press: Boston. • Franz, M. (2014): Project Management with SAP Project System, 4e, Galileo Press: Boston. • Hoppe, M./Gulyassy, F. (2009): Materials Planning with SAP, Galileo Press: Boston. • Veeriah, N. (2011): Customizing Financial Accounting in SAP, Galileo Press: Boston.

Course L1785: Business Adm	ourse L1785: Business Administration and Enterprise Resource Planning: CERMEDES AG		
Тур	Lecture		
Hrs/wk	2		
СР	3		
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28		
Lecturer	Prof. Christian Ringle		
Language	EN		
Cycle	WiSe		
Content	See interlocking course		
Literature	See interlocking course		

Module M1754: Pract	ical module 5 (dual study program, Bachelor's degree)				
Courses					
Title	Тур	Hrs/wk	СР		
Practical term 5 (dual study progra	m, Bachelor's degree) (L2883)	0	6		
Module Responsible	Dr. Henning Haschke				
Admission Requirements	None				
Recommended Previous					
Knowledge	Successful completion of practical module 4 as part of the dual Bachelor's course				
	course C from the module on interlinking theory and practice as part of the dual Ba	achelor's course			
Educational Objectives	After taking part successfully, students have reached the following learning results				
Professional Competence					
Knowledge	Dual students				
	 combine their knowledge of facts, principles, theories and methods gained from previous study content with acquire practical knowledge - in particular their knowledge of practical professional procedures and approaches, in the current fiel of activity. have a critical understanding of the practical applications of their engineering subject. 				
Skills	Dual students				
	 apply technical theoretical knowledge to complex, interdisciplinary problems within the company, and evaluate the associated work processes and results, taking into account different possible courses of action. implement the university's application recommendations with regard to their current tasks. develop new solutions as well as procedures and approaches in their field of activity and area of responsibility - including in the case of frequently changing requirements (systemic skills). are able to analyse and evaluate operational issues using academic methods. 				
Personal Competence					
Social Competence	Dual students				
	 work responsibly in operational project teams and proactively deal with problems within their team. represent complex engineering viewpoints, facts, problems and solution approaches in discussions with internal and external stakeholders and develop these further together. 				
Autonomy	Dual students				
	 define goals for their own learning and working processes as engineers. document and reflect on learning and work processes in their area of responsibility. document and reflect on the relevance of subject modules, specialisations and research for work as an engineer, as well as the implementation of the university's application recommendations and the associated challenges of a positive transfer of knowledge between theory and practice. 				
Workload in Hours	Independent Study Time 180, Study Time in Lecture 0				
Credit points					
Course achievement					
Examination	Written elaboration				
Examination duration and scale	Documentation accompanying studies and across semesters: Module credit points are ead development report (e-portfolio). This documents and reflects individual learning experinterlinking theory and practice, as well as professional practice. In addition, the	iences and skills dev	relopment relating to		
	dual@TUHH Coordination Office that the dual student has completed the practical phase.		2205 p. 001 to the		
Assignment for the					
Following Curricula	Civil- and Environmental Engineering: Core Qualification: Compulsory	•			
	Chemical and Bioprocess Engineering: Core Qualification: Compulsory				
	Computer Science: Core Qualification: Compulsory				
	Data Science: Core Qualification: Compulsory				
	Electrical Engineering: Core Qualification: Compulsory				
	Engineering Science: Core Qualification: Compulsory				
	Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory				
	Computer Science in Engineering: Core Qualification: Compulsory				
	Mechanical Engineering: Core Qualification: Compulsory				
	Mechatronics: Core Qualification: Compulsory				
	Naval Architecture: Core Qualification: Compulsory Technomathematics: Core Qualification: Compulsory				
	Engineering and Management - Major in Logistics and Mobility: Core Qualification: Compu	lsory			
	and mobility. Core Qualification. Compu				

Course L2883: Practical term	n 5 (dual study program, Bachelor's degree)
Тур	
Hrs/wk	0
СР	6
Workload in Hours	Independent Study Time 180, Study Time in Lecture 0
Lecturer	Dr. Henning Haschke
Language	DE
Cycle	WiSe
Content	Company onboarding process
	 Assigning a future professional field of activity as an engineer (B.Sc.) and associated areas of work Extending responsibilities and authorisations of the dual student within the company up to the intended first assignment after completing their studies or to the assignment completed during the subsequent dual Master's course Taking personal responsibility within a team - in their own area of responsibility and across departments Scheduling the final practical module with a clear correlation to work structures Internal agreement on a potential topic for the Bachelor's dissertation Planning the Bachelor's dissertation within the company in cooperation with TU Hamburg Scheduling the examination phase/sixth study semester Operational knowledge and skills Company-specific: dealing with change, team development, responsibility as an engineer in their own future field of work (B.Sc.), dealing with complex contexts and unresolved problems, developing and implementing innovative solutions Specialising in one field of work (final dissertation) Systemic skills Implementing the university's application recommendations (theory-practice transfer) in corresponding work and task areas across the company
	Sharing/reflecting on learning
	 E-portfolio Relevance of subject modules and specialisations when working as an engineer Importance of research and innovation when working as an engineer University application recommendations for transferring knowledge between theory and practice
Literature	 Studierendenhandbuch Betriebliche Dokumente Hochschulseitige Anwendungsempfehlungen zum Theorie-Praxis-Transfer

Module M0681: Project	ct Course Logistics and Mobility			
Courses				
Title	Typ Hrs/wk CP			
Module Responsible	Dozenten des Studiengangs			
Admission Requirements	None			
Recommended Previous	none			
Knowledge				
	After taking part successfully, students have reached the following learning results			
Professional Competence				
Knowledge	Students will receive in-depth knowledge and in-depth skills in a special area of business administration, engineering science, logistics or mobility and can reproduce this knowledge.			
Skills	After the project work in a business, engineering related, logistics and or mobility related research field, students are able to			
	familiarize themselves with a scientific and/or application-oriented problem			
	analyze the problem and find a solution (if appropriate as part of a team)			
	• to refer to appropriate literature for the work on a problem as well as to critically evaluate publications			
	 produce a scientifically sound written report on the problem in question (if appropriate as part of a team) 			
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 sizable (expert) audience			
Autonomy	After the project work students are able to			
	familiarize themselves successfully with a demanding scientific or application oriented problem independently			
	prepare and deliver a presentation of their results independently			
Workload in Hours	Independent Study Time 180, Study Time in Lecture 0			
Credit points	6			
Course achievement	None			
Examination	Study work			
Examination duration and				
scale				
Assignment for the	Logistics and Mobility: Core Qualification: Compulsory			
Following Curricula	Engineering and Management - Major in Logistics and Mobility: Core Qualification: Elective Compulsory			

Module M1911: Project	ct Seminar WILUM				
Courses					
Title		Тур	Hrs/wk	СР	
Project Seminar WILUM (L3153)		Seminar	3	6	
Module Responsible	Dozenten des SD W				
Admission Requirements	None				
Recommended Previous	Prior knowledge in the relevant area from the releva	nt Management modules.			
Knowledge					
Educational Objectives	After taking part successfully, students have reache	d the following learning results			
Professional Competence					
Knowledge					
Skills	Students are able to				
	independently acquire the relevant knowledg	e to handle their project			
	independently carry out a (pre-defined) comp		omplex problem		
	select and use the relevant literature and crit				
	aggregate their knowledge and results and pr	resent it to others			
	write a scientific report on the project / problem at hand, individually or in a team.				
Personal Competence					
Social Competence	Students are able to				
	work respectfully and successfully in a team	organize the team, and solve comp	nley tasks in a team in a	given timeframe	
	 work respectfully and successfully in a team, organize the team, and solve complex tasks in a team in a given timeframe analyse a problem in a team and develop a solution for the problem 				
	present the results of their work to specialists				
Autonomy	Students are able to				
	define the scope of their project				
	independently acquire relevant scientific know	vledge			
	 independently carry out a (pre-defined) comp 	lex research task			
	independently prepare a presentation of the i	elevant aspects of the project.			
Workload in Hours	Independent Study Time 138, Study Time in Lecture	42			
Credit points	6				
Course achievement	None				
Examination	Written elaboration				
Examination duration and	To be announced in seminar.			<u> </u>	
scale					
Assignment for the	Engineering and Management - Major in Logistics an	d Mobility: Core Qualification: Elec	tive Compulsory		
Following Curricula					

Course L3153: Project Semin	ar WILUM
Тур	Seminar
Hrs/wk	3
СР	6
Workload in Hours	Independent Study Time 138, Study Time in Lecture 42
Lecturer	Prof. Heike Flämig
Language	DE/EN
Cycle	WiSe/SoSe
Content	Contents differ, depending on the institute which organizes the respective seminar. Topics are always announced at the start of the term.
Literature	Wird je nach Thema angegeben; in der Regel handelt es sich um wissenschaftliche Fachartikel und Publikationen, vorwiegend in englischer Sprache.

Module M1889: Innovation and product development - a business game					
Courses					
Title		Тур	Hrs/wk	СР	
Innovation and product developme	nt - a business game (L3126)	Project-/problem-based Learning	4	6	
Module Responsible	Prof. Tim Schweisfurth				
Admission Requirements	None				
Recommended Previous					
Knowledge					
Educational Objectives	After taking part successfully, students have reached the follow	ing learning results			
Professional Competence					
Knowledge					
Skills					
Personal Competence					
Social Competence					
Autonomy					
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56				
Credit points	6				
Course achievement	None				
Examination	Subject theoretical and practical work	•		•	
Examination duration and	Different achievements (single/team) - learning diary, presental	tions, reflections, essay			
scale					
Assignment for the	Engineering and Management - Major in Logistics and Mobility:	Core Qualification: Elective Comp	ulsory		
Following Curricula					

Course L3126: Innovation an	urse L3126: Innovation and product development - a business game	
Тур	Project-/problem-based Learning	
Hrs/wk	4	
СР	6	
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56	
Lecturer	Prof. Tim Schweisfurth, Prof. Moritz Göldner	
Language	EN	
Cycle	SoSe	
Content		
Literature		

Module M1675: Legal	Foundations of Logistics and Mobility	у		
Courses				
Title		Тур	Hrs/wk	СР
Legal Foundations of Transportation	n and Logistics (L1186)	Lecture	2	2
Legal Foundations of Transportation	n and Logistics (L1187)	Recitation Section (large)	1	2
Module Responsible	Prof. Heike Flämig			
Admission Requirements	None			
Recommended Previous	None			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the	he following learning results		
Professional Competence				
Knowledge	Students are able to			
	describe the systematics of transport law and log	gistiss law		
	explain the legal connections in transport and lo	-		
	explain the legal conflections in transport and to	gistics		
Skills	Students can			
	analyze and solve questions of law for transport	and logistics		
	discuss and systematically evaluate law cases at	-		
	- discuss and systematically evaluate law cases an	na verny triem 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 concerning transport an	d logistics independently		
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42			
Credit points	4			
Course achievement	None			
Examination	Written exam			
Examination duration and	60 min			
scale				
Assignment for the	Logistics and Mobility: Core Qualification: Compulsory			
Following Curricula	Engineering and Management - Major in Logistics and M	Mobility: Core Qualification: Compulsor	/	

Course L1186: Legal Founda	tions of Transportation and Logistics
Тур	Lecture
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Niels Witt
Language	DE
Cycle	SoSe
Content	Basics of german law regulations of the HGB international conventions maritime trade law contract logistics complex logistics chains
Literature	Aktueller Text des Bürgerlichen Gesetzbuches und Handelsgesetzbuches

Course L1187: Legal Founda	Course L1187: Legal Foundations of Transportation and Logistics	
Тур	Recitation Section (large)	
Hrs/wk	1	
СР	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Dr. Niels Witt	
Language	DE	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	

Module M0974: Busin	ess Simulation Marktstrat			
Courses				
Title Business Simulation Marktstrat (L0	918)	Typ Seminar	Hrs/wk	CP
Module Responsible	Prof. Christian Lüthje			
Admission Requirements	None			
Recommended Previous	none			
Knowledge				
Educational Objectives	After taking part successfully, students have	ve reached the following learning results		
Professional Competence				
Knowledge	Students are able to			
		and interdependencies between different dec theories and methods of business administrati		
Skills	Students are able to			
	consider in parallel and balance se behavior of competitors, market der critically analyze business decisions	istic coroporate settings by drawing on the bus everal relevant factors when making business- mand, production capacities) in hindsight and deduce consequences for fut m daily business by drawing on business admin	related decisions (e.g	. financial situation,
Personal Competence				
-	Students are able to			
	arrive at a consensus as a team wh achieving the consensus adequately present the situation of	students, even those, who were previously unless making management decisions and, if necessary and their decision making management and their decision making	essary, to solve confli	cts along the way to
Autonomy	Students are able to			
	_	t and arrive at suggestions for improvements in s in a structured way, both, orally as well as in	•	
Workload in Hours	Independent Study Time 124, Study Time	in Lecture 56		
Credit points	6			
Course achievement	None			
Examination	Subject theoretical and practical work			
Examination duration and scale	different achievements (single/team) - lear	rning diary, presentations, reflections		
Assignment for the	Logistics and Mobility: Core Qualification: E	Elective Compulsory		
Following Curricula	Engineering and Management - Major in Lo	ogistics and Mobility: Core Qualification: Electiv	e Compulsory	

Course L0918: Business Simulation Marktstrat		
Тур	Seminar	
Hrs/wk	4	
СР	6	
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56	
Lecturer	Prof. Christian Lüthje	
Language	DE	
Cycle	SoSe	
	The business simulation game Markstrat B2B - Markstrat is a business simulation which puts you into the role of managing the marketing division of the electro-mechanical business unit of a large corporation. Competing with several other companies, you try to successfully market two products to business customers. To this end, you and other students jointly develop and implement a long-term marketing strategy for your business unit. During the 10 rounds of the simulation game, the students and the randomly assigned student team make decisions in the areas of product development, advertising, sales, price, production, and human resources on a weekly basis. To make well-informed decisions, the student teams can draw on a large number of information sources such as customer surveys, experiments, market studies, and benchmarks which you need to analyze during each round of the simulation. The simulation is accompanied by a comprehensive introduction, a concomitant coaching, as well as a mid-term and final presentation. In addition, the student teams will prepare a written report.	
Literature	Kotler, Philip und Keller, Kevin Lane (2011): Marketing Management, 14th Edition, Prentice Hall International Morris, Michael H.; Pitt, Leyland F.; Honeycutt Jr., Earl D. (2001): Business-To-Business Marketing: A Strategic Approach, 3rd Edition, Sage Bruhn, Manfred (2012): Marketing - Grundlagen für Studium und Praxis, 11. Auflage, Gabler	

Specialization Information Technology

Module M1897: New 7	Technologies and Markets			
Courses				
Title		Тур	Hrs/wk	СР
Data-driven marketing and sales (L	3138)	Lecture	3	4
New technologies and market oppo	ortunities (L3139)	Project-/problem-based Learning	1	2
Module Responsible	Prof. Christian Lüthje			
Admission Requirements	None			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have read	hed the following learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 124, Study Time in Lect	ure 56		
Credit points	6			
Course achievement	None			
Examination	Subject theoretical and practical work			
Examination duration and	Written elaboration, exercises, presentation, oral	participation		
scale				
Assignment for the	Engineering and Management - Major in Logistics	and Mobility: Specialisation Information Techno	ology: Elective	Compulsory
Following Curricula	Engineering and Management - Major in Logistics	and Mobility: Specialisation Traffic Planning an	d Systems: Ele	ective Compulsory
	Engineering and Management - Major in Logisti	cs and Mobility: Specialisation Production Mar	nagement and	d Processes: Elective
	Compulsory			

Course L3138: Data-driven m	ourse L3138: Data-driven marketing and sales	
Тур	Lecture	
Hrs/wk	3	
СР	4	
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42	
Lecturer	Prof. Christian Lüthje	
Language	DE	
Cycle	SoSe	
Content		
Literature		

Course L3139: New technolo	Course L3139: New technologies and market opportunities	
Тур	Project-/problem-based Learning	
Hrs/wk	1	
СР	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Christian Lüthje	
Language	DE	
Cycle	SoSe	
Content		
Literature		

C				
Courses				
Title		Тур	Hrs/wk	СР
	rogramming Concepts, Data Handling & Communication (L2689)	Lecture	3	3
	rogramming Concepts, Data Handling & Communication (L2690)	Recitation Section (small)	2	3
Module Responsible	Prof. Sibylle Fröschle			
Admission Requirements	None			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have reached the foll	owing learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Course achievement	Compulsory Bonus Form Description			
	No 10 % Attestation Testate fi	nden semesterbegleitend statt.		
Examination	Written exam			
Examination duration and	120 min			
scale				
Assignment for the	General Engineering Science (German program, 7 seme	ster): Specialisation Mechanica	al Engineering, Fo	ocus Biomechanic
Following Curricula	Compulsory			
	General Engineering Science (German program, 7 semester):	: Specialisation Biomedical Engir	neering: Compulso	ry
	General Engineering Science (German program, 7 semester):	: Specialisation Green Technolog	ies, Focus Renewa	able Energy: Electi
	Compulsory			
	General Engineering Science (German program, 7 semest	ter): Specialisation Mechanical	Engineering, Focu	us Energy System
	Compulsory			
	General Engineering Science (German program, 7 semest	ter): Specialisation Mechanical	Engineering, Foci	us Aircraft Systen
	Engineering: Compulsory			
	General Engineering Science (German program, 7 seme	ester): Specialisation Mechanica	al Engineering, F	ocus Mechatronic
	Compulsory			
	General Engineering Science (German program, 7 semester): Specialisation Mechanical Eng	ineering, Focus Pr	roduct Developme
	and Production: Elective Compulsory			
	General Engineering Science (German program, 7 semester)	: Specialisation Mechanical Engi	neering, Focus The	eoretical Mechanic
	Engineering: Elective Compulsory			
	General Engineering Science (German program, 7 semester):	: Specialisation Electrical Engine	ering: Elective Cor	npulsory
	Bioprocess Engineering: Core Qualification: Compulsory			
	Chemical and Bioprocess Engineering: Core Qualification: Co	mpulsory		
	Electrical Engineering: Core Qualification: Compulsory			
	Green Technologies: Energy, Water, Climate: Specialisation E		ergies: Elective Cor	mpulsory
	Logistics and Mobility: Specialisation Information Technology			
	Mechatronics: Specialisation Robot- and Machine-Systems: C			
	Mechatronics: Specialisation Medical Engineering: Compulsor			
	Mechatronics: Specialisation Dynamic Systems and Al: Comp	•		
	Mechatronics: Specialisation Electrical Systems: Elective Com	npulsory		
	Process Engineering: Core Qualification: Compulsory			
	Engineering and Management - Major in Logistics and Mobilit	y: Specialisation Information Tec	chnology: Compuls	sory

Course L2689: Computer Scientific Course	Course L2689: Computer Science for Engineers - Programming Concepts, Data Handling & Communication	
Тур	Lecture	
Hrs/wk	3	
СР	3	
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42	
Lecturer	Prof. Sibylle Fröschle	
Language	DE	
Cycle	SoSe SoSe	
Content		
Literature	John V. Guttag: Introduction to Computation and Programming Using Python.	
	With Application to Understanding Data. 2nd Edition. The MIT Press, 2016.	

Course L2690: Computer Sci	ourse L2690: Computer Science for Engineers - Programming Concepts, Data Handling & Communication	
Тур	Recitation Section (small)	
Hrs/wk	2	
СР	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Prof. Sibylle Fröschle	
Language	DE	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	

Module M0610: Electi	rical Machines and Actuators			
Courses				
Title		Tyrn	Hrs/wk	СР
Electrical Machines and Actuators ((10293)	Typ Lecture	3	4
Electrical Machines and Actuators (• • • • •	Recitation Section (large)	2	2
				_
Module Responsible				
Admission Requirements				
Recommended Previous	Basics of mathematics, in particular complexe numbers, inte	grals, differentials		
Knowledge	Basics of electrical engineering and mechanical engineering			
Educational Objectives	After taking part successfully, students have reached the following	lowing learning results		
Professional Competence				
Knowledge	Students can to draw and explain the basic principles of elec	tric and magnetic fields.		
	They can describe the function of the standard types of electric machines and present the corresponding equations and characteristic curves. For typically used drives they can explain the major parameters of the energy efficiency of the whole system from the power grid to the driven engine.			
Skills	Students are able to calculate two-dimensional electric and this they apply the usual methods of the design auf electric to the design and electric to the electric to the design and electric to the electric to		romagnetic circu	uits with air gap. For
	They can calulate the operational performance of electric machines from their given characteristic data and selected quantiti and characteristic curves. They apply the usual equivalent circuits and graphical methods.			
Personal Competence				
Social Competence	none			
Autonomy	Students are able independently to calculate electric and m	agnatic fields for applications. The	ey are able to ar	nalyse independently
	the operational performance of electric machines from the and characteristic curves.	charactersitic data and theycan	calculate thereo	f selected quantities
344				
Workload in Hours	Independent Study Time 110 Study Time in Lecture 70			
Workload in Hours	, ,			
Credit points	6			
Credit points Course achievement	6 None			
Credit points Course achievement Examination	6 None Subject theoretical and practical work			
Credit points Course achievement Examination Examination duration and	6 None	5		
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes		ingineering, Foc	us Energy Systems:
Credit points Course achievement Examination Examination duration and scale	6 None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory	ter): Specialisation Mechanical E		
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes	ter): Specialisation Mechanical E		
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory	ter): Specialisation Mechanical E ester): Specialisation Mechanical	l Engineering, I	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester)	ter): Specialisation Mechanical E ester): Specialisation Mechanical	l Engineering, I	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory	ter): Specialisation Mechanical E ester): Specialisation Mechanical): Specialisation Mechanical Engin	l Engineering, I	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) General Engineering Science (German program, 7 semester)	ter): Specialisation Mechanical E ester): Specialisation Mechanical): Specialisation Mechanical Engin :: Specialisation Electrical Enginee	l Engineering, I	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulsory	ter): Specialisation Mechanical E ester): Specialisation Mechanical): Specialisation Mechanical Engin :: Specialisation Electrical Engineerry	l Engineering, I	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso	ter): Specialisation Mechanical E ester): Specialisation Mechanical): Specialisation Mechanical Engin :: Specialisation Electrical Engineerory	l Engineering, I	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulsor Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E	ter): Specialisation Mechanical E ester): Specialisation Mechanical): Specialisation Mechanical Engin :: Specialisation Electrical Engineer ory ory lective Compulsory	Engineering, f	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulsor Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation I	ter): Specialisation Mechanical E ester): Specialisation Mechanical): Specialisation Mechanical Engine ory ory lective Compulsory Energy Technology: Elective Comp	I Engineering, I eering, Focus Th ring: Elective Co	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulsor Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation I Green Technologies: Energy, Water, Climate: Specialisation I	ter): Specialisation Mechanical E ester): Specialisation Mechanical): Specialisation Mechanical Engine): Specialisation Electrical Enginee ory ory lective Compulsory Energy Technology: Elective Comp Maritime Technologies: Elective Comp	I Engineering, I eering, Focus Th ring: Elective Co pulsory compulsory	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation II Computer Science in Engineering: Specialisation II. Mathema	ter): Specialisation Mechanical E ester): Specialisation Mechanical): Specialisation Mechanical Engine ory ory lective Compulsory Energy Technology: Elective Compulsion Maritime Technologies: Elective Contrologies: Elective Cont	I Engineering, I eering, Focus Th ring: Elective Co pulsory compulsory	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation II Green Technologies: Energy, Water, Climate: Specialisation II Computer Science in Engineering: Specialisation II. Mathema Logistics and Mobility: Specialisation Traffic Planning and Sys	ter): Specialisation Mechanical E ester): Specialisation Mechanical): Specialisation Mechanical Engine ory ory lective Compulsory Energy Technology: Elective Compulsory Maritime Technologies: Elective Cotics & Engineering Science: Electistems: Elective Compulsory	eering, Focus Th ring: Elective Co pulsory ompulsory ve Compulsory	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation I Computer Science in Engineering: Specialisation II. Mathema Logistics and Mobility: Specialisation Production Management	ter): Specialisation Mechanical E ester): Specialisation Mechanical): Specialisation Mechanical Engine ory ory lective Compulsory Energy Technology: Elective Compulsion Maritime Technologies: Elective Contics & Engineering Science: Electistems: Elective Compulsory thand Processes: Elective Compulsory	eering, Focus Th ring: Elective Co pulsory ompulsory ve Compulsory	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation I Green Technologies: Energy, Water, Climate: Specialisation I Computer Science in Engineering: Specialisation II. Mathema Logistics and Mobility: Specialisation Traffic Planning and Sys Logistics and Mobility: Specialisation Production Managemen Mechanical Engineering: Core Qualification: Elective Compuls	ter): Specialisation Mechanical E ester): Specialisation Mechanical): Specialisation Mechanical Engine ory ory lective Compulsory Energy Technology: Elective Compulsory Maritime Technologies: Elective Costics & Engineering Science: Electistems: Elective Compulsory and Processes: Elective Compulsory	eering, Focus Th ring: Elective Co pulsory ompulsory ve Compulsory	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation I Green Technologies: Energy, Water, Climate: Specialisation I Computer Science in Engineering: Specialisation II. Mathema Logistics and Mobility: Specialisation Production Managemen Mechanical Engineering: Core Qualification: Elective Compul Mechatronics: Specialisation Naval Engineering: Compulsory	ter): Specialisation Mechanical E ester): Specialisation Mechanical): Specialisation Mechanical Engine ory ory lective Compulsory Energy Technology: Elective Compulsory Maritime Technologies: Elective Costics & Engineering Science: Electistems: Elective Compulsory and Processes: Elective Compulsory	eering, Focus Th ring: Elective Co pulsory ompulsory ve Compulsory	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation I Green Technologies: Energy, Water, Climate: Specialisation I Computer Science in Engineering: Specialisation II. Mathema Logistics and Mobility: Specialisation Production Management Mechanical Engineering: Core Qualification: Elective Compul Mechatronics: Specialisation Naval Engineering: Compulsory Mechatronics: Core Qualification: Compulsory	ter): Specialisation Mechanical E ester): Specialisation Mechanical): Specialisation Mechanical Engine ory ery lective Compulsory Energy Technology: Elective Compulsory Maritime Technologies: Elective Costics & Engineering Science: Electistems: Elective Compulsory at and Processes: Elective Compulsory	eering, Focus Th ring: Elective Co pulsory ompulsory ve Compulsory	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation I Green Technologies: Energy, Water, Climate: Specialisation I Computer Science in Engineering: Specialisation II. Mathema Logistics and Mobility: Specialisation Production Managemen Mechanical Engineering: Core Qualification: Elective Compuls Mechatronics: Specialisation Naval Engineering: Compulsory Mechatronics: Specialisation Robot- and Machine-Systems: Core	ter): Specialisation Mechanical Electrics: Specialisation Mechanical Engine Specialisation Mechanical Engine Specialisation Electrical Engineerry Energy Technology: Elective Computations Electrical Engineering Science: Electrical Electrical Electrical Engineering Science: Electrical Engineerry Electrical Engineer	eering, Focus Th ring: Elective Co pulsory ompulsory ve Compulsory	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) General Engineering Science (German program, 7 semester) General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation I Green Technologies: Energy, Water, Climate: Specialisation I Computer Science in Engineering: Specialisation II. Mathema Logistics and Mobility: Specialisation Traffic Planning and Sy: Logistics and Mobility: Specialisation Production Management Mechanical Engineering: Core Qualification: Elective Compuls Mechatronics: Specialisation Naval Engineering: Compulsory Mechatronics: Specialisation Robot- and Machine-Systems: C Mechatronics: Specialisation Electrical Systems: Elective Corr	ter): Specialisation Mechanical Electrics: Specialisation Mechanical Engine Specialisation Mechanical Engine Specialisation Electrical Engineerry Electrical Engineerry Electrical Electrical Engineerry Specialisation Electrical Engineerry Electrical Electrical Engineerry Electrical Electrical Electrical Electrical Electrical Engineerry Electrical Electrical Electrical Electrical Electrical Electrical Electrical Engineerry Electr	eering, Focus Th ring: Elective Co pulsory ompulsory ve Compulsory	Focus Mechatronics:
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) General Engineering Science (German program, 7 semester) General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation I Green Technologies: Energy, Water, Climate: Specialisation I Computer Science in Engineering: Specialisation II. Mathema Logistics and Mobility: Specialisation Production Managemen Mechanical Engineering: Core Qualification: Elective Compuls Mechatronics: Specialisation Naval Engineering: Compulsory Mechatronics: Specialisation Robot- and Machine-Systems: C Mechatronics: Specialisation Electrical Systems: Elective Cor Technomathematics: Specialisation III. Engineering Science:	ter): Specialisation Mechanical Elective Compulsory and Processes: Elective Compulsory and Elective Compulsory and Elective Compulsory Compulsory Elective Compulsory Elective Compulsory	eering, Focus Th ring: Elective Co pulsory ompulsory ve Compulsory sory	Focus Mechatronics: neoretical Mechanical mpulsory
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering Science (German program, 7 semester) General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation I Green Technologies: Energy, Water, Climate: Specialisation I Computer Science in Engineering: Specialisation III. Mathema Logistics and Mobility: Specialisation Production Managemen Mechanical Engineering: Core Qualification: Elective Compuls Mechatronics: Specialisation Naval Engineering: Compulsory Mechatronics: Specialisation Robot- and Machine-Systems: C Mechatronics: Specialisation Electrical Systems: Elective Cor Technomathematics: Specialisation III. Engineering Science: Engineering and Management - Major in Logistics and Mobilitics.	ter): Specialisation Mechanical Electrics: Specialisation Mechanical Engine Specialisation Mechanical Engine Specialisation Electrical Engineerry Incompulsory Energy Technology: Elective Compulsory Energy Technologies: Elective Compulsory Engineering Science: Electistems: Elective Compulsory and Processes: Elective Compulsory Engineering Science: Elective Compulsory Specialisation Traffic Planning Specialisation Traffi	eering, Focus Th ring: Elective Co pulsory ompulsory ve Compulsory sory	Focus Mechatronics: Recretical Mechanical Impulsory
Credit points Course achievement Examination Examination duration and scale Assignment for the	Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation I Green Technologies: Energy, Water, Climate: Specialisation I Computer Science in Engineering: Specialisation II. Mathema Logistics and Mobility: Specialisation Production Managemen Mechanical Engineering: Core Qualification: Elective Compuls Mechatronics: Specialisation Naval Engineering: Compulsory Mechatronics: Specialisation Robot- and Machine-Systems: C Mechatronics: Specialisation Electrical Systems: Elective Cor Technomathematics: Specialisation III. Engineering Science: Engineering and Management - Major in Logistics and Mobilitic	ter): Specialisation Mechanical Electrics: Specialisation Mechanical Engine Specialisation Mechanical Engine Specialisation Electrical Engineerry Incompulsory Energy Technology: Elective Compulsory Energy Technologies: Elective Compulsory Engineering Science: Electistems: Elective Compulsory and Processes: Elective Compulsory Engineering Elective Compulsory Elective Electrical Engineering Electrical Engineerin	eering, Focus The ring: Elective Conductory ompulsory ve Compulsory sory	Focus Mechatronics: Recretical Mechanical Impulsory Rective Compulsory Rective Compulsory
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering Science (German program, 7 semester) General Engineering Science (German program, 7 semester) Engineering: Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation I Green Technologies: Energy, Water, Climate: Specialisation I Computer Science in Engineering: Specialisation III. Mathema Logistics and Mobility: Specialisation Production Managemen Mechanical Engineering: Core Qualification: Elective Compuls Mechatronics: Specialisation Naval Engineering: Compulsory Mechatronics: Specialisation Robot- and Machine-Systems: C Mechatronics: Specialisation Electrical Systems: Elective Cor Technomathematics: Specialisation III. Engineering Science: Engineering and Management - Major in Logistics and Mobilitics.	ter): Specialisation Mechanical Electrics: Specialisation Mechanical Engine Specialisation Mechanical Engine Specialisation Electrical Engineerry Incompulsory Energy Technology: Elective Compulsory Energy Technologies: Elective Compulsory Engineering Science: Electistems: Elective Compulsory and Processes: Elective Compulsory Engineering Elective Compulsory Elective Electrical Engineering Electrical Engineerin	eering, Focus The ring: Elective Conductory ompulsory ve Compulsory sory	Focus Mechatronics: Recretical Mechanical Impulsory Rective Compulsory Rective Compulsory
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation I Green Technologies: Energy, Water, Climate: Specialisation I Computer Science in Engineering: Specialisation II. Mathema Logistics and Mobility: Specialisation Production Managemen Mechanical Engineering: Core Qualification: Elective Compuls Mechatronics: Specialisation Naval Engineering: Compulsory Mechatronics: Specialisation Robot- and Machine-Systems: C Mechatronics: Specialisation Electrical Systems: Elective Cor Technomathematics: Specialisation III. Engineering Science: Engineering and Management - Major in Logistics and Mobilit Engineering and Management - Major in Logistics and Mobilit Engineering and Management - Major in Logistics and Mobilit	ter): Specialisation Mechanical Electrics: Specialisation Mechanical Engine Specialisation Mechanical Engine Specialisation Electrical Engineerry Incompulsory Energy Technology: Elective Compulsory Energy Technologies: Elective Compulsory Elective Compulsory Elective Compulsory Electrics & Engineering Science: Electistems: Elective Compulsory Electrics Electrice Compulsory Electrice	eering, Focus The ring: Elective Conductory ompulsory ve Compulsory sory	Focus Mechatronics: Recretical Mechanical Impulsory Rective Compulsory Compulsory Processes: Elective
Credit points Course achievement Examination Examination duration and scale Assignment for the	None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semes Compulsory General Engineering Science (German program, 7 semester) Engineering Elective Compulsory General Engineering Science (German program, 7 semester) Digital Mechanical Engineering: Core Qualification: Compulso Electrical Engineering: Core Qualification: Elective Compulso Engineering Science: Specialisation Electrical Engineering: E Green Technologies: Energy, Water, Climate: Specialisation I Green Technologies: Energy, Water, Climate: Specialisation I Computer Science in Engineering: Specialisation II. Mathema Logistics and Mobility: Specialisation Production Managemen Mechanical Engineering: Core Qualification: Elective Compuls Mechatronics: Specialisation Naval Engineering: Compulsory Mechatronics: Specialisation Robot- and Machine-Systems: C Mechatronics: Specialisation Electrical Systems: Elective Cor Technomathematics: Specialisation III. Engineering Science: Engineering and Management - Major in Logistics and Mobilit Engineering and Management - Major in Logistics and Mobilit Engineering and Management - Major in Logistics and Mobilit Engineering and Management - Major in Logistics and Mobilit	ter): Specialisation Mechanical Electrics: Specialisation Mechanical Engine Specialisation Mechanical Engine Specialisation Electrical Engineerry Incompulsory Energy Technology: Elective Compulsory Energy Technologies: Elective Compulsory Elective Compulsory Elective Compulsory Electrics & Engineering Science: Electistems: Elective Compulsory Electrics Electrice Compulsory Electrice	eering, Focus The ring: Elective Conductory ompulsory ve Compulsory sory	Focus Mechatronics: Recretical Mechanical Impulsory Rective Compulsory Compulsory Processes: Elective

Course L0293: Electrical Mac	hines and Actuators
Тур	Lecture
Hrs/wk	3
СР	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Thorsten Kern, Dennis Kähler
Language	DE
Cycle	SoSe
Content	Electric field: Coulomb's law, flux (field) line, work, potential, capacitor, energy, force, capacitive actuators
	Magnetic field: force, flux line, Ampere's law, field at bounderies, flux, magnetic circuit, hysteresis, induction, self-induction, mutual inductance, transformer, electromagnetic actuators
	Synchronous machines, construction and layout, equivalent single line diagrams, no-load and short-cuircuit characteristics, vector diagrams, motor and generator operation, stepper motors
	DC-Machines: Construction and layout, torque generation mechanismen, torque vs speed characteristics, commutation,
	Asynchronous Machines. Magnetic field, construction and layout, equivalent single line diagram, complex stator current diagram (Heylands 'diagram), torque vs. speed characteristics, rotor layout (squirrel-cage vs. sliprings),
	Drives with variable speed, inverter fed operation, special drives
Literature	Hermann Linse, Roland Fischer: "Elektrotechnik für Maschinenbauer", Vieweg-Verlag; Signatur der Bibliothek der TUHH: ETB 313
	Ralf Kories, Heinz Schmitt-Walter: "Taschenbuch der Elektrotechnik"; Verlag Harri Deutsch; Signatur der Bibliothek der TUHH: ETB 122
	"Grundlagen der Elektrotechnik" - anderer Autoren
	Fachbücher "Elektrische Maschinen"

Course L0294: Electrical Mac	ourse L0294: Electrical Machines and Actuators		
Тур	Recitation Section (large)		
Hrs/wk	2		
СР	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Thorsten Kern, Dennis Kähler		
Language	DE		
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		

Module M0594: Funda	mentals of Mechanical Engi	neering Design			
Courses					
Title		Тур	Hrs/wk	СР	
Fundamentals of Mechanical Engine	ering Design (L0258)	Lecture	2	3	
Fundamentals of Mechanical Engine	ering Design (L0259)	Recitation Section (large)	2	3	
Module Responsible	Prof. Dieter Krause				
Admission Requirements	None				
Recommended Previous Knowledge	Basic knowledge about mechanicsInternship (Stage I Practical)	and production engineering			
Educational Objectives	After taking part successfully, students ha	ave reached the following learning results			
Professional Competence	,,,				
	After passing the module, students are ab	ole to:			
	 explain basic working principles and explain requirements, selection crithe background of dimensioning ca 	iteria, application scenarios and practical example	es of basic machir	ne elements, indica	
Skills	After passing the module, students are ab	ole to:			
	 accomplish dimensioning calculatio transfer knowledge learned in the r recognize the content of technical o technically evaluate basic designs. 	module to new requirements and tasks (problem s	olving skills),		
Personal Competence Social Competence Autonomy	Students are able to independently	cal information in the lecture supported by activat deepen their acquired knowledge in exercises. cional knowledge and to recapitulate poorly unde		ı. by using the vide	
Workload in Hours	Independent Study Time 124, Study Time	in Lecture 56			
	6	Till Lecture 30			
-					
	None				
	Written exam				
	120				
scale					
_		ogram, 7 semester): Core Qualification: Compulsor	у		
_	Digital Mechanical Engineering: Core Qual				
	Engineering Science: Specialisation Mechanical Engineering: Compulsory				
	Engineering Science: Specialisation Biomedical Engineering: Compulsory				
	Engineering Science: Specialisation Mechatronics: Compulsory				
	Green Technologies: Energy, Water, Climate: Specialisation Energy Technology: Elective Compulsory Green Technologies: Energy, Water, Climate: Specialisation Maritime Technologies: Elective Compulsory				
	Mechanical Engineering: Core Qualification: Compulsory				
	Mechatronics: Core Qualification: Compulsory				
	Orientation Studies: Core Qualification: Elective Compulsory				
	Naval Architecture: Core Qualification: Compulsory				
	Technomathematics: Specialisation III. Engineering Science: Elective Compulsory				
	Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Elective Compulsory				
		Logistics and Mobility: Specialisation Production			

Course L0258: Fundamentals	of Mechanical Engineering Design
Тур	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Dieter Krause, Prof. Dr. Nikola Bursac, Prof. Sören Ehlers
Language	DE
Cycle	SoSe SoSe
Content	Lecture
	 Introduction to design Introduction to the following machine elements Screws Shaft-hub joints Rolling contact bearings Welding / adhesive / solder joints Springs Axes & shafts Presentation of technical objects (technical drawing)
	Calculation methods for dimensioning the following machine elements:
Literature	 Dubbel, Taschenbuch für den Maschinenbau; Grote, KH., Feldhusen, J.(Hrsg.); Springer-Verlag, aktuelle Auflage. Maschinenelemente, Band I-III; Niemann, G., Springer-Verlag, aktuelle Auflage. Maschinen- und Konstruktionselemente; Steinhilper, W., Röper, R., Springer Verlag, aktuelle Auflage. Einführung in die DIN-Normen; Klein, M., Teubner-Verlag. Konstruktionslehre, Pahl, G.; Beitz, W., Springer-Verlag, aktuelle Auflage. Maschinenelemente 1-2; Schlecht, B., Pearson Verlag, aktuelle Auflage. Maschinenelemente - Gestaltung, Berechnung, Anwendung; Haberhauer, H., Bodenstein, F., Springer-Verlag, aktuelle Auflage. Roloff/Matek Maschinenelemente; Wittel, H., Muhs, D., Jannasch, D., Voßiek, J., Springer Vieweg, aktuelle Auflage. Sowie weitere Bücher zu speziellen Themen

Course L0259: Fundamentals of Mechanical Engineering Design		
Тур	Recitation Section (large)	
Hrs/wk	2	
СР	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Prof. Dieter Krause, Prof. Dr. Nikola Bursac, Prof. Sören Ehlers	
Language	DE	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	

Module M1290: Simul	ation of intra logistics				
Courses					
Title		Тур	Hrs/wk	СР	
Simulation of intra logistics (L1755		Seminar	4	6	
Module Responsible	NN				
Admission Requirements	None				
	Successful completion of the module "Technical Log	gistics"			
Knowledge					
	After taking part successfully, students have reache	ed the following learning results			
Professional Competence	The short state will a social black fall social be social at				
Knowledge	The students will acquire the following knowledge: 1. The students are able to explain the significance, the structure and the components of an event- and object-oriented simulation model in intralogistics.				
	2. The students are able to reflect and explain the process of creating and programming an event- and object-oriented model in intralogistics.			t-oriented simulation	
	3. The students are able to view critically the streng	gths and weaknesses of event- and o	bject-oriented simulation	on model.	
Skills The students will acquire the following skills: 1. The students will be able to derive the necessary parameters for the development of the model in intralogistics from an existing logistics system.			of an event- and object	c-oriented simulation	
	2. The students will be able to program and run Plant Simulation simulation models independently.				
	3. The students can evaluate and interpret the resu	Its from a simulation model.			
Personal Competence					
Social Competence	The students will acquire the following social skills: 1. The students are able to develop a complex simu	llation model in a team.			
	2. The students know the different roles in joint development of a simulation model and can give feedback to their re 3. The students are able to process the simulation results and present them in front of a audience.			heir respective roles.	
Autonomy	The students will acquire the following independent 1. The students work independently in an initially un				
	2. The students are able to derive independently the necessary simulation parameters from information about a logistics system.				
3. The students are able to develop and program an event- and object-oriented simulation models from given pa				oarameters.	
Workload in Hours	Independent Study Time 124, Study Time in Lecture	e 56			
Credit points	6				
Course achievement					
Examination					
Examination duration and scale	90 min				
Assignment for the	Logistics and Mobility: Specialisation Production Ma	nagement and Processes: Elective C	ompulsory		
Following Curricula				_	
	Engineering and Management - Major in Logistics Compulsory	and Mobility: Specialisation Produc	ction Management and	Processes: Elective	
	Engineering and Management - Major in Logistics a	nd Mobility: Specialisation Informatio	on Technology: Elective	Compulsory	

Course L1755: Simulation of	intra logistics
Тур	Seminar
Hrs/wk	4
СР	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	NN
Language	DE
Cycle	SoSe
	The seminar provides an introduction to the development and programming of event and object-oriented simulation models based on the Plant Simulation software. The simulation models are focused on issues and problems in the field of intralogistics. The seminar will be conducted as a combination of theoretical content and autonomously solving simulation tasks on the computer. The students learn the ideal development workflow, programming and evaluation of a simulation model. Furthermore, the student will become familiar with the standard objects of a simulation model in Plant Simulation and their properties and functions. These standard objects will be used, if necessary with the assistance of the instructor, to build simulation models and analyze and evaluate the results. Furthermore, an introduction to the individual programming of simulation models is given on the basis of Sim Talk language.
Literature	Bangsow, Steffen (2011): Praxishandbuch Plant Simulation und SimTalk, Hanser Verlag, München. Bangsow, Steffen (2015): Tecnomatix plant simulation: modeling and programming by means of examples, Springer, Berlin. Eley, Michael (2012): Simulation in der Logistik: Einführung in die Erstellung ereignisdiskreter Modelle unter Verwendung des Werkzeuges "Plant Simulation", Springer, Berlin.

Mobility				
Module M0852: Graph	h Theory and Optimization			
Courses				
Title		Тур	Hrs/wk	СР
Graph Theory and Optimization (L1	1046)	Lecture	2	3
Graph Theory and Optimization (L1	1047)	Recitation Section (small)	2	3
Module Responsible	Prof. Anusch Taraz			
Admission Requirements	None			
Recommended Previous	 Discrete Algebraic Structures 			
Knowledge	Mathematics I			
Educational Objections	After the life was the second of the standards by	and the state of t		
	After taking part successfully, students ha	ave reached the following learning results		
Professional Competence				
Knowledge	Students can name the basic conc	cepts in Graph Theory and Optimization. They are	able to explain the	em using appropriate
	examples.			
	Students can discuss logical conne	ections between these concepts. They are capabl	e of illustrating th	ese connections with
	the help of examples.			
	They know proof strategies and car	n reproduce them.		
Skills				
	· ·	Graph Theory and Optimization with the help of	f the concepts st	udied in this course.
	* '	ring them by applying established methods.	anto atualizad in the	
		verify further logical connections between the conc s can develop and execute a suitable approach,		
	results.	s can develop and execute a suitable approach,	and are able to c	indically evaluate the
	results.			
Personal Competence	,			
Social Competence				
,		r in teams. They are capable to use mathematics as		
		e new concepts according to the needs of their co	operating partners	. Moreover, they can
	design examples to check and dee	pen the understanding of their peers.		
Autonomy				
Autonomy		their understanding of complex concepts on their	own. They can sp	ecify open questions
	precisely and know where to get he	elp in solving them.		
	 Students have developed sufficient 	nt persistence to be able to work for longer period	ods in a goal-orien	ted manner on hard
	problems.			
Wedded to Herry	Independent Study Time 124 Study Time	in Lanking EC		
Workload in Hours Credit points	Independent Study Time 124, Study Time	e iii Lecture 50		
Course achievement				
Examination	Written exam			
Examination duration and	120 min			
scale				
Assignment for the	General Engineering Science (Gorman are	ogram, 7 semester): Specialisation Computer Scien	ice: Compulsory	
-		ogram, 7 semester): Specialisation Computer Science: E	. ,	v
. S.I.S.Willig Cultifcula	Computer Science: Core Qualification: Con	•	.ccave compaisor	J
	Data Science: Core Qualification: Compuls			
	Engineering Science: Specialisation Data	•		
	,	lisation II. Mathematics & Engineering Science: Elec	ctive Compulsory	
		fic Planning and Systems: Elective Compulsory	, ,	
	* '	rmation Technology: Elective Compulsory		
	Logistics and Mobility. Specialisation info			
	Technomathematics: Specialisation I. Mat	thematics: Elective Compulsory		
	Technomathematics: Specialisation I. Mat	thematics: Elective Compulsory Logistics and Mobility: Specialisation Traffic Plannin	g and Systems: El	ective Compulsory

Course L1046: Graph Theory	and Optimization
Тур	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Anusch Taraz
Language	DE/EN
Cycle	SoSe
Content	 Graphs, search algorithms for graphs, trees planar graphs shortest paths minimum spanning trees maximum flow and minimum cut theorems of Menger, König-Egervary, Hall NP-complete problems backtracking and heuristics linear programming duality integer linear programming
Literature	 M. Aigner: Diskrete Mathematik, Vieweg, 2004 T. Cormen, Ch. Leiserson, R. Rivest, C. Stein: Algorithmen - Eine Einführung, Oldenbourg, 2013 J. Matousek und J. Nesetril: Diskrete Mathematik, Springer, 2007 A. Steger: Diskrete Strukturen (Band 1), Springer, 2001 A. Taraz: Diskrete Mathematik, Birkhäuser, 2012 V. Turau: Algorithmische Graphentheorie, Oldenbourg, 2009 KH. Zimmermann: Diskrete Mathematik, BoD, 2006

Course L1047: Graph Theory	Course L1047: Graph Theory and Optimization		
Тур	Recitation Section (small)		
Hrs/wk	2		
СР	3		
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28		
Lecturer	Prof. Anusch Taraz		
Language	DE/EN		
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		

Module M1014: Logis	tics Service Provider Management					
Courses						
Title		Тур	Hrs/wk	СР		
Logistics Service Provider Manager	nent (L1240)	Seminar	3	6		
Module Responsible	Prof. Heike Flämig					
Admission Requirements	None					
Recommended Previous	 Introduction to Logistics and Mobility 					
Knowledge	Transport and cross-docking Technology					
	Logistics Management					
	After taking part successfully, students have reached	d the following learning results				
Professional Competence						
Knowledge	Students are able to					
	 integrate LSPs into the concept of business lo 	gistics				
	 tell the specifics of business services and logi 	stics Services and their derived ch	aracteristics			
	 describe logistics functions as LSP service page 	ckages				
	 explain, why companies outsource logistics Se 					
	describe basic outsorucing processes and ter	-				
	 describe and analyze intra- and intermodal Management of LSPs 	transport institutions as well as	tasks, challenges and c	pportunities for the		
Skills	Students can					
	 support the sub-segment specific business to 	functions and management Tasks	(e.g. for Road Transpor	t, Airlines, SeaPort		
	Providers etc.)					
		categorize LSPs regarding strategic product-market-positioning				
	 derive action plans regarding management ta 	sks depending on contigencies				
Personal Competence						
Social Competence	Students can					
	a discuss case studies in Croups (within and our	toide of the classroom) reaching s	common understanding	and recult		
	 discuss case studies in Groups (within and ou prepare and deliver Business presentations 	iside of the classroom, reaching a	common understanding	and result		
	give and discuss Feedbacks in the large group					
	g g. g					
Autonomy	Students can					
	produce written reports independently					
Workland in Hours	Independent Study Time 129 Study Time in Lecture	12				
Credit points	Independent Study Time 138, Study Time in Lecture 6	74				
Course achievement						
	Written elaboration					
	2 scientific written papers of approx. 20 pages each	Presentation (approx 15 pages)	with 20-minute closing le	ecture in groups of 3		
	to max. 5 persons. Grading of 4 partial grades of 2!					
	member.	, , , , , , , , , , , , , , , , , , ,	,	, , , , , , , , , , , , , , , , , , , ,		
Assignment for the	Logistics and Mobility: Specialisation Traffic Planning	and Systems: Elective Compulsor	ry			
Following Curricula						
	Engineering and Management - Major in Logistics an	d Mobility: Specialisation Traffic P	lanning and Systems: Ele	ctive Compulsory		
	Engineering and Management - Major in Logistics an	d Mobility: Specialisation Informat	ion Technology: Elective	Compulsory		
	Engineering and Management - Major in Logistics	and Mobility: Specialisation Produ	uction Management and	Processes: Elective		
	Compulsory					
	Engineering and Management - Major in Logistics	and Mobility: Specialisation Produ	uction Management and	Processes: Elective		
	Compulsory					

Course L1240: Logistics Serv	rice Provider Management
	Seminar
Hrs/wk	3
CP	6
Workload in Hours	Independent Study Time 138, Study Time in Lecture 42
Lecturer	Prof. Stephan Freichel
Language	DE
Cycle	
Content	1 Concept and Functions
	Define the role of logistics services providers in the overall concept and functions of logistics services providers. Workshop on the role of logistics services providers in the economy, based on up-to-date topics in the field and in the news.
	2 Outsourcing and Cooperation
	Make or buy, forms and management of inter-organizational relations
	3 Institutions
	Special business management features of carriers, haulage contractors, CEP services
	4 Trends, Strategies and Management Functions
	Market trends, requirements, basic business management and management functions (operations, business development, HR, IT, finance/planning and control, organization, leadership)
	5 Strategic Developments and Case Studies
	Selected aspects (e.g. risk and innovation management, global and regional networking, greenwashing and sustainability)
	Examples:
	Case Study A) Types of company (such as haulage contractors, railway operators, road transport companies, heavy goods, textile and refrigerated goods specialists, CEPs, etc) will be introduced and discussed in the context of a presentation.
	Case Study B) Individual companies will be analyzed on the basis of accessible material such as company reports, websites and possibly telephone interviews and case studies will be explained and discussed with regard to the functions of the logistics services provider and the management task of the corporate managements of the selected cases.
Literature	Pfohl, HChr.: Logistiksysteme. Betriebswirtschaftliche Grundlagen. 8., neu bearbeite und aktualisierte Auflage, Berlin u.a. 2009
	Eßig, M. / Hofmann, E. / Stölzle, W.: Supply Chain Management. München 2013.
	Freichel, S.L.K.: Organisation von Logistikservice-Netzwerken. Reihe: Logistik und Unternehmensführung, hrsg. von Prof. Dr. HChr. Pfohl, Bd. 4. Berlin 1993.
	Aberle, G.: Transportwirtschaft. Einzelwirtschaftliche und gesamtwirtschaftliche Grundlagen, 4. überarbeitete und erweiterte Auflage, München/Wien 2006.
	Buchholz, J./Clausen, U./Vastag, A. (Hrsg): Handbuch der Verkehrslogistik, Heidelberg 1998.
	Corsten, H.: Dienstleistungsmanagement, 3. Auflage, München 1997.
	Müller-Daupert, B. (Hrsg.): Logistik-Outsourcing, 2. Auflage, München, Vogel, 2009
	Ihde, G. B.: Transport, Verkehr, Logistik. Gesamtwirtschaftliche Aspekte und einzelwirtschaftliche Handhabung, 3. völlig überarb. und erw. Auflage, München 2001.

van Suntum, U., Verkehrspolitik, München 1986

Title Automation in logistics - Lab (L2913) Automation in logistics - Lab (L2913) Automation in logistics - Seminar (L288) Seminar Automation in logistics - Seminar (L288) NIN Admission Requirements None Recommended Previous Knowledge Computer Science for Engineers - Introduction and Overview' successfully completed Educational Objectives Professional Competence Knowledge 1. The students know the basic principles of measurement and control technology. 2. The students know be calization and navigation solutions for storage and order picking. 4. The students know automation solutions for storage and order picking. 4. The students can developed and implement basic programs with a programmable logic controller. Skills 1. The students can developed and implement basic programs with a programmable logic controller. Personal Competence Social Competence Social Competence 1. The students can arry out algorithms for localization and navigation. 3. The students can evaluate the performance of automated storage and picking solutions. Personal Competence 1. The students are able to explain the basic principles of measurement and control technology to other students. 2. The students can belp other students to find algorithmic errors in localization and navigation algorithms. 3. The students are able to present their results in front of an audience. Autonomy Workload in Hours Credit points Computery Security Secur	Module M1680: Auton	nation in logistics				
Automation in logistics - sub (12913) Project-problem-based Learning 2 2 4 Module Responsible NN None Recommended Previous Knowledge Educational Objectives Professional Competence Knowledge 1. The students know the basic principles of measurement and control technology. 2. The students know the basic principles of measurement and control technology. 3. The students know automation solutions for storage and order picking. 4. The students can developed and implement basic programs with a programmable logic controller. Skills 1. The students can developed and implement basic programs with a programmable logic controller. Personal Competence Social Competence Social Competence 1. The students are able to explain the basic principles of measurement and control technology to other students can developed and implement basic programs with a programmable logic controller. 1. The students can describe and evaluate basic control loops. 2. The students can evaluate the performance of automated storage and picking solutions. Personal Competence Social Competence 1. The students are able to explain the basic principles of measurement and control technology to other students. 2. The students are able to present their results in front of an audience. 1. The students are able to present their results in front of an audience. Workload in Hours Independent Study Time 124, Study Time in Lecture 56 Credit points 6 Course achievement Study Time 124, Study Time in Lecture 56 Credit points 6 Computery Bonus Form Description Type 10% Attestation Programmieraufgaben in SPS Examination and Scale Assignment for the Following Curricula Following	Courses					
Admission Requirements Recommended Previous Knowledge Computer Science for Engineers - Introduction and Overview" successfully completed Educational Objectives After taking part successfully, students have reached the following learning results Professional Competence Knowledge 1. The students know the basic principles of measurement and control technology. 2. The students know localization and navigation solutions used in mobile robotics. 3. The students know automation solutions for storage and order picking. 4. The students can developed and implement basic programs with a programmable logic controller. Skills 1. The students can developed and implement basic programs with a programmable logic controller. Skills 2. The students can describe and evaluate basic control loops. 2. The students can evaluate the performance of automated storage and picking solutions. Personal Competence Social Competence 1. The students are able to explain the basic principles of measurement and control technology to other students. 2. The students are able to presudents to find algorithmic errors in localization and navigation algorithms. 3. The students are able to the performance of automated storage and picking solutions. Autonomy 1. The students are able to explain the basic principles of measurement and control technology to other students. 2. The students are able to predent their results in front of an audience. Autonomy 1. The students are able to independently find a suitable automation approach for a problem. 3. Based on the given task, the students can design an appropriate automation solution. Workload in Hours 6. Course achievement Computery 8. Description Yes 10 % Attestation Programmieraufgaben in SPS Examination duration and scale Assignment for the Following Curricula Logistics and Mobility: Specialisation Information Technology: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Compulsory Engineering and Management - Major in L	Automation in logistics - Lab (L2913			Project-/problem-based Learning	2	2
Recommended Previous Knowledge	Module Responsible	NN				
Educational Objectives After taking part successfully, students have reached the following learning results	Admission Requirements	None				
**Computer Science for Engineers - Introduction and Overview* successfully completed	Recommended Previous	"Technical logistics" successfully comp	oleted			
Professional Competence Knowledge 1. The students know the basic principles of measurement and control technology. 2. The students know localization and navigation solutions used in mobile robotics. 3. The students know automation solutions for storage and order picking. 4. The students can developed and implement basic programs with a programmable logic controller. Skills 1. The students can describe and evaluate basic control loops. 2. The students can carry out algorithms for localization and navigation. 3. The Students can evaluate the performance of automated storage and picking solutions. Personal Competence Social Competence Social Competence 1. The students are able to explain the basic principles of measurement and control technology to other students. 2. The students are able to present their results in front of an audience. Autonomy Autonomy Autonomy Workload in Hours 1. The students are able to independently find a suitable automation approach for a problem. 3. Based on the given task, the students can design an appropriate automation solution. Workload in Hours Credit points Credit points Credit points Sompulsory Bonus Form Description Yes 10 % Attestation Programmieraufgaben in SPS Examination Examination duration and scale Assignment for the Logistics and Mobility: Specialisation Information Technology: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Information Technology: Compulsory	Knowledge	"Computer Science for Engineers - Intr	oduction and Overview" su	uccessfully completed		
1. The students know the basic principles of measurement and control technology. 2. The students know localization and navigation solutions used in mobile robotics. 3. The students know automation solutions for storage and order picking. 4. The students can developed and implement basic programs with a programmable logic controller. Skills	Educational Objectives	After taking part successfully, students	s have reached the following	ng learning results		
1. The students know the basic principles of measurement and control technology. 2. The students know Jocalization and navigation solutions used in mobile robotics. 3. The students know automation solutions for storage and order picking. 4. The students can developed and implement basic programs with a programmable logic controller. Skills 1. The students can describe and evaluate basic control loops. 2. The students can carry out algorithms for localization and navigation. 3. The Students can evaluate the performance of automated storage and picking solutions. Personal Competence Social Competence Social Competence 1. The students are able to explain the basic principles of measurement and control technology to other students. 2. The students are able to present their results in front of an audience. Autonomy Autonomy 1. The students familiarize themselves independently with unknown algorithms. 2. The students are able to independently find a suitable automation approach for a problem. 3. Based on the given task, the students can design an appropriate automation solution. Workload in Hours Independent Study Time 124, Study Time in Lecture 56 Credit points Course achievement Compulsory Bonus Form Description Yes 10 % Attestation Programmieraufgaben in SPS Examination Written exam 90 min Examination duration and scale Assignment for the Logistics and Mobility: Specialisation Information Technology: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Compulsory	Professional Competence					
1. The students can describe and evaluate basic control loops. 2. The students can carry out algorithms for localization and navigation. 3. The Students can evaluate the performance of automated storage and picking solutions. Personal Competence Social Competence 1. The students are able to explain the basic principles of measurement and control technology to other students. 2. The students can help other students to find algorithmic errors in localization and navigation algorithms. 3. The students are able to present their results in front of an audience. Autonomy 1. The students familiarize themselves independently with unknown algorithms. 2. The students are able to independently find a suitable automation approach for a problem. 3. Based on the given task, the students can design an appropriate automation solution. Workload in Hours Credit points 6 Course achievement Yes 10 % Attestation Programmieraufgaben in SPS Examination Written exam Examination duration and scale Assignment for the Following Curricula Logistics and Mobility: Specialisation Information Technology: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Information Technology: Compulsory	Knowledge	2. The students know localization a3. The students know automation s	and navigation solutions us solutions for storage and o	sed in mobile robotics. order picking.	ntroller.	
1. The students are able to explain the basic principles of measurement and control technology to other students. 2. The students can help other students to find algorithmic errors in localization and navigation algorithms. 3. The students are able to present their results in front of an audience. Autonomy 1. The students familiarize themselves independently with unknown algorithms. 2. The students are able to independently find a suitable automation approach for a problem. 3. Based on the given task, the students can design an appropriate automation solution. Workload in Hours Independent Study Time 124, Study Time in Lecture 56 Credit points 6 Course achievement Yes 10 % Attestation Programmieraufgaben in SPS Examination Written exam Examination duration and scale Assignment for the Following Curricula Logistics and Mobility: Specialisation Information Technology: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Information Technology: Compulsory	Skills	2. The students can carry out algo	rithms for localization and	navigation.		
1. The students familiarize themselves independently with unknown algorithms. 2. The students are able to independently find a suitable automation approach for a problem. 3. Based on the given task, the students can design an appropriate automation solution. Workload in Hours Independent Study Time 124, Study Time in Lecture 56 Credit points 6 Compulsory Bonus Form Description Yes 10 % Attestation Programmieraufgaben in SPS Examination Written exam Examination duration and scale Assignment for the Following Curricula Logistics and Mobility: Specialisation Information Technology: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Information Information Technology: Compulsory	Social Competence	2. The students can help other stu	dents to find algorithmic e	rrors in localization and navigati		idents.
3. Based on the given task, the students can design an appropriate automation solution. Workload in Hours Independent Study Time 124, Study Time in Lecture 56 Credit points 6 Course achievement Compulsory Bonus Form Description Yes 10 % Attestation Programmieraufgaben in SPS Examination Written exam Examination duration and scale Assignment for the Following Curricula Logistics and Mobility: Specialisation Information Technology: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Information Information Information Technology: Compulsory	Autonomy	1. The students familiarize themse	elves independently with u	nknown algorithms.		
Workload in Hours Independent Study Time 124, Study Time in Lecture 56 Credit points 6 Course achievement Yes 10 % Attestation Programmieraufgaben in SPS Examination Written exam Examination duration and scale Assignment for the Following Curricula Following Curricula Engineering and Management - Major in Logistics and Mobility: Specialisation Information I		·	•			
Credit points 6 Course achievement Compulsory Bonus Form Description Yes 10 % Attestation Programmieraufgaben in SPS Examination Written exam Examination duration and scale Assignment for the Following Curricula Following Curricula Logistics and Mobility: Specialisation Information Technology: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information I		3. Based on the given task, the stu	idents can design an appro	opriate automation solution.		
Course achievement Compulsory Bonus Form Description Yes 10 % Attestation Programmieraufgaben in SPS Examination Written exam Examination duration and scale Assignment for the Following Curricula Following Curricula Examination Mobility: Specialisation Information Technology: Compulsory Logistics and Mobility: Specialisation Production Management and Processes: Elective Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Compulsory	Workload in Hours	Independent Study Time 124, Study Ti	me in Lecture 56			
Yes 10 % Attestation Programmieraufgaben in SPS Examination Written exam Examination duration and scale Assignment for the Following Curricula Following Curricula Examination duration and scale Assignment for the Following Curricula Logistics and Mobility: Specialisation Information Technology: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Compulsory	Credit points	6				
Examination Written exam Examination duration and scale Assignment for the Following Curricula Assignment for the Indicate the Following Curricula Sequence of Management - Major in Logistics and Mobility: Specialisation Information Technology: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Compulsory	Course achievement					
Examination duration and scale Assignment for the Following Curricula Assignment for the Following Curricula Examination duration and Scale Assignment for the Following Curricula Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Compulsory			Programmier	autgaben in SPS		
Assignment for the Following Curricula Logistics and Mobility: Specialisation Information Technology: Compulsory Logistics and Mobility: Specialisation Production Management and Processes: Elective Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Compulsory						
Assignment for the Following Curricula Logistics and Mobility: Specialisation Information Technology: Compulsory Logistics and Mobility: Specialisation Production Management and Processes: Elective Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Compulsory		90 mm				
Compulsory	Assignment for the	Logistics and Mobility: Specialisation P Engineering and Management - Major Engineering and Management - Major	roduction Management an in Logistics and Mobility: S	d Processes: Elective Compulsor pecialisation Information Techno	ology: Compuls	•

Course L2913: Automation in	logistics - Lab
Тур	Project-/problem-based Learning
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	NN
Language	DE
Cycle	WiSe
Content	Introduction to programmable logic controllers (PLC) with CodeSys
	PLC basics with function blocks and structured text Integration of sensors and actuators Testing of PLC programs in a simulation Transfer of own PLC programs to real control hardware
Literature	Wellenreuther, Günter; Zastrow, Dieter (2016): Automatisieren mit SPS - Übersichten und Übungsaufgaben. Von Grundverknüpfungen bis Ablaufsteuerungen, Wortverarbeitungen und Regelungen, Programmieren mit STEP 7 und CoDeSys, Beispiele, Lernaufgaben, Kontrollaufgaben, Lösungen. 7. Auflage. Wiesbaden: Springer Vieweg (Lehrbuch).

Course L2688: Automation in	logistics - seminar
Тур	Seminar
Hrs/wk	2
СР	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	NN
Language	DE
Cycle	WiSe
Content	(1) Measurement and sensor technology
	(2) Basics of control theory
	(3) Autonomous Mobile Robots
	(4) Automated storage systems
	(5) Robotics in order picking.
Literature	Heinrich, Berthold (2019): Grundlagen Regelungstechnik. 5. Auflage. Hg. v. Wolfgang Schneider. Wiesbaden: Springer Vieweg.
	Parthier, Rainer (2016): Messtechnik. Grundlagen und Anwendungen der elektrischen Messtechnik. 8. Auflage. Wiesbaden, Springer Fachmedien Wiesbaden.
	Thrun, Sebastian; Burgard, Wolfram; Fox, Dieter (2006): Probabilistic robotics. Cambridge, Massachusetts, London, England: MIT Press.
	Wehking, Karl-Heinz (2020): Technisches Handbuch Logistik 1. Fördertechnik, Materialfluss, Intralogistik. Berlin, Heidelberg; Springer Vieweg.

1.00						
Module M1593: Data	Mining					
Courses						
Title				Тур	Hrs/wk	СР
Data Mining (L2434)				Lecture	2	3
Data Mining (L2435)				Project-/problem-based Learning	2	3
Module Responsible	Prof. Stefan Schulte					
Admission Requirements	None					
Recommended Previous						
Knowledge	Databases					
	Machine learning					
Educational Objectives	After taking part succes	sfully, students have re	ached the followin	ng learning results		
Professional Competence						
Knowledge	After successful comple	ion of the course, stud	ents know:			
	5					
	Basic concepts fo Similarity and dia					
	Similarity and disMethods to mine					
	Procedures to ana					
	Approaches to ide	•				
			e a data streams	text data, time series data		
	- Data mining for a	merene types or data, c	g., data streams,	text data, time series data		
Skills	Students are able to ana	lyze large, heterogene	ous volumes of da	ta. They know methods and the	ir application	to recognize patterns
	in data sets and data clu	isters. The students are	e able to apply the	studied methods in different do	omains, e.g., fo	or data streams, text
	data, or time series data	l.				
Personal Competence						
Social Competence	Students can work on co	omplex problems both i	ndependently and	in teams. They can exchange i	deas with each	other and use their
,	individual strengths to s		,	, ,		
Autonomy	Students are able to ind	ependently investigate	a complex proble	m and assess which competenc	ies are require	d to solve it.
Workload in Hours	Independent Study Time	124, Study Time in Le	cture 56			
Credit points	6					
Course achievement	Compulsory Bonus F	orm	Description			
	Yes 20 % S	subject theoretical	andPraktische Arl	peiten zu bestimmten Themen a	us dem Berei	th Data Mining
	ķ	ractical work				
Examination	Written exam					
Examination duration and	90 min					
scale						
				ecialisation Data Science: Comp	ulsory	
Following Curricula			and Software Engir	neering: Elective Compulsory		
	Data Science: Core Qua					
	Engineering Science: Sp					
	Logistics and Mobility: S					
	Mechatronics: Specialisa					
	Technomathematics: Sp					
	Engineering and Manage	ement - Major in Logisti	cs and Mobility: S	pecialisation Information Techno	ology: Elective	Compulsory

Course L2434: Data Mining	
	Lecture
Hrs/wk	
СР	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Stefan Schulte, Dr. Dominik Schallmoser
Language	EN
Cycle	WiSe
Content	 Data preparation Similarity and distance measures Pattern mining Cluster analysis Outliers detection Data mining for different types of data, e.g., data streams, text data, time series data
Literature	Charu C. Aggarwal: Text Mining - The Textbook, Springer, 2015. Available at https://link.springer.com/book/10.1007/978-3-319-14142-8

$\label{thm:module Manual B.Sc.} \begin{tabular}{ll} Module Manual B.Sc. \\ "Engineering and Management - Major in Logistics and Mobility" \\ \end{tabular}$

Course L2435: Data Mining	
Тур	Project-/problem-based Learning
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Stefan Schulte, Dr. Dominik Schallmoser
Language	EN
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M1890: Strate	egic Mar	nageme	ent of To	echnologi	ical Innovati	on		
Courses								
Title						Тур	Hrs/wk	СР
Strategic Management of Technolo	gical Innovat	ion (L3127)				Lecture	3	3
Strategic Management of Technolo	gical Innovat	ion (L3128)				Project-/problem-based Learning	2	3
Module Responsible	Prof. Tim S	chweisfurtl	h					
Admission Requirements	None							
Recommended Previous								
Knowledge								
Educational Objectives	After taking	g part succ	essfully, st	udents have r	eached the followi	ng learning results		
Professional Competence								
Knowledge								
Skills								
Personal Competence								
Social Competence								
Autonomy								
Workload in Hours	Independe	nt Study Ti	me 110, St	udy Time in L	ecture 70			
Credit points	6							
Course achievement	Compulsory	Bonus	Form		Description			
	Yes	20 %	Subject	theoretical	andsemesterbeg	leitende Mini-Tests, Gruppenarb	eiten	
			practical	work				
Examination	Written exa	am						
Examination duration and	60 minutes	5						
scale								
Assignment for the	Engineerin	g and Mana	agement -	Major in Logis	tics and Mobility: S	Specialisation Information Techno	ology: Elective	Compulsory
Following Curricula	Engineerin	g and Man	agement -	- Major in Log	istics and Mobility	y: Specialisation Production Mar	nagement and	Processes: Elective
	Compulsor	у						
	Engineerin	g and Mana	agement -	Major in Logis	tics and Mobility: S	Specialisation Traffic Planning an	d Systems: Ele	ctive Compulsory

Course L3127: Strategic Man	rrse L3127: Strategic Management of Technological Innovation				
Тур	Lecture				
Hrs/wk	3				
СР	3				
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42				
Lecturer	Prof. Tim Schweisfurth				
Language	EN				
Cycle	WiSe				
Content					
Literature					

Course L3128: Strategic Man	Course L3128: Strategic Management of Technological Innovation				
Тур	Project-/problem-based Learning				
Hrs/wk	2				
СР	3				
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28				
Lecturer	Prof. Tim Schweisfurth				
Language	EN				
Cycle	WiSe				
Content					
Literature					

Module M1679: Proce	ss Managemen	it			
Courses					
Title			Тур	Hrs/wk	СР
Basics of process management (L2			Lecture	2	3
Process management practice (L28	(11)		Seminar	2	3
Module Responsible	Prof. Christian Thies				
Admission Requirements	None				
Recommended Previous					
Knowledge					
Educational Objectives	After taking part succ	essfully, students have r	eached the following learning res	sults	
Professional Competence					
Knowledge					
Skills					
Personal Competence					
Social Competence					
Autonomy					
Workload in Hours	Independent Study Ti	me 124, Study Time in L	ecture 56		
Credit points	6				
Course achievement	Compulsory Bonus	Form	Description		
	Yes 20 %	Written elaboration			
Examination	Written exam				
Examination duration and	60 min				
scale					
Assignment for the	Logistics and Mobility	: Specialisation Production	on Management and Processes: C	Compulsory	
Following Curricula	Logistics and Mobility	: Specialisation Informat	ion Technology: Elective Compuls	sory	
	5 5	, ,	tics and Mobility: Specialisation P		. ,
	Engineering and Man	agement - Major in Logis	tics and Mobility: Specialisation Ir	nformation Technology: Electiv	e Compulsory

Course L2810: Basics of proc	cess management
Тур	Lecture
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Christian Thies
Language	DE
Cycle	WiSe
Content	Introduction to business process management Process identification and modeling Process analysis (qualitative and quantitative methods) Process improvement, implementation and monitoring
Literature	Lehrbuch - Dumas, M., La Rosa, M., Mendling, J., & Reijers, H. A. (2021). Grundlagen des Geschäftsprozessmanagements. Übersetzt von T. Grishold, S. Groß, J. Mendling & B. Wurm. Springer Vieweg. Ergänzende Literatur - Weske, M. (2019). Business Process Management. Concepts, Languages, Architectures. Springer - Hirzel, M., Geisel, U., & Gaida, I. (2013). Prozessmanagement in der Praxis. Springer Gabler. - Becker, J., Kugeler, M., & Rosemann, M. (2012). Prozessmanagement. Ein Leitfaden zur prozessorientierten Organisationsgestaltung. Springer.

Course L2811: Process mana	gement practice
Тур	Seminar
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Christian Thies
Language	DE
Cycle	WiSe
Content	
Literature	Lehrbuch
	Seidlmeier, H. (2019). Prozessmodellierung mit ARIS ®. Eine beispielorientierte Einführung für Studium und Praxis in ARIS 10 (5. Auflage). Springer Vieweg. Ergänzende Literatur wird im Seminar bekanntgegeben

	oduction to Control Systems	
Courses		
Title	Typ Hrs/wk CP	
ntroduction to Control Systems (LC		
ntroduction to Control Systems (LC	L0655) Recitation Section (small) 2 2	
Module Responsible	e NN	
Admission Requirements	s None	
Recommended Previous	s Representation of signals and systems in time and frequency domain, Laplace transform	
Knowledge	e e	
Educational Objectives	s After taking part successfully, students have reached the following learning results	
Professional Competence	e	
Knowledge	e	
	Students can represent dynamic system behavior in time and frequency domain, and can in particular explain prope First and accordingly systems.	rties o
	first and second order systems	
	They can explain the dynamics of simple control loops and interpret dynamic properties in terms of frequency response.	ise and
	root locus	
	They can explain the Nyquist stability criterion and the stability margins derived from it. They can explain the myle of the above experie in explain and with a significant stability margins derived from it.	
	They can explain the role of the phase margin in analysis and synthesis of control loops They can explain the way of the phase margin in analysis and synthesis of control loops.	
	They can explain the way a PID controller affects a control loop in terms of its frequency response They can explain is use a riging when controllers designed in continuous time deposits are implemented digitally.	
	They can explain issues arising when controllers designed in continuous time domain are implemented digitally	
Skills	's	
	Students can transform models of linear dynamic systems from time to frequency domain and vice versa	
	They can simulate and assess the behavior of systems and control loops They can simulate and assess the behavior of systems and control loops.	
	They can design PID controllers with the help of heuristic (Ziegler-Nichols) tuning rules They are also because the size of the size	
	They can analyze and synthesize simple control loops with the help of root locus and frequency response techniques They can analyze and synthesize simple control loops with the help of root locus and frequency response techniques. They can analyze and synthesize simple control loops with the help of root locus and frequency response techniques.	-1114
	They can calculate discrete-time approximations of controllers designed in continuous-time and use it for	aigita
	implementation	
	They can use standard software tools (Matlab Control Toolbox, Simulink) for carrying out these tasks	
Personal Competence		
Social Competence	e Students can work in small groups to jointly solve technical problems, and experimentally validate their controller designs	
Autonomy	Students can obtain information from provided sources (lecture notes, software documentation, experiment guides) and	l use it
	when solving given problems.	
	The same about the state of the same and the	
	They can assess their knowledge in weekly on-line tests and thereby control their learning progress.	
Workload in Hours	s Independent Study Time 124, Study Time in Lecture 56	
Credit points	s 6	
Course achievement	t None	
Course achievement Examination		
Examination	Mritten exam	
Examination Examination and	Mritten exam d 120 min	
Examination Examination duration and scale	M Written exam d 120 min e	
Examination Examination duration and scale Assignment for the	Mvritten exam 120 min German program, 7 semester): Core Qualification: Compulsory	
Examination Examination duration and scale	M Written exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory	
Examination Examination duration and scale Assignment for the	M Written exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory	
Examination Examination duration and scale Assignment for the	M Written exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory	
Examination Examination duration and scale Assignment for the	M Written exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory	
Examination Examination duration and scale Assignment for the	M Written exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory Electrical Engineering: Core Qualification: Compulsory	
Examination Examination duration and scale Assignment for the	M Written exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory Electrical Engineering: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory	
Examination Examination duration and scale Assignment for the	M Written exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory Electrical Engineering: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Computer Science in Engineering: Core Qualification: Compulsory	
Examination Examination duration and scale Assignment for the	M Written exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory a Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory Electrical Engineering: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Computer Science in Engineering: Core Qualification: Compulsory Integrated Building Technology: Core Qualification: Elective Compulsory	
Examination Examination duration and scale Assignment for the	M Written exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory a Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory Electrical Engineering: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Computer Science in Engineering: Core Qualification: Compulsory Integrated Building Technology: Core Qualification: Elective Compulsory Logistics and Mobility: Specialisation Information Technology: Elective Compulsory	
Examination Examination duration and scale Assignment for the	M Written exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory a Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory Electrical Engineering: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Computer Science in Engineering: Core Qualification: Compulsory Integrated Building Technology: Core Qualification: Elective Compulsory Logistics and Mobility: Specialisation Information Technology: Elective Compulsory Logistics and Mobility: Specialisation Traffic Planning and Systems: Elective Compulsory	
Examination Examination duration and scale Assignment for the	M Written exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory a Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory Electrical Engineering: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Computer Science in Engineering: Core Qualification: Compulsory Integrated Building Technology: Core Qualification: Elective Compulsory Logistics and Mobility: Specialisation Information Technology: Elective Compulsory Logistics and Mobility: Specialisation Production Management and Processes: Elective Compulsory	
Examination Examination duration and scale Assignment for the	Mitten exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory a Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory Electrical Engineering: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Computer Science in Engineering: Core Qualification: Compulsory Integrated Building Technology: Core Qualification: Elective Compulsory Logistics and Mobility: Specialisation Information Technology: Elective Compulsory Logistics and Mobility: Specialisation Production Management and Processes: Elective Compulsory Mechanical Engineering: Core Qualification: Compulsory	
Examination Examination duration and scale Assignment for the	M Written exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory a Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory Electrical Engineering: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Computer Science in Engineering: Core Qualification: Compulsory Integrated Building Technology: Core Qualification: Elective Compulsory Logistics and Mobility: Specialisation Information Technology: Elective Compulsory Logistics and Mobility: Specialisation Production Management and Processes: Elective Compulsory Mechanical Engineering: Core Qualification: Compulsory Mechanical Engineering: Core Qualification: Compulsory Mechanics: Core Qualification: Compulsory	
Examination Examination duration and scale Assignment for the	Mitten exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory a Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory Electrical Engineering: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Computer Science in Engineering: Core Qualification: Compulsory Integrated Building Technology: Core Qualification: Elective Compulsory Logistics and Mobility: Specialisation Information Technology: Elective Compulsory Logistics and Mobility: Specialisation Production Management and Processes: Elective Compulsory Mechanical Engineering: Core Qualification: Compulsory Mechanical Engineering: Core Qualification: Compulsory Technomathematics: Specialisation III. Engineering Science: Elective Compulsory	
Examination Examination duration and scale Assignment for the	Mitten exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory a Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory Electrical Engineering: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Computer Science in Engineering: Core Qualification: Compulsory Integrated Building Technology: Core Qualification: Elective Compulsory Logistics and Mobility: Specialisation Information Technology: Elective Compulsory Logistics and Mobility: Specialisation Production Management and Processes: Elective Compulsory Mechanical Engineering: Core Qualification: Compulsory Mechanical Engineering: Core Qualification: Compulsory Technomathematics: Specialisation III. Engineering Science: Elective Compulsory Theoretical Mechanical Engineering: Technical Complementary Course Core Studies: Elective Compulsory	
Examination Examination duration and scale Assignment for the	Myritten exam de 20 min de 320 min de 320 min de 320 min de 320 min de 420 min de 520 min de 620 min de 720 min de 7	
Examination Examination duration and scale Assignment for the	Myritten exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory Electrical Engineering: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Computer Science in Engineering: Core Qualification: Elective Compulsory Integrated Building Technology: Core Qualification: Elective Compulsory Logistics and Mobility: Specialisation Information Technology: Elective Compulsory Logistics and Mobility: Specialisation Traffic Planning and Systems: Elective Compulsory Logistics and Mobility: Specialisation Production Management and Processes: Elective Compulsory Mechanical Engineering: Core Qualification: Compulsory Mechatronics: Core Qualification: Compulsory Technomathematics: Specialisation III. Engineering Science: Elective Compulsory Theoretical Mechanical Engineering: Technical Complementary Course Core Studies: Elective Compulsory Process Engineering: Core Qualification: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Elective Compulsory	
Examination Examination duration and scale Assignment for the	m Written exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory Electrical Engineering: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Computer Science in Engineering: Core Qualification: Elective Compulsory Integrated Building Technology: Core Qualification: Elective Compulsory Logistics and Mobility: Specialisation Information Technology: Elective Compulsory Logistics and Mobility: Specialisation Production Management and Processes: Elective Compulsory Mechanical Engineering: Core Qualification: Compulsory Mechanical Engineering: Core Qualification: Compulsory Technomathematics: Specialisation III. Engineering Science: Elective Compulsory Theoretical Mechanical Engineering: Technical Complementary Course Core Studies: Elective Compulsory Process Engineering: Core Qualification: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Elective Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Traffic Planning and Systems: Elective Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Traffic Planning and Systems: Elective Compulsory	-
Examination Examination duration and scale Assignment for the	Myritten exam d 120 min e General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Data Science: Core Qualification: Elective Compulsory Data Science: Specialisation II. Application: Elective Compulsory Electrical Engineering: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Computer Science in Engineering: Core Qualification: Elective Compulsory Integrated Building Technology: Core Qualification: Elective Compulsory Logistics and Mobility: Specialisation Information Technology: Elective Compulsory Logistics and Mobility: Specialisation Traffic Planning and Systems: Elective Compulsory Logistics and Mobility: Specialisation Production Management and Processes: Elective Compulsory Mechanical Engineering: Core Qualification: Compulsory Mechatronics: Core Qualification: Compulsory Technomathematics: Specialisation III. Engineering Science: Elective Compulsory Theoretical Mechanical Engineering: Technical Complementary Course Core Studies: Elective Compulsory Process Engineering: Core Qualification: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Elective Compulsory	-

Course L0654: Introduction t	co Control Systems
Тур	Lecture
Hrs/wk	2
СР	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Language	DE
Cycle	WiSe
Content	Signals and systems
	Linear systems, differential equations and transfer functions First and second order systems, poles and zeros, impulse and step response Stability Feedback systems
	 Principle of feedback, open-loop versus closed-loop control Reference tracking and disturbance rejection Types of feedback, PID control System type and steady-state error, error constants Internal model principle
	Root locus techniques • Root locus plots • Root locus design of PID controllers
	Bode diagram Minimum and non-minimum phase systems Nyquist plot, Nyquist stability criterion, phase and gain margin Loop shaping, lead lag compensation Frequency response interpretation of PID control
	Time delay systems Root locus and frequency response of time delay systems Smith predictor Digital control
	Sampled-data systems, difference equations Tustin approximation, digital implementation of PID controllers
	Introduction to Matlab, Simulink, Control toolbox Computer-based exercises throughout the course
Literature	 Werner, H., Lecture Notes "Introduction to Control Systems" G.F. Franklin, J.D. Powell and A. Emami-Naeini "Feedback Control of Dynamic Systems", Addison Wesley, Reading, MA, 2009 K. Ogata "Modern Control Engineering", Fourth Edition, Prentice Hall, Upper Saddle River, NJ, 2010 R.C. Dorf and R.H. Bishop, "Modern Control Systems", Addison Wesley, Reading, MA 2010

Course L0655: Introduction t	ourse L0655: Introduction to Control Systems				
Тур	Recitation Section (small)				
Hrs/wk	2				
СР	2				
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28				
Lecturer	NN				
Language	DE				
Cycle	WiSe				
Content	See interlocking course				
Literature	See interlocking course				

Module M1289: Logis	tical systems - Industry 4.0				
Courses					
Title		Тур	Hrs/wk	СР	
Logistics systems - Industry 4.0 (L1	753)	Seminar	4	6	
Module Responsible	Prof. Jochen Kreutzfeldt				
Admission Requirements	None				
Recommended Previous	Successful completion of the module "Technical Log	istics"			
Knowledge					
-	After taking part successfully, students have reache	d the following learning results			
Professional Competence					
Knowledge	The students will acquire the following knowledge:				
	The students are able to understand and explain	the concept "Logistical System".			
	2. The students are able to design a logistic system	conceptually.			
	2. The students can develop and implement the con	trol of a logistic system with python			
	The students can develop and implement the con	troi oi a logistic system with python.			
Skills	The students will acquire the following skills:				
	1. The students are able to identify logistical system	s, analyze and identify potential for o	change and improvem	ent.	
	2. The students know different technical solutions to	address problems in logistical system	ms.		
	3. The students are capable of deploying technic	al solutions and ideas from the co	ncept Industry 4.0 to	deal with logistical	
	problems.				
Personal Competence	The shudowke will assuite the following social skills:				
Social Competence	The students will acquire the following social skills: 1. The students are able to develop technical solutions for logistical systems and reflect their contribution within the team.				
	1. The students are able to develop technical solution	mis for logistical systems and reflect t	inen contribution with	in the team.	
	2. The technical solutions from the group can be join	ntly documented and presented.			
	3. Students are able to present their technologic	cal solutions to an audience and d	erived from the criti-	que new ideas and	
	improvements.				
Autonomy	The students will acquire the following independent	competencies:			
	The students can independently develop technical		der supervision.		
	2. The students are able to evaluate their technical	solutions and discuss the pros and co	ns		
	3. The students are able to assess the impact of the	concept Industry 4.0 on their own ca	reer development.		
Workload in Hours	Independent Study Time 124, Study Time in Lecture	: 56			
Credit points	6				
Course achievement	None				
Examination	Written elaboration				
Examination duration and	Lab prototype with documentation (group work)				
scale					
Assignment for the	Logistics and Mobility: Specialisation Information Te	chnology: Elective Compulsory			
Following Curricula	Logistics and Mobility: Specialisation Traffic Planning	and Systems: Elective Compulsory			
	Logistics and Mobility: Specialisation Production Mar				
	Engineering and Management - Major in Logistics ar				
	Engineering and Management - Major in Logistics ar	* *			
	Engineering and Management - Major in Logistics and Mobility: Specialisation Production Management and Processes: Elective				
	Compulsory				
			·	•	

Course L1753: Logistics syst	ems - Industry 4.0
Тур	Seminar
Hrs/wk	4
СР	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Prof. Jochen Kreutzfeldt
Language	DE
Cycle	WiSe
Content	The lecture gives an introduction to the concept of logistical systems with a special emphasis on the subject of Industry 4.0. Here, the system concept in logistics from a technical point of view is introduced. A logistical system is understood as a combination of transport, storage and change processes between source and sink of goods. This lecture will look at the technical aspect of these processes. Industry is a topic of this lecture. Industry 4.0 is understood as the far-reaching digitization and networking of logistical systems and the connection of logistical objects, processes and systems. The logistics industry expects Industry 4.0 to be a profound change and the realization of large improvement potentials. The lecture provides an in-depth introduction to application cases and business models of Industry 4.0 in logistics from a technical standpoint. A possible framework for Industry 4.0 is presented and several application examples are shown. In the exercises, students learn will learn the exemplary use of different technical solutions and know how, which can be used to improve logistical systems.
Literature	Bauernhansl, Thomas et al. (2014): Industrie 4.0 in Produktion, Automatisierung und Logistik. Anwendung, Technologien, Migration. Wiesbaden: Springer Vieweg. Hausladen, Iris (2014): IT-gestützte Logistik. Systeme - Prozesse - Anwendungen. 2. Auflage 2014. Wiesbaden: Imprint: Gabler Verlag. Hompel, Michael ten; Büchter, Hubert; Franzke, Ulrich (2008): Identifikationssysteme und Automatisierung. [Intralogistik]. Berlin, Heidelberg: Springer. Kaufmann, Timothy (2015): Geschäftsmodelle in Industrie 4.0 und dem Internet der Dinge. Der Weg vom Anspruch in die Wirklichkeit. Wiesbaden: Springer Fachmedien Wiesbaden. Martin, Heinrich (2014): Transport- und Lagerlogistik. Planung, Struktur, Steuerung und Kosten von Systemen der Intralogistik. 9., Auflage 2014. Wiesbaden: Imprint: Springer Vieweg. Runkler, Thomas A. (2010): Data-Mining. Methoden und Algorithmen intelligenter Datenanalyse. 1. Aufl. Wiesbaden: Vieweg + Teubner (Studium).

Module M1423: Algor	ithms and Data Structures			
Courses				
Fitle	2046)	Тур	Hrs/wk 4	CP
Algorithms and Data Structures (L2 Algorithms and Data Structures (L2		Lecture Recitation Section (small)	1	4
Module Responsible		,		
Admission Requirements				
Recommended Previous				
Knowledge	Discrete Algebraic Structures			
3.	Mathematics I			
	Mathematics II			
	Procedual Programming Ohio staniontal Programming			
	Objectoriented Programming			
Educational Objectives	After taking part successfully, students have rea	ached the following learning results		
Professional Competence				
Knowledge	Charles to a second the basis assessed in			There are able to
	 Students can name the basic concepts in explain them using appropriate examples 		problem reductio	ns. They are able to
	Students can discuss logical connections		e of illustrating th	ese connections with
	the help of examples.	between these concepts. They are capable	e or mustrating th	ese connections with
	They know proof strategies and can repro	oduce them.		
Skills	Students can model discrete decision, sea	arch and optimization problems with the hel	p of the concepts	studied in this course
	Moreover, they are capable of solving the	em, and reducing them to each other, by app	olying established	methods.
	Students are able to discover and verify for	urther logical connections between the cond	epts studied in the	e course.
	For a given problem, the students can describe the students can d	develop and execute a suitable approach,	and are able to c	ritically evaluate the
	results.			
Personal Competence				
Social Competence				
bocial competence	Students are able to work together in tear	ms. They are capable to use mathematics as	s a common langu	age.
	In doing so, they can communicate new or		operating partners	. Moreover, they car
	design examples to check and deepen the	e understanding of their peers.		
Autonomy				
	Students are capable of checking their up		own. They can sp	ecify open questions
	precisely and know where to get help in s			***********
	 Students have developed sufficient persi problems. 	isterice to be able to work for longer pend	ous in a goal-orien	ted manner on hard
	problems.			
Workload in Hours	Independent Study Time 110, Study Time in Lec	ture 70		
Credit points				
Course achievement		Description		
Evamination	No 20 % Excercises Written exam			
Examination duration and				
scale				
Searc				
Assignment for the	General Engineering Science (German program,	7 semester): Specialisation Computer Scien	ice: Compulsory	
Following Curricula		•	ompulsory	
	Computer Science: Core Qualification: Compulso	pry		
	Data Science: Core Qualification: Compulsory			
	Engineering Science: Specialisation Data Science			
	Computer Science in Engineering: Core Qualifica	, ,		
	Logistics and Mobility: Specialisation Information	3, , ,		
	Technomathematics: Specialisation II. Informatic Engineering and Management - Major in Logistic	, ,	chnology: Floctive	Compulsory
	Linging and management - major in Logistic	.s and Mobility. Specialisation illioinidtion 16	cimology. Elective	Compuisory

$\label{thm:module Manual B.Sc.} \mbox{\tt "Engineering and Management - Major in Logistics and Mobility"}$

Course L2046: Algorithms and Data Structures	
Тур	Lecture
Hrs/wk	4
СР	4
Workload in Hours	Independent Study Time 64, Study Time in Lecture 56
Lecturer	Prof. Matthias Mnich
Language	DE/EN
Cycle	WiSe
Content	 Insertion sort Register machines Asymptotic analysis, Landau notation Polynomial-time algorithms and NP-completeness Divide-and-conquer, merge sort Strassen algorithm Greedy algorithm Dynamic programming Quick sort AVL-trees, B-trees Hashing Depth first search, breadth first search Shortest paths Flow problems, Ford-Fulkerson algorithm
Literature	 T. Cormen, Ch. Leiserson, R. Rivest, C. Stein: Introduction to Algorithms. MIT Press, 2013 S. Skiena: The Algorithm Design Manual. Springer, 2008 J. M. Kleinberg and É. Tardos. Algorithm Design. Addison-Wesley, 2005.

ourse I 2047. Algorithms and Pata Churchuse		
Course L2047: Algorithms an	ourse L2047: Algorithms and Data Structures	
Тур	Recitation Section (small)	
Hrs/wk	1	
СР	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Matthias Mnich	
Language	DE/EN	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Module M1592: Statis	stics			
Courses				
Title		Тур	Hrs/wk	СР
Statistics (L2430)		Lecture	3	4
Statistics (L2431)		Recitation Section (small)	1	2
Module Responsible	Prof. Matthias Schulte			
Admission Requirements				
Recommended Previous	Stochastics (or a comparable class)			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the	following learning results		
Professional Competence				
Knowledge Skills	Students can name the basic concepts in Statistics Students can discuss logical connections between the help of examples. Students can model statistical problems with the h solving them by applying established methods. The	these concepts. They are capable elp of the concepts studied in this certain are able to use the statistical software.	of illustrating th ourse. Moreover ware R.	ese connections with
	 Students are able to discover and verify further log For a given problem, the students can develop a results. 	·		
Personal Competence Social Competence	Students are able to work together (e.g. on their in their results appropriately (e.g. during exercise classes). In doing so, they can communicate new concepts and design examples to check and deepen the understand	ss). according to the needs of their coop		
Autonomy	 Students are capable of checking their understand precisely and know where to get help in solving the Students can put their knowledge in relation to the Students have developed sufficient persistence to problems. 	em. contents of other lectures.		
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points				
Course achievement				
Examination				
Examination duration and				
scale				
Assignment for the	General Engineering Science (German program, 7 semest	er): Specialisation Advanced Materia	als: Elective Com	pulsory
-	General Engineering Science (German program, 7 semest			
	General Engineering Science (German program, 7 semest	er): Specialisation Data Science: Cor	mpulsory	
	Computer Science: Specialisation II. Mathematics and Eng	ineering Science: Elective Compulso	ory	
	Data Science: Core Qualification: Compulsory			
	Engineering Science: Specialisation Advanced Materials: E			
	Engineering Science: Specialisation Data Science: Compu			
	Logistics and Mobility: Specialisation Information Technology			
	Technomathematics: Specialisation I. Mathematics: Electi Theoretical Mechanical Engineering: Specialisation Roboti		`omnulson/	
	Theoretical Mechanical Engineering: Specialisation Roboti Theoretical Mechanical Engineering: Specialisation Roboti	•		
	Engineering and Management - Major in Logistics and Mol	•		Compulsory
	Evgloces und Planagement	, Specialization morniation reci	J.ogj. Elective	

Course L2430: Statistics	
Тур	Lecture
Hrs/wk	3
СР	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Matthias Schulte
Language	DE/EN
Cycle	WiSe
Content	Multivariate distributions and stochastic convergence Point estimators Confidence intervals Hypothesis testing Nonparametric statistics Linear Regression Time series analysis Statistical software (R)
Literature	 L. Dümbgen (2016): Einführung in die Statistik, Birkhäuser. L. Dümbgen (2003): Stochastik für Informatiker, Springer. HO. Georgii (2012): Stochastics: Introduction to Probability and Statistics, 2nd edition, De Gruyter. N. Henze (2018): Stochastik für Einsteiger, 12th edition, Springer. A. Klenke (2014): Probability Theory: A Comprehensive Course, 2nd edition, Springer. U. Krengel (2005): Einführung in die Wahrscheinlichkeitstheorie und Statistik, 8th edition, Vieweg.

Course L2431: Statistics	ourse L2431: Statistics	
Тур	Recitation Section (small)	
Hrs/wk	1	
СР	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Matthias Schulte	
Language	DE/EN	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Module M0853: Math	ematics III			
Courses				
Title		Тур	Hrs/wk	СР
Analysis III (L1028)		Lecture	2	2
Analysis III (L1029)		Recitation Section (small)	1	1
Analysis III (L1030)		Recitation Section (large)	1	1
Differential Equations 1 (Ordinary I	Differential Equations) (L1031)	Lecture	2	2
Differential Equations 1 (Ordinary I	Differential Equations) (L1032)	Recitation Section (small)	1	1
Differential Equations 1 (Ordinary I	Differential Equations) (L1033)	Recitation Section (large)	1	1
Module Responsible	Prof. Marko Lindner			
Admission Requirements	None			
Recommended Previous	Mathematics I + II			
Knowledge				
	After taking part successfully, students have reached the	following learning results		
	Arter taking pare successibility, students have reached the	Tollowing learning results		
Professional Competence				
Knowledge	Students can name the basic concepts in the area	of analysis and differential equations	s. They are able	to explain them using
	appropriate examples.	,	•	,
	Students can discuss logical connections between	these concepts. They are capable	of illustrating th	ese connections with
	the help of examples.	these concepts. They are capable	or mastrating th	iese comiceanis man
	They know proof strategies and can reproduce the	ım		
	They know proof strategies and carrieproduce the			
Skills	Students can model problems in the area of analy	rsis and differential equations with th	e help of the co	ncents studied in this
	course. Moreover, they are capable of solving the	·	e neip of the col	ncepts studied in this
			ate etudied in the	o cource
	Students are able to discover and verify further lo			
	For a given problem, the students can develop	and execute a suitable approach, a	nd are able to c	critically evaluate the
	results.			
Personal Competence				
Social Competence				
•	Students are able to work together in teams. They	are capable to use mathematics as	a common langu	age.
	 In doing so, they can communicate new concepts 	according to the needs of their coop	erating partners	. Moreover, they can
	design examples to check and deepen the unders	tanding of their peers.		
Autonomy				
	 Students are capable of checking their understan 	ding of complex concepts on their o	wn. They can sp	ecify open questions
	precisely and know where to get help in solving th	em.		
	 Students have developed sufficient persistence t 	o be able to work for longer period	s in a goal-orien	ited manner on hard
	problems.			
Workload in Hours	Independent Study Time 128, Study Time in Lecture 112			
Credit points	, ,			
Course achievement				
Examination				
Examination duration and	60 min (Analysis III) + 60 min (Differential Equations 1)			
scale				
Assignment for the	General Engineering Science (German program, 7 semes	ter): Core Qualification: Compulsory		
Following Curricula	Civil- and Environmental Engineering: Core Qualification:	Compulsory		
	Bioprocess Engineering: Core Qualification: Compulsory			
	Chemical and Bioprocess Engineering: Core Qualification	: Compulsory		
	Digital Mechanical Engineering: Core Qualification: Comp			
	Electrical Engineering: Core Qualification: Compulsory	-		
	Green Technologies: Energy, Water, Climate: Core Qualif	ication: Compulsory		
	Computer Science in Engineering: Core Qualification: Cor			
	Integrated Building Technology: Core Qualification: Comp			
		·		
	Logistics and Mobility: Specialisation Traffic Planning and		conv	
	Logistics and Mobility: Specialisation Production Manager	·	sury	
	Logistics and Mobility: Specialisation Information Techno	logy: Compulsory		
	Mechanical Engineering: Core Qualification: Compulsory			
	Mechatronics: Core Qualification: Compulsory			
	Naval Architecture: Core Qualification: Compulsory			
	Process Engineering: Core Qualification: Compulsory			
	Engineering and Management - Major in Logistics and Mo	bility: Specialisation Traffic Planning	and Systems: El	ective Compulsory
	Engineering and Management - Major in Logistics and	* '	-	
	Compulsory		goment and	
	I COLLINGIANI V			
	Engineering and Management - Major in Logistics and Mo	hility: Specialisation Information Tea	hnology: Commi	leory

Course L1028: Analysis III	
Тур	Lecture
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	Main features of differential and integrational calculus of several variables
Literature	 Differential calculus for several variables Mean value theorems and Taylor's theorem Maximum and minimum values Implicit functions Minimization under equality constraints Newton's method for multiple variables Fourier series Double integrals over general regions Line and surface integrals Theorems of Gauß and Stokes http://www.math.uni-hamburg.de/teaching/export/tuhh/index.html

Course L1029: Analysis III	
Тур	Recitation Section (small)
Hrs/wk	1
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L1030: Analysis III	
Тур	Recitation Section (large)
Hrs/wk	1
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L1031: Differential Equations 1 (Ordinary Differential Equations)	
Тур	Lecture
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	Main features of the theory and numerical treatment of ordinary differential equations
Literature	 Introduction and elementary methods Exsitence and uniqueness of initial value problems Linear differential equations Stability and qualitative behaviour of the solution Boundary value problems and basic concepts of calculus of variations Eigenvalue problems Numerical methods for the integration of initial and boundary value problems Classification of partial differential equations
Literature	http://www.math.uni-hamburg.de/teaching/export/tuhh/index.html

$\label{thm:module Manual B.Sc.} \begin{tabular}{ll} Module Manual B.Sc. \\ "Engineering and Management - Major in Logistics and Mobility" \\ \end{tabular}$

Course L1032: Differential Equations 1 (Ordinary Differential Equations)	
Тур	Recitation Section (small)
Hrs/wk	1
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L1033: Differential Equations 1 (Ordinary Differential Equations)	
Тур	Recitation Section (large)
Hrs/wk	1
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M1070: Simu	lation of Transport and Handl	ling Systems		
Courses				
Title		Тур	Hrs/wk	СР
Simulation of Transport and Handli	ing Systems (L1352)	Lecture	1	2
Simulation of Transport and Handli	ing Systems (L1818)	Recitation Section (small)	3	4
Module Responsible	Prof. Carlos Jahn			
Admission Requirements	None			
Recommended Previous	Basic knowledge of transport- and handling	gtechnology.		
Knowledge				
Educational Objectives	After taking part successfully, students have	ve reached the following learning results		
Professional Competence				
Knowledge	Students can			
	Evolain the structure and workings (of standard external logistics systems		
	Explain the structure and workings of using simulations of using simulations.	tion software subject to the starting situation.		
		ns and kinds of simulation that are in widespread i	ice and evolain th	eir characteristics
	• Tresent different simulation program	ns and kinds of simulation that are in widespread t	ise and explain th	en characteristics.
Skille	Students are able to			
Skills	Students are usic to			
	Recognize, analyze, and assemble in	nto a model the elementary building blocks of a log	gistics system.	
	Map complex external logistics proc	cess using the <i>Plant Simulation</i> ® simulation softwa	re.	
	Draw inferences from the results of	f the simulation, transfer them to the reality, and	deduce action red	commendations from
	them.			
Personal Competence				
Social Competence	Students are capable of			
	Solving complex tasks in a team and	d to document assignments accordingly.		
		ork and giving each other appropriate feedback in	the team.	
		neir project to specialists and representing them.		
Autonomy	Students are able			
		ntly with software with which they are not familiar	and to use it to so	lve complex tasks.
	To define work steps independently	and to acquire the knowledge required to do so.		
Maddenda	Indopendent Childy Time 124 Child Ti	in Lachura EC		
	Independent Study Time 124, Study Time i	III Lecture 56		
Credit points		Description		
Course achievement	No 20 % Subject theoretic	Description Cal and		
	practical work	···		
Examination	Subject theoretical and practical work			
	and production from			
Examination duration and	Simulation study and report with approxim	nately 15 pages per person		
scale				
Assignment for the	Data Science: Core Qualification: Elective C	Compulsory		
Following Curricula	Logistics and Mobility: Specialisation Inform	mation Technology: Elective Compulsory		
	- '	ic Planning and Systems: Elective Compulsory		
		ogistics and Mobility: Specialisation Information Te		
		ogistics and Mobility: Specialisation Traffic Planning		
		Logistics and Mobility: Specialisation Production	Management and	Processes: Elective
	Compulsory			
	Engineering and Management - Major in Compulsory	Logistics and Mobility: Specialisation Production	Management and	l Processes: Elective

Course L1352: Simulation of	Transport and Handling Systems
Тур	Lecture
Hrs/wk	1
СР	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	WiSe
Content	The lecture deals with the simulation of external logistics systems. The focus is therefore on the consideration of logistical
	processes between companies or on transhipment systems, such as ports or individual terminals.
	In the first part of the lecture, students will first acquire basic knowledge of external logistics systems and the advantages of using
	simulations to present them. Then an overview of existing simulation types and programs is given and examples for existing
	simulation models of logistic systems in science and practice are shown. Some simulation models will be demonstrated.
	In the second part of the lecture the students learn the basic handling of the simulation software Plant Simulation®. They receive
	theoretical explanations of the general functionality of the simulation tool, which are further deepened through the use of
	extensive, interactive examples. At the same time, five exercises, which build on each other, offer students the opportunity to
	implement the course content they have learnt alone and in small groups. The exercises can be completed during the supervised
	lecture periods as well as at other times.
	The acquired knowledge is to be applied in the third part in the course of group work. The students will be divided into groups,
	each of which will then work on a relevant problem from the field of (external) logistic systems by means of simulation. The
	students are given a defined period of time for their work. During this time at least one person is always available for questions
	and suggestions. The results of the group work are to be documented in a simulation report and handed in at the end of the
	processing time. Finally, the individual groups present the problems they have worked on and their results in a presentation.
Literature	Bangsow, Steffen (2011): Praxishandbuch Plant Simulation und SimTalk. Anwendung und Programmierung in über 150 Beispiel-
	Modellen. München: Hanser Verlag.
	Eley, Michael (2012): Simulation in der Logistik. Einführung in die Erstellung ereignisdiskreter Modelle unter Verwendung des
	Werkzeuges "Plant Simulation". Berlin, Heidelberg: Springer.
	3pg
	Engelhardt-Nowitzki, Corinna; Nowitzki, Olaf; Krenn, Barbara (2008): Management komplexer Materialflüsse mittels Simulation.
	State-of-the-Art und innovative Konzepte. Wiesbaden: Deutscher Universitäts-Verlag / GWV Fachverlage GmbH, Wiesbaden.
	Rabe, Markus; Spieckermann, Sven; Wenzel, Sigrid (2008): Verifikation und Validierung für die Simulation in Produktion und
	Logistik. Vorgehensmodelle und Techniken. Berlin, Heidelberg: Springer.
	Sargent, Robert G. (2010): Verification and Validation of Simulation Models. In: B. Johansson, S. Jain, J. Montoya-Torres, J. Hugan,
	and E. Yücesan, eds.: Proceedings of the 2010 Winter Simulation Conference.
	VDI-Richlinie: VDI 3633. Simulation von Logistik-, Materialfluß-und Produktionssystemen
	Wenzel, Sigrid; Rabe, Markus; Spieckermann, Sven (2006): Verifikation und Validierung für die Simulation in Produktion und
	Logistik. Vorgehensmodelle und Techniken. 1. Aufl. Berlin: Springer Berlin.

Course L1818: Simulation of	Transport and Handling Systems
Тур	Recitation Section (small)
Hrs/wk	3
СР	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M1349: Object	t-oriented programming in log	gistics		
Courses				
Title		Тур	Hrs/wk	СР
Object-oriented programming in log	gistics (L1901)	Seminar	4	6
Module Responsible				
Admission Requirements				
Recommended Previous Knowledge	Basic computer skills			
Knowledge	Computer Science for Engineers - Introducti	on and Overview		
Educational Objectives	After taking part successfully, students have	e reached the following learning results		
Professional Competence				
Knowledge	The students will acquire the following know	rledge:		
	1. The students are able to explain the basic	cs of object-oriented programming with Java		
	2. The students know basic data types, co programming language.	ntrol structures and basic concepts of obj	ect orientation and inf	neritance in the Java
	3. The students know the necessary tools fo	r programming with Java.		
Skills	The students will acquire the following skills	:		
	1. The students will be able to develop and	run programs with Java independently.		
	2. The students will be able to develop and	implement own objects and classes with Jav	a.	
	3. The students are able to identify and ove	rcome failures autonomously (debugging).		
Personal Competence				
Social Competence	The students will acquire the following socia	ıl skills:		
	1. The students can explain self-developed	programs to other students.		
	2. The students can support others in findin	g failures and mistakes in their software-coo	le.	
	3. The students are able to present their pro	ograms in front of a audience.		
Autonomy	The students will acquire the following comp	petencies:		
	1. The students work independently with an	initially unknown programming language (J	ava).	
	2. The students are able to derive independ	ently the necessary source code for a given	problem.	
	3. The students are able to write their own s	source code in Java based on given a problem	m.	
Workload in Hours	Independent Study Time 124, Study Time in	Lecture 56		
Credit points	6			
Course achievement	None			
Examination				
Examination duration and	90 min			
scale				
Assignment for the	Logistics and Mobility: Specialisation Inform		n Tochnolomy Flactive	Compulsor
Following Curricula	Engineering and Management - Major in Log Engineering and Management - Major in L	• •	3,	. ,
	Compulsory	ogistics and Mobility. Specialisation Produc	.cion management and	riocesses: Elective

Course L1901: Object-oriente	ed programming in logistics
Тур	Seminar
Hrs/wk	4
СР	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	NN
Language	DE
Cycle	WiSe
Content	The seminar provides an introduction to object-oriented programming with Java. Practical knowledge will be transferred through programming exercises parallel to theoretical content. The exercises will deal mainly with logistical problems. The seminar will be conducted as an integrated seminar with a combination of theoretical content and autonomously solved programming problems on the computer. Furthermore, the student will become familiar with the standard libraries of Java and their properties and functions. These standard objects will be used, if necessary with the assistance of an instructor, to build own programs. Furthermore, an introduction to the actual software development kits (SDK) of Java will be given.
Literature	Goll, Joachim; Heinisch, Cornelia (2014): Java als erste Programmiersprache. Ein professioneller Einstieg in die Objektorientierung mit Java. 7. Aufl. 2014. Wiesbaden: Imprint: Springer Vieweg. Jobst, Fritz (2015): Programmieren in Java. [aktuell zu Java 8]. 7., vollst. überarb. Aufl. München: Hanser. Abts, Dietmar (2015): Grundkurs JAVA. Von den Grundlagen bis zu Datenbank- und Netzanwendungen. 8. Aufl. Wiesbaden: Springer Vieweg.

Module M0980: Logis	tics, Transport and Environment			
Courses				
Title Logistics, Transport and Environme Environmental Management and C		Typ Project-/problem-based Learning Seminar	Hrs/wk 2 2	CP 4 2
Module Responsible	Prof. Heike Flämig			
Admission Requirements				
Recommended Previous Knowledge	Introduction to logistics and mobility Foundations of Management			
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence Knowledge	Students are able to explain basic terms of transport logistics, comedescribe actors and system boundaries, challe reflect standards of sustainability managemen	nges and goals of transport logistics	bility	
Skills	Students are able to • design logistics systems independently • differentiate sustainability, CR, CSR and envirc • critically evaluate measures for sustainable log			
Personal Competence Social Competence	Students can creatively develop solutions in teams and work present their knowledge and skills to other stu	·		
Autonomy	carry out small research studies independently apply theoretical knowledge in practical projec apply presentation techniques such as free Whiteboard, Metaplan)	tts	Point), use of i	media (Flip-Chart:
Workload in Hours	Independent Study Time 124, Study Time in Lecture	56		
Credit points	6			
Course achievement	None			
Examination	Written elaboration			
Examination duration and	Written assignment with short presentation			
scale				
Assignment for the Following Curricula		agement and Processes: Elective Compulsor hnology: Elective Compulsory d Mobility: Specialisation Traffic Planning an	d Systems: Elec	
	Engineering and Management - Major in Logistics and	d Mobility: Specialisation Information Techno	ology: Elective (Compulsory

$\label{thm:module Manual B.Sc.} \mbox{\tt "Engineering and Management - Major in Logistics and Mobility"}$

Course L0009: Logistics, Tra	nsport and Environment
Тур	Project-/problem-based Learning
Hrs/wk	2
СР	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	SoSe
Content	Application and creative development of professional knowledge within the framework of the case study "Environmental impacts of
	supply chains" using a specific company as example.
	Depending on the chosen focus of the academic year:
	characteristics of different transport systems
	technologies, structures and processes of transport logistics systems (nodes, network, interactions)
	location and route planning
	connections of information flow and material flows in transport chains
	• interrelation between private and private (contract logistics) and private and public (business policy, transport policy) and
	their (diverging)
	design approaches for sustainable logistics
Literature	Ihde, Gösta B.: Transport, Verkehr, Logistik. Gesamtwirtschaftliche Aspekte und einzelwirtschaftliche Handhabung. 3. überarbeitete Auflage. Vahlen, München 2001

Course L1160: Environmenta	l Management and Corporate Responsibilty
Тур	Seminar
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	SoSe
Content	 Imparting knowledge about standards (e.g. EMAS and ISO 14.001) as important methodological approaches for the integration of environmental and sustainability management in business companies Explaination of theoretical concepts of corporate sustainability management Imparting practical knowledge from different stakeholder views: consulting company, trading enterprise, NGO, financial market
Literature	-

1-10bility				
Module M1595: Mach	ine Learning I			
Courses				
Title		Тур	Hrs/wk	СР
Machine Learning I (L2432)		Lecture	2	3
Machine Learning I (L2433)		Recitation Section (small)	3	3
Module Responsible	Prof. Nihat Ay			
Admission Requirements	None			
Recommended Previous	Linear Algebra, Analysis, Basic Programming Course	e		
Knowledge				
Educational Objectives	After taking part successfully, students have reache	ed the following learning results		
Professional Competence				
Knowledge	The students know			
Skills	general principles of machine learning I parametric/non-parametric learning different learning methods: neural networks, fundamentals of statistical learning theory advanced techniques such as transfer lear control The students can apply machine learning methods to concrete	support vector machines, clustering, dim rning, reinforcement learning, generativ problems	ensionality reduct	ion, kernel methods
Powerful Competence	select and evaluate suitable methods for spe evaluate the quality of a trained data-driven work with known software frameworks for material and the architecture and cost function of notes that show the limits of machine learning methods.	model achine learning eural networks to specific problems		
Personal Competence	Charles to a second and a second as a seco	The contract of the track of the contract of t		
Social Competence	Students can work on complex problems both indep individual strengths to solve the problem.	bendentiy and in teams. They can exchan	ge ideas with each	i other and use their
	individual strengths to solve the problem.			
Autonomy	Students are able to independently investigate a co	implex problem and assess which compet	encies are require	ed to solve it.
Workload in Hours	Independent Study Time 110, Study Time in Lecture	2.70		
Credit points		- 70		
Course achievement		Description		
Course achievement	No 20 % Excercises			
Examination	Written exam			
Examination duration and	90 min			
scale				
Assignment for the	General Engineering Science (German program, 7 s	semester): Specialisation Mechanical Engi	neering, Focus Th	eoretical Mechanical
Following Curricula	Engineering: Elective Compulsory			
	General Engineering Science (German program, 7 s	emester): Specialisation Data Science: Co	ompulsory	
	Computer Science: Specialisation I. Computer and S	Software Engineering: Elective Compulsor	у	
	Data Science: Core Qualification: Compulsory			
	Engineering Science: Specialisation Advanced Mate	, ,		
	Engineering Science: Specialisation Mechatronics: E	, ,		
	Engineering Science: Specialisation Data Science: C			
	Engineering Science: Specialisation Mechanical Eng			
	Computer Science in Engineering: Specialisation I. (
	Logistics and Mobility: Specialisation Information Te	3, ,	son.	
	Mechanical Engineering: Specialisation Theoretical		sui y	
	Mechatronics: Specialisation Dynamic Systems and Technomathematics: Specialisation II. Informatics: I			
	Engineering and Management - Major in Logistics a		chnology: Flective	Compulsory
	Linging and management - major in Logistics at	na modiney. Specialisation information re-	annology. Liective	Compuisory

Course L2432: Machine Lear	ning I
Тур	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Nihat Ay
Language	DE/EN
Cycle	SoSe
Content	 History of neuroscience and machine learning (in particular, the age of deep learning) McCulloch-Pitts neurons and binary Artificial Neural Networks Boolean and threshold functions Universality of McCulloch-Pitts neural networks Learning and the perceptron convergence theorem Support vector machines Harmonic analysis of Boolean functions Continuous Artificial Neural Networks Kolmogorov's superposition theorem Universal approximation with continuous neural networks Approximation error and the gradient decent method: the general idea The stochastic gradient decent method (Robbins-Monro and Kiefer-Wolfowitz cases) Multilayer networks and the backpropagation algorithm Statistical Learning Theory
Literature	 Martin Anthony and Peter L. Bartlett. Neural Network Learning: Theoretical Foundations. Cambridge University Press, 1999. Martin Anthony. Discrete Mathematics of Neural Networks: Selected Topics. SIAM Monographs on Discrete Mathematics & Applications, 1987. Mehryar Mohri, Afshin Rostamizadeh and Ameet Talwalkar. Foundations of Machine Learning, Second Edition. MIT Press, 2018. Christopher M. Bishop. Pattern Recognition and Machine Learning. Information Science and Statistics. Springer-Verlag, 2008. Bernhard Schölkopf, Alexander Smola. Learning with Kernels: Support Vector Machines, Regularization, Optimization, and Beyond. Adaptive Computation and Machine Learning series. MIT Press, Cambridge, MA, 2002. Luc Devroye, László Györfi, Gábor Lugosi. A Probabilistic Theory of Pattern Recognition. Springer, 1996. Vladimir Vapnik. The Nature of Statistical Learning Theory. Springer-Verlag: New York, Berlin, Heidelberg, 1995.

Course L2433: Machine Lear	ning I
Тур	Recitation Section (small)
Hrs/wk	3
СР	3
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42
Lecturer	Prof. Nihat Ay
Language	DE/EN
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Title Stochastics (L0777) Stochastics (L0778) Module Responsible Admission Requirements Knowledge Calculus Discrete algebraic structures (combinatorics) Propositional logic Educational Objectives Frofessional Competence Knowledge Skills Students can name the basic concepts in Stoci Students can discuss logical connections betwith help of examples. They know proof strategies and can reproduce Skills Students are able to discover and verify furthe For a given problem, the students can devel results. Personal Competence Social Competence Students are able to work together (e.g. on the different study programs and background know In doing so, they can communicate new conce design examples to check and deepen the under precisely and know where to get help in solvin to Students can put their knowledge in relation to Students have developed sufficient persisten problems. Workload in Hours Credit points Course achievement None Examination Written exam	nastics. They are able to explain them useen these concepts. They are capable them. Its with the help of the concepts studied methods. It logical connections between the concept and execute a suitable approach, a deir regular home work) in heterogeneous ledge) and to present their results approprists according to the needs of their concepts and in the present their peers. It and ing of complex concepts on their contents are appropriated as a suitable approach.	e of illustrating the ed in this course epts studied in the and are able to expensely composed teropriately (e.g. deperating partners	hese connections with e. Moreover, they are ne course. critically evaluate the eams (i.e., teams from luring exercise class) is. Moreover, they ca
Module Responsible Prof. Matthias Schulte Admission Requirements None Recommended Previous Knowledge Calculus Discrete algebraic structures (combinatorics) Propositional logic Educational Objectives Professional Competence Knowledge Students can name the basic concepts in Stoci Students can discuss logical connections betwith the help of examples. They know proof strategies and can reproduce Skills Students can model problems from stochastic capable of solving them by applying establishe Students are able to discover and verify furthe For a given problem, the students can devel results. Personal Competence Social Competence Social Competence Students are able to work together (e.g. on the different study programs and background know In doing so, they can communicate new conce design examples to check and deepen the under precisely and know where to get help in solvin Students can put their knowledge in relation to Students can put their knowledge in relation to Students have developed sufficient persisten problems. Workload in Hours Independent Study Time 124, Study Time in Lecture Credit points Course achievement None	Lecture Recitation Section (small) the following learning results mastics. They are able to explain them useen these concepts. They are capable them. It is with the help of the concepts studied methods. It logical connections between the concept and execute a suitable approach, a deir regular home work) in heterogeneous ledge) and to present their results approprist according to the needs of their coolerstanding of their peers.	sing appropriate e of illustrating the ed in this course epts studied in the and are able to e usly composed te ropriately (e.g. d	examples. hese connections wit e. Moreover, they ar ne course. critically evaluate th eams (i.e., teams fror luring exercise class) is. Moreover, they ca
Recommended Previous Knowledge Calculus Discrete algebraic structures (combinatorics) Propositional logic Educational Objectives Professional Competence Knowledge Students can name the basic concepts in Stoci Students can discuss logical connections betwith the help of examples. They know proof strategies and can reproduce Skills Students can model problems from stochastic capable of solving them by applying establishe Students are able to discover and verify furthe For a given problem, the students can devel results. Personal Competence Social Competence Social Competence Social Competence Students are able to work together (e.g. on the different study programs and background know) In doing so, they can communicate new concerdesign examples to check and deepen the undersprecisely and know where to get help in solvin Students are capable of checking their undersprecisely and know where to get help in solvin Students have developed sufficient persistent problems. Workload in Hours Independent Study Time 124, Study Time in Lecture Credit points Course achievement None	nastics. They are able to explain them useen these concepts. They are capable them. Its with the help of the concepts studied methods. It logical connections between the concept and execute a suitable approach, a deir regular home work) in heterogeneous ledge) and to present their results approprists according to the needs of their concepts and in the present their peers. It and ing of complex concepts on their contents are appropriated as a suitable approach.	e of illustrating the ed in this course epts studied in the and are able to expensely composed teropriately (e.g. deperating partners	hese connections with e. Moreover, they are ne course. critically evaluate the eams (i.e., teams from luring exercise class) is. Moreover, they ca
Recommended Previous Knowledge Calculus Discrete algebraic structures (combinatorics) Propositional logic Educational Objectives Professional Competence Knowledge Students can name the basic concepts in Stock the help of examples. They know proof strategies and can reproduce students can model problems from stochastic capable of solving them by applying establishe Students are able to discover and verify furthe For a given problem, the students can devel results. Personal Competence Social Competence Social Competence Students are able to work together (e.g. on the different study programs and background know) In doing so, they can communicate new concerdesign examples to check and deepen the undersprecisely and know where to get help in solving students can put their knowledge in relation to Students are developed sufficient persistent problems. Workload in Hours Independent Study Time 124, Study Time in Lecture Credit points 6 Course achievement None	nastics. They are able to explain them useen these concepts. They are capable them. Its with the help of the concepts studied methods. It logical connections between the concept and execute a suitable approach, a deir regular home work) in heterogeneous ledge) and to present their results approprists according to the needs of their concepts and in the present their peers. It and ing of complex concepts on their contents are appropriated as a suitable approach.	e of illustrating the ed in this course epts studied in the and are able to expensely composed teropriately (e.g. deperating partners	hese connections with e. Moreover, they are ne course. critically evaluate the eams (i.e., teams from luring exercise class) is. Moreover, they ca
Calculus Discrete algebraic structures (combinatorics) Propositional logic Educational Objectives After taking part successfully, students have reached Knowledge Students can name the basic concepts in Stoci Students can discuss logical connections betwith help of examples. They know proof strategies and can reproduce students are able to discover and verify furthe For a given problem, the students can devel results. Personal Competence Social Competence Social Competence Social Competence Social Competence Students are able to work together (e.g. on the different study programs and background know in different study programs and background know here to get help in solving students can put their knowledge in relation to Students have developed sufficient persistent problems. Workload in Hours Independent Study Time 124, Study Time in Lecture Credit points Course achievement None	nastics. They are able to explain them useen these concepts. They are capable them. Its with the help of the concepts studied methods. It logical connections between the concept and execute a suitable approach, a deir regular home work) in heterogeneous ledge) and to present their results approprists according to the needs of their concepts and in the present their peers. It and ing of complex concepts on their contents are appropriated as a suitable approach.	e of illustrating the ed in this course epts studied in the and are able to expensely composed teropriately (e.g. deperating partners	hese connections with e. Moreover, they are ne course. critically evaluate the eams (i.e., teams from luring exercise class) is. Moreover, they ca
Professional Competence Knowledge Students can name the basic concepts in Stock Students can discuss logical connections between the help of examples. They know proof strategies and can reproduce Skills Students can model problems from stochastic capable of solving them by applying established Students are able to discover and verify furthed For a given problem, the students can devel results. Personal Competence Social Competence Social Competence Students are able to work together (e.g. on the different study programs and background known) In doing so, they can communicate new concern design examples to check and deepen the undersprecisely and known where to get help in solving Students can put their knowledge in relation to Students have developed sufficient persistent problems. Workload in Hours Independent Study Time 124, Study Time in Lecture Credit points Course achievement None	nastics. They are able to explain them useen these concepts. They are capable them. Its with the help of the concepts studied methods. It logical connections between the concept and execute a suitable approach, a deir regular home work) in heterogeneous ledge) and to present their results approprists according to the needs of their concepts and in the present their peers. It and ing of complex concepts on their contents are appropriated as a suitable approach.	e of illustrating the ed in this course epts studied in the and are able to expensely composed teropriately (e.g. deperating partners	hese connections with e. Moreover, they are ne course. critically evaluate the eams (i.e., teams from luring exercise class) is. Moreover, they ca
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Autonomy Students are capable of checking their unders precisely and know where to get help in solvin Students can put their knowledge in relation to Students have developed sufficient persisten problems. Workload in Hours Independent Study Time 124, Study Time in Lecture Credit points Course achievement None	erstanding of their peers. tanding of complex concepts on their o		
Credit points 6 Course achievement None	the contents of other lectures.	ds in a goal-orieı	nted manner on har
Course achievement None	56		
Examination Written exam			
Examination duration and scale 120 min			
Assignment for the General Engineering Science (German program, 7 ser	nester): Specialisation Computer Science	ce: Compulsory	
Following Curricula General Engineering Science (German program, 7 set General Engineering Science (German program, 7 set Computer Science: Core Qualification: Compulsory Data Science: Core Qualification: Compulsory Engineering Science: Specialisation Advanced Materia Engineering Science: Specialisation Data Science: Co Engineering Science: Specialisation Electrical Engineering Science: Specialisation Electrical Engineering Science: Specialisation Electrical Engineering Science in Engineering: Core Qualification: Logistics and Mobility: Specialisation Information Tectorical Mechanical Engineering: Core Qualification: Theoretical Mechanical Engineering: Core Qualification	nester): Specialisation Data Science: Co als: Elective Compulsory inpulsory iring: Elective Compulsory iring: Elective Compulsory Compulsory		npulsory
Engineering and Management - Major in Logistics and	pulsory		

Course L0777: Stochastics			
Тур	Lecture		
Hrs/wk	2		
СР			
Workload in Hours	ndependent Study Time 92, Study Time in Lecture 28		
Lecturer	Prof. Matthias Schulte		
Language	DE/EN		
Cycle	SoSe		
Content	Definitions of probability, conditional probability Random variables Independence Distributions and density functions Characteristics: expectation, variance, standard deviation, moments Multivariate distributions Law of large numbers and central limit theorem Basic notions of stochastic processes Basic concepts of statistics (point estimators, confidence intervals, hypothesis testing)		
Literature	 L. Dümbgen (2003): Stochastik für Informatiker, Springer. HO. Georgii (2012): Stochastics: Introduction to Probability and Statistics, 2nd edition, De Gruyter. N. Henze (2018): Stochastik für Einsteiger, 12th edition, Springer. A. Klenke (2014): Probability Theory: A Comprehensive Course, 2nd edition, Springer. U. Krengel (2005): Einführung in die Wahrscheinlichkeitstheorie und Statistik, 8th edition, Vieweg. A.N. Shiryaev (2012): Problems in probability, Springer. 		

Course L0778: Stochastics			
Тур	citation Section (small)		
Hrs/wk			
СР			
Workload in Hours	ndependent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Matthias Schulte		
Language	DE/EN		
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		

Specialization Production Management and Processes

Module M0865: Funda	amentals of Production and Qu	uality Management		
Courses				
Title		Тур	Hrs/wk	СР
Production Process Organization (LC	0925)	Lecture	2	3
Quality Management (L0926)		Lecture	2	3
Module Responsible	Prof. Hermann Lödding			
Admission Requirements	None			
Recommended Previous	None			
Knowledge				
Educational Objectives	After taking part successfully, students have	e reached the following learning results		
Professional Competence				
Knowledge	Students are able to explain the contents of	f the lecture of the module.		
Skills	Students are able to apply the methods and	models in the module to industrial problems		
Personal Competence				
Social Competence	-			
Autonomy	-			
Workload in Hours	Independent Study Time 124, Study Time in	Lecture 56		
Credit points	6			
Course achievement	None			
Examination	Written exam			
Examination duration and	180 Minuten			
scale				
Assignment for the	General Engineering Science (German pro	ogram, 7 semester): Specialisation Mechan	ical Engineering, Foc	us Aircraft Systems
Following Curricula	Engineering: Compulsory			
	General Engineering Science (German prog	gram, 7 semester): Specialisation Mechanical	Engineering, Focus Pr	roduct Development
	and Production: Compulsory			
	3 3	ram, 7 semester): Specialisation Advanced M	aterials: Elective Comp	oulsory
	Engineering Science: Specialisation Mechat	ronics: Elective Compulsory		
	Engineering Science: Specialisation Mechan			
	Engineering Science: Specialisation Mechan			
	Engineering Science: Specialisation Advanc	• •		
		ction Management and Processes: Compulsor	у	
	Mechanical Engineering: Core Qualification:	' '		0 1
	Engineering and Management - Major in Log	gistics and Mobility: Specialisation Production	Management and Proc	cesses: Compulsory

Course L0925: Production Process Organization			
Тур	Lecture		
Hrs/wk			
СР			
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28		
Lecturer	Prof. Hermann Lödding		
Language			
Cycle			
Content	(A) Introduction		
	(B) Product planning		
	(C) Process planning		
	(D) Procurement		
	(E) Manufacturing		
	(F) Production planning and control (PPC)		
	(G) Distribution		
	(H) Cooperation		
Literature	Wiendahl, HP.: Betriebsorganisation für Ingenieure		
	Vorlesungsskript		

Course L0926: Quality Management			
Тур	Lecture		
Hrs/wk			
СР	3		
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28		
Lecturer	Prof. Hermann Lödding		
Language	EN		
Cycle	SoSe SoSe		
Content	 Definition and Relevance of Quality Continuous Quality Improvement Quality Management in Product Development Quality Management in Production Processes Design of Experiments 		
Literature	 Pfeifer, Tilo: Quality Management. Strategies, Methods, Techniques; Hanser-Verlag, München 2002 Pfeifer, Tilo: Qualitätsmanagement. Strategien, Methoden, Techniken; Hanser-Verlag, München, 3. Aufl. 2001 Mitra, Amitava: Fundamentals of Quality Control and Improvement; Wiley; Macmillan, 2008 Kleppmann, W.: Taschenbuch Versuchsplanung. Produkte und Prozesse optimieren; Hanser-Verlag, München, 6. Aufl. 2009 		

Module M1897: New	Technologies and Markets			
Courses				
Title		Тур	Hrs/wk	СР
Data-driven marketing and sales (L	3138)	Lecture	3	4
New technologies and market oppo	rtunities (L3139)	Project-/problem-based Learning	1	2
Module Responsible	Prof. Christian Lüthje			
Admission Requirements	None			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have reached the fo	ollowing learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Course achievement	None			
Examination	Subject theoretical and practical work			
Examination duration and	Written elaboration, exercises, presentation, oral participat	ion		
scale				
Assignment for the	Engineering and Management - Major in Logistics and Mobil	lity: Specialisation Information Techno	ology: Elective	Compulsory
Following Curricula	Engineering and Management - Major in Logistics and Mobil	lity: Specialisation Traffic Planning an	d Systems: Ele	ective Compulsory
	Engineering and Management - Major in Logistics and Mo	obility: Specialisation Production Mar	nagement and	Processes: Elective
	Compulsory			

Course L3138: Data-driven marketing and sales			
Тур	ecture		
Hrs/wk	3		
СР			
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42		
Lecturer	Prof. Christian Lüthje		
Language	ge DE		
Cycle	SoSe		
Content			
Literature			

Course L3139: New technologies and market opportunities				
Тур	t-/problem-based Learning			
Hrs/wk				
СР				
Workload in Hours	lependent Study Time 46, Study Time in Lecture 14			
Lecturer	Prof. Christian Lüthje			
Language	Jage DE			
Cycle	SoSe			
Content				
Literature				

Module M0594: Funda	amentals of Mechanical Engi	neering Design			
Courses					
Title		Тур	Hrs/wk	СР	
Fundamentals of Mechanical Engin	eering Design (L0258)	Lecture	2	3	
Fundamentals of Mechanical Engine	eering Design (L0259)	Recitation Section (large)	2	3	
Module Responsible	Prof. Dieter Krause				
Admission Requirements	None				
Recommended Previous Knowledge	Basic knowledge about mechanics Internship (Stage I Practical)	and production engineering			
	- meensing (stage in ractical)				
Educational Objectives	After taking part successfully, students ha	ave reached the following learning results			
Professional Competence					
Knowledge	After passing the module, students are ab	ple to:			
	 explain basic working principles an 	d functions of machine elements,			
		iteria, application scenarios and practical example	es of basic machir	ne elements, indica	
	the background of dimensioning ca				
Skills	After passing the module, students are at	ole to:			
	accomplish dimensioning calculation	ons of covered machine elements,			
	• transfer knowledge learned in the i	module to new requirements and tasks (problem se	olving skills),		
	 recognize the content of technical 				
	 technically evaluate basic designs. 				
B					
Personal Competence					
Social Competence	Students are able to discuss techni	cal information in the lecture supported by activat	ing methods.		
Autonomy	 Students are able to independently 	deepen their acquired knowledge in exercises.			
		tional knowledge and to recapitulate poorly unde	rstood content e.g	. by using the vide	
	recordings of the lectures.		_		
Workload in Hours	Independent Study Time 124, Study Time	in Lecture 56			
Credit points	6				
Course achievement	None				
Examination	Written exam				
Examination duration and	120				
scale					
Assignment for the		ogram, 7 semester): Core Qualification: Compulsor	у		
Following Curricula	Digital Mechanical Engineering: Core Qua				
	Engineering Science: Specialisation Mecha				
	Engineering Science: Specialisation Biome				
	Engineering Science: Specialisation Mechatronics: Compulsory				
		ate: Specialisation Energy Technology: Elective Co			
	Green Technologies: Energy, Water, Climate: Specialisation Maritime Technologies: Elective Compulsory				
	Mechanical Engineering: Core Qualificatio				
	Mechatronics: Core Qualification: Compuls	·			
	Orientation Studies: Core Qualification: El	,			
	Naval Architecture: Core Qualification: Co				
	Technomathematics: Specialisation III. En				
		ogistics and Mobility: Specialisation Information Te			
		Logistics and Mobility: Specialisation Production	Management and	l Processes: Electi	
	Compulsory				

Course L0258: Fundamentals	of Mechanical Engineering Design					
Тур	Lecture					
Hrs/wk	2					
СР	3					
Workload in Hours	dependent Study Time 62, Study Time in Lecture 28					
Lecturer	Prof. Dieter Krause, Prof. Dr. Nikola Bursac, Prof. Sören Ehlers					
Language	DE					
Cycle	Se					
Content	Lecture					
	Introduction to design					
	Introduction to design Introduction to the following machine elements					
	Screws					
	Shaft-hub joints					
	Rolling contact bearings					
	Welding / adhesive / solder joints					
	Springs					
	Axes & shafts					
	Presentation of technical objects (technical drawing)					
	Exercise					
	Calculation methods for dimensioning the following machine elements:					
	• Screws					
	Shaft-hub joints					
	Rolling contact bearings					
	Welding / adhesive / solder joints					
	Springs					
	Axis & shafts					
Literature	Dubbel, Taschenbuch für den Maschinenbau; Grote, KH., Feldhusen, J.(Hrsg.); Springer-Verlag, aktuelle Auflage.					
	Maschinenelemente, Band I-III; Niemann, G., Springer-Verlag, aktuelle Auflage.					
	Maschinen- und Konstruktionselemente; Steinhilper, W., Röper, R., Springer Verlag, aktuelle Auflage.					
	Einführung in die DIN-Normen; Klein, M., Teubner-Verlag.					
	Konstruktionslehre, Pahl, G.; Beitz, W., Springer-Verlag, aktuelle Auflage.					
	Maschinenelemente 1-2; Schlecht, B., Pearson Verlag, aktuelle Auflage.					
	 Maschinenelemente - Gestaltung, Berechnung, Anwendung; Haberhauer, H., Bodenstein, F., Springer-Verlag, aktuelle Auflage. 					
	 Roloff/Matek Maschinenelemente; Wittel, H., Muhs, D., Jannasch, D., Voßiek, J., Springer Vieweg, aktuelle Auflage. Sowie weitere Bücher zu speziellen Themen 					

Course L0259: Fundamentals	ourse L0259: Fundamentals of Mechanical Engineering Design		
Тур	Recitation Section (large)		
Hrs/wk	2		
СР	3		
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28		
Lecturer	Prof. Dieter Krause, Prof. Dr. Nikola Bursac, Prof. Sören Ehlers		
Language	DE		
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		

Module M0725: Produ	ıction Engineering					
Courses						
Title		Тур	Hrs/wk	СР		
Production Engineering I (L0608)		Lecture	2	2		
Production Engineering I (L0612)		Recitation Section (large)	1	1		
Production Engineering II (L0610)	Lecture 2 2					
Production Engineering II (L0611)		Recitation Section (large)	1	1		
Module Responsible	Prof. Jan Hendrik Dege					
Admission Requirements	None					
Recommended Previous	no course assessments required					
Knowledge	internship recommended					
	memoring recommended					
Educational Objectives	After taking part successfully, students have reached th	e following learning results				
Professional Competence						
Knowledge	Students are able to					
	 name basic criteria for the selection of manufactu 	ring processes				
	name the main groups of Manufacturing Technology					
	name the application areas of different manufacture					
	name boundaries, advantages and disadvantages		SS.			
	describe elements, geometric properties and kine	- ·		and process.		
	explain the essential models of manufacturing tea	·		•		
	,					
Skills	Students are able to					
	select manufacturing processes in accordance with					
	design manufacturing processes for simple tasks		e component to b	e produced.		
	 assess components in terms of their production-o 	riented construction.				
Davisanal Commetence						
Personal Competence	Chudanha aya ahla ha					
Social Competence	Students are able to					
	• develop solutions in a production environment with qualified personnel at technical level and represent decisions.					
Autonomy	Students are able to					
	 interpret independently the manufacturing process 					
	assess own strengths and weaknesses in general.					
	assess their learning progress and define gaps to					
	 assess possible consequences of their actions. 	be improved.				
	assess possible consequences of their actions.					
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84					
	,					
Credit points	6					
Course achievement	None					
Examination	Written exam					
Examination duration and	120 min					
scale						
Assignment for the		ster): Specialisation Mechanical Engir	eering, Focus Th	eoretical Mechanica		
Following Curricula	Engineering: Elective Compulsory					
	General Engineering Science (German program, 7 seme	ester): Specialisation Mechanical Engi	neering, Focus F	roduct Developmer		
	and Production: Compulsory					
	Digital Mechanical Engineering: Core Qualification: Com	•				
	Engineering Science: Specialisation Mechanical Engineer	* '				
	Engineering Science: Specialisation Mechanical Engineer		anima. Cara			
	General Engineering Science (English program, 7 semes	- ·		гу		
	Green Technologies: Energy, Water, Climate: Specialisat		pulsory			
	Logistics and Mobility: Specialisation Production Manage	ment and Processes: Compulsory				
	Mechanical Engineering: Core Qualification: Compulsory					
	Mechatronics: Specialisation Naval Engineering: Compul	sory				
	Mechatronics: Core Qualification: Compulsory	Communication				
	Mechatronics: Specialisation Medical Engineering: Electi					
	Mechatronics: Specialisation Robot- and Machine-System		agomont and Pro	cossos. Compulsa-		
	Engineering and Management - Major in Logistics and M Engineering and Management - Major in Logistics and M					
	Engineering and management - major in Logistics and M	Jointy. Specialisation Froduction Malla	agement and F10	ccases. Compuisory		

Course L0608: Production En	gineering I
Тур	Lecture
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Jan Hendrik Dege
Language	DE
Cycle	SoSe
Content	 Manufacturing Accuracy Manufacturing Metrology Measurement Errors and Uncertainties Introduction to Forming Massiv forming and Sheet Metal Forming Introduction to Machining Technology Geometrically defined machining (Turning, milling, drilling, broaching, planning)
Literature	Dubbel, Heinrich (Grote, Karl-Heinrich.; Feldhusen, Jörg.; Dietz, Peter,; Ziegmann, Gerhard,;) Taschenbuch für den Maschinenbau : mit Tabellen. Berlin [u.a.] : Springer, 2007 Fritz, Alfred Herbert: Fertigungstechnik : mit 62 Tabellen. Berlin [u.a.] : Springer, 2004 Keferstein, Claus P (Dutschke, Wolfgang,;): Fertigungsmesstechnik : praxisorientierte Grundlagen, moderne Messverfahren. Wiesbaden : Teubner, 2008 Mohr, Richard: Statistik für Ingenieure und Naturwissenschaftler : Grundlagen und Anwendung statistischer Verfahren. Renningen : expert-Verl, 2008 Klocke, F., König, W.: Fertigungsverfahren Bd. 1 Drehen, Fäsen, Bohren. 8. Aufl., Springer (2008) Klocke, Fritz (König, Wilfried,;): Umformen. Berlin [u.a.] : Springer, 2006 Paucksch, E.: Zerspantechnik, Vieweg-Verlag, 1996 Tönshoff, H.K.; Denkena, B., Spanen. Grundlagen, Springer-Verlag (2004)

Course L0612: Production En	ourse L0612: Production Engineering I		
Тур	Recitation Section (large)		
Hrs/wk	1		
СР	1		
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14		
Lecturer	Prof. Jan Hendrik Dege		
Language	DE		
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		

Course L0610: Production Er	ngineering II
Тур	Lecture
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Jan Hendrik Dege, Prof. Claus Emmelmann
Language	DE
Cycle	SoSe
Content	 Geometrically undefined machining (grinding, lapping, honing) Introduction into erosion technology Introduction into blastig processes Introduction to the manufacturing process forming (Casting, Powder Metallurgy, Composites) Fundamentals of Laser Technology Process versions and Fundamentals of Laser Joining Technology
Literature	Klocke, F., König, W.: Fertigungsverfahren Bd. 2 Schleifen, Honen, Läppen, 4. Aufl., Springer (2005) Klocke, F., König, W.: Fertigungsverfahren Bd. 3 Abtragen, Generieren und Lasermaterialbearbeitung. 4. Aufl., Springer (2007) Spur, Günter (Stöferle, Theodor.;): Urformen. München [u.a.]: Hanser, 1981 Schatt, Werner (Wieters, Klaus-Peter,; Kieback, Bernd,;): Pulvermetallurgie: Technologien und Werkstoffe. Berlin [u.a.]: Springer, 2007

$\label{thm:module Manual B.Sc.} \begin{tabular}{ll} Module Manual B.Sc. \\ "Engineering and Management - Major in Logistics and Mobility" \\ \end{tabular}$

Course L0611: Production En	Course L0611: Production Engineering II		
Тур	Recitation Section (large)		
Hrs/wk	1		
СР	1		
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14		
Lecturer	of. Jan Hendrik Dege, Prof. Claus Emmelmann		
Language			
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		

Module M1680: Auton	nation in logistic	cs				
Courses						
Title Automation in logistics - Lab (L2913) Automation in logistics - seminar (L				Typ Project-/problem-based Learning Seminar	Hrs/wk 2 2	CP 2 4
Module Responsible	NN					
Admission Requirements	None					
Recommended Previous	"Technical logistics" su	ccessfully comple	ted			
Knowledge	"Computer Science for	Engineers - Introd	duction and Overview" su	uccessfully completed		
Educational Objectives	After taking part succe	ssfully, students h	nave reached the following	ng learning results		
Professional Competence						
Knowledge	The students know The students know	ow localization an ow automation so	ciples of measurement and d navigation solutions us lutions for storage and o mplement basic program	sed in mobile robotics.	ntroller.	
Skills	2. The students can	n carry out algorit	aluate basic control loop hms for localization and rformance of automated			
Personal Competence Social Competence	2. The students can	n help other stude		easurement and control technolo rrors in localization and navigati n audience.		
Autonomy	The students far	niliarize themselv	es independently with ur	nknown algorithms.		
				omation approach for a problem		
	3. Based on the giv	en task, the stud	ents can design an appro	opriate automation solution.		
Workload in Hours	Independent Study Tim	ne 124 Study Tim	e in Lecture 56			
Credit points	6					
Course achievement	Compulsory Bonus	Form	Description			
	Yes 10 %	Attestation	Programmiera	aufgaben in SPS		
Examination	Written exam					
Examination duration and	90 min					
scale	t and add and the time	Caratalla et es s				
Assignment for the Following Curricula			ormation Technology: Co	mpulsory d Processes: Elective Compulsor	· ·	
rollowing curricula						sorv
	Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Production Management and Processes: Elective					
	Compulsory	.,	<u> </u>	,	<u> </u>	

Course L2913: Automation in	logistics - Lab
Тур	Project-/problem-based Learning
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	NN
Language	DE
Cycle	WiSe
Content	Introduction to programmable logic controllers (PLC) with CodeSys
	PLC basics with function blocks and structured text Integration of sensors and actuators Testing of PLC programs in a simulation Transfer of own PLC programs to real control hardware
Literature	Wellenreuther, Günter; Zastrow, Dieter (2016): Automatisieren mit SPS - Übersichten und Übungsaufgaben. Von Grundverknüpfungen bis Ablaufsteuerungen, Wortverarbeitungen und Regelungen, Programmieren mit STEP 7 und CoDeSys, Beispiele, Lernaufgaben, Kontrollaufgaben, Lösungen. 7. Auflage. Wiesbaden: Springer Vieweg (Lehrbuch).

Module Manual B.Sc. "Engineering and Management - Major in Logistics and Mobility"

Course L2688: Automation in	logistics - seminar
Тур	Seminar
Hrs/wk	2
СР	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	NN
Language	DE
Cycle	WiSe
Content	(1) Measurement and sensor technology
	(2) Basics of control theory
	(3) Autonomous Mobile Robots
	(4) Automated storage systems
	(5) Robotics in order picking.
Literature	Heinrich, Berthold (2019): Grundlagen Regelungstechnik. 5. Auflage. Hg. v. Wolfgang Schneider. Wiesbaden: Springer Vieweg.
	Parthier, Rainer (2016): Messtechnik. Grundlagen und Anwendungen der elektrischen Messtechnik. 8. Auflage. Wiesbaden, Springer Fachmedien Wiesbaden.
	Thrun, Sebastian; Burgard, Wolfram; Fox, Dieter (2006): Probabilistic robotics. Cambridge, Massachusetts, London, England: MIT Press.
	Wehking, Karl-Heinz (2020): Technisches Handbuch Logistik 1. Fördertechnik, Materialfluss, Intralogistik. Berlin, Heidelberg; Springer Vieweg.

Module M0608: Basic	s of Electrical Er	ngineering				
Courses			_			
Title	200)			Гур	Hrs/wk	CP
Basics of Electrical Engineering (L0 Basics of Electrical Engineering (L0				ecture Recitation Section (small)	3 2	4 2
	1		г	Recitation Section (Smail)	2	2
Module Responsible						
Admission Requirements	None					
Recommended Previous Knowledge	Basics of mathematics					
	After taking part guesa	aafullu atudaata baya s	and and the fallowing	. La a main a maguilha		
Educational Objectives	After taking part succes	ssiully, students have re	eached the following	learning results		
Professional Competence	G					
Knowledge			-	nd electronic circuits with		
				nentes and can present t	ne corresponding (equations. They can
	demonstrate the use of	r the standard methods	for calculations.			
CL III						
SKIIIS		-		th few components and the	to calculate select	ed quantities in the
	circuits. They apply the	e ususai methods of the	electrical engineerii	ng for this.		
Personal Competence						
Social Competence	Students are enabled to	o collaborate in interdis	ciplinary teams with	electrical engineering as	a common languag	ge
	With this, they are learning communication in a target-oriented communication style, are able to understand interfaces to					
	neighboring engineering disciplines and learn about commonalities but also limits in the different directions of engineering.					
Autonomy	Students are able independently to analyse electric and electronic circuits and to calculate selected quantities in the circuits.					
Workload in Hours	Independent Study Tim	Independent Study Time 110, Study Time in Lecture 70				
Credit points	· · · · · · · · · · · · · · · · · · ·	ie 110, Stady Time in L	cetare 70			
Course achievement		Form	Description			
course acmevement		Subject theoretical		Semesters werden Hau	sarbeiten in Forn	n von elektrischen
		practical work	Aufgaben verg	geben, für die durch Sir	mulation eine Lös	ung entwickelt und
			nachgewiesen	werden muss.		
Examination	Subject theoretical and	practical work				
Examination duration and	135 minutes					
scale						
Assignment for the	Bioprocess Engineering	: Core Qualification: Co	mpulsory			<u> </u>
Following Curricula	Digital Mechanical Engi	ineering: Core Qualifica	tion: Compulsory			
	Green Technologies: Er	nergy, Water, Climate: 0	Core Qualification: C	ompulsory		
	Logistics and Mobility:	Specialisation Production	n Management and	Processes: Elective Comp	ulsory	
	Logistics and Mobility:	Specialisation Traffic Pla	anning and Systems	: Elective Compulsory		
	Mechanical Engineering	g: Core Qualification: Co	mpulsory			
	Orientation Studies: Co	re Qualification: Electiv	e Compulsory			
	Naval Architecture: Cor	•	•			
	Process Engineering: C		-			
		gement - Major in Log	istics and Mobility:	Specialisation Production	Management and	Processes: Elective
	Compulsory					
	Engineering and Manag	gement - Major in Logist	ics and Mobility: Sp	ecialisation Traffic Plannin	g and Systems: Ele	ctive Compulsory

Course L0290: Basics of Elec	trical Engineering
	Lecture
71	
Hrs/wk	
СР	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Thorsten Kern
Language	DE
Cycle	WiSe
Content	DC networks: Current, voltage, power, Kirchhoff's laws, equivalent sources, network analysis
	AC: Characteristics, RMS, complexe representation, phasor diagrams, power
	Three phase AC: Characterisitics, star-delta- connection, power, transformer
	Elektronics: Principle, operating behaviour and application of electronic devises as diode, Zener-diode, thyristor, transistor
	operational amplifier
Literature	Alexander von Weiss, Manfred Krause: "Allgemeine Elektrotechnik"; Viweg-Verlag, Signatur der Bibliothek der TUHH: ETB 309
	Ralf Kories, Heinz Schmitt - Walter: "Taschenbuch der Elektrotechnik"; Verlag Harri Deutsch; Signatur der Bibliothek der TUHH:
	ETB 122
	"Grundlagen der Elektrotechnik" - andere Autoren

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Course L0292: Basics of Electrical Engineering					
Тур	Recitation Section (small)				
Hrs/wk	2				
СР	2				
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28				
Lecturer	Prof. Thorsten Kern, Weitere Mitarbeiter				
Language	DE				
Cycle	WiSe				
Content	Excercises to the analysis of circuits and the calculation of electrical quantities th the topics:				
	DC networks: Current, voltage, power, Kirchhoff's laws, equivalent sources, network analysis AC: Characteristics, RMS, complexe representation, phasor diagrams, power Three phase AC: Characteristics, star-delta- connection, power, transformer Elektronics: Principle, operating behaviour and application of electronic devises as diode, Zener-diode, thyristor, transistor operational amplifier Alexander von Weiss, Manfred Krause: "Allgemeine Elektrotechnik"; Viweg-Verlag, Signatur der Bibliothek der TUHH: ETB 309 Ralf Kories, Heinz Schmitt - Walter: "Taschenbuch der Elektrotechnik"; Verlag Harri Deutsch; Signatur der Bibliothek der TUHH: ETB 122 "Grundlagen der Elektrotechnik" - andere Autoren				

Module M1890: Strate	egic Manageme	ent of Tech	nologi	cal Innovation	on		
Courses							
Title					Тур	Hrs/wk	СР
Strategic Management of Technolo	gical Innovation (L3127)				Lecture	3	3
Strategic Management of Technolo	gical Innovation (L3128)				Project-/problem-based Learning	2	3
Module Responsible	Prof. Tim Schweisfurth	h					
Admission Requirements	None						
Recommended Previous							
Knowledge							
Educational Objectives	After taking part succ	essfully, studen	its have re	eached the following	ng learning results		
Professional Competence							
Knowledge							
Skills							
Personal Competence							
Social Competence							
Autonomy							
Workload in Hours	Independent Study Ti	me 110, Study	Time in Le	ecture 70			
Credit points	6						
Course achievement	Compulsory Bonus	Form		Description			
	Yes 20 %	Subject the	oretical	andsemesterbeg	leitende Mini-Tests, Gruppenarb	eiten	
		practical work					
Examination	Written exam						
Examination duration and	60 minutes						
scale							
_		-	-	-	pecialisation Information Techno		
Following Curricula	Engineering and Man	nagement - Maj	or in Log	istics and Mobility	: Specialisation Production Mar	agement and	Processes: Elective
	Compulsory						
	Engineering and Mana	agement - Majoı	r in Logist	ics and Mobility: S	pecialisation Traffic Planning an	d Systems: Ele	ective Compulsory

Course L3127: Strategic Man	ourse L3127: Strategic Management of Technological Innovation				
Тур	Lecture				
Hrs/wk	3				
СР	3				
Workload in Hours	lependent Study Time 48, Study Time in Lecture 42				
Lecturer	Tim Schweisfurth				
Language	EN				
Cycle	WiSe				
Content					
Literature					

Course L3128: Strategic Management of Technological Innovation			
Тур	Project-/problem-based Learning		
Hrs/wk	2		
СР	3		
Workload in Hours	dependent Study Time 62, Study Time in Lecture 28		
Lecturer	f. Tim Schweisfurth		
Language	EN		
Cycle	WiSe		
Content			
Literature			

Module M1679: Proce	ss Managemen	t			
Courses					
Title			Тур	Hrs/wk	СР
Basics of process management (L2			Lecture	2	3
Process management practice (L28	11)		Seminar	2	3
Module Responsible	Prof. Christian Thies				
Admission Requirements	None				
Recommended Previous					
Knowledge					
Educational Objectives	After taking part succ	essfully, students have	reached the following learning result	s	
Professional Competence					
Knowledge					
Skills					
Personal Competence					
Social Competence					
Autonomy					
Workload in Hours	Independent Study Ti	me 124, Study Time in	_ecture 56		
Credit points	6				
Course achievement	Compulsory Bonus	Form	Description		
	Yes 20 %	Written elaboration			
Examination	Written exam				
Examination duration and	60 min				
scale					
Assignment for the	Logistics and Mobility	: Specialisation Product	on Management and Processes: Com	npulsory	
Following Curricula	,	•	tion Technology: Elective Compulsory		
			stics and Mobility: Specialisation Proc	-	
	Engineering and Mana	agement - Major in Logi:	stics and Mobility: Specialisation Info	rmation Technology: Elective	Compulsory

Course L2810: Basics of proc	ess management
Тур	Lecture
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Christian Thies
Language	DE
Cycle	WiSe
Content	 Introduction to business process management Process identification and modeling Process analysis (qualitative and quantitative methods) Process improvement, implementation and monitoring
Literature	Lehrbuch - Dumas, M., La Rosa, M., Mendling, J., & Reijers, H. A. (2021). Grundlagen des Geschäftsprozessmanagements. Übersetzt von T. Grishold, S. Groß, J. Mendling & B. Wurm. Springer Vieweg. Ergänzende Literatur - Weske, M. (2019). Business Process Management. Concepts, Languages, Architectures. Springer - Hirzel, M., Geisel, U., & Gaida, I. (2013). Prozessmanagement in der Praxis. Springer Gabler. - Becker, J., Kugeler, M., & Rosemann, M. (2012). Prozessmanagement. Ein Leitfaden zur prozessorientierten Organisationsgestaltung. Springer.

Course L2811: Process mana	gement practice
Тур	Seminar
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Christian Thies
Language	DE
Cycle	WiSe
Content	
Literature	Lehrbuch
	Seidlmeier, H. (2019). Prozessmodellierung mit ARIS ®. Eine beispielorientierte Einführung für Studium und Praxis in ARIS 10 (5. Auflage). Springer Vieweg. Ergänzende Literatur wird im Seminar bekanntgegeben

MODILITY							
Module M0933: Funda	amentals of Materials Science						
Courses							
Title		Тур	Hrs/wk	СР			
Fundamentals of Materials Science	I (L1085)	Lecture	2	2			
	II (Advanced Ceramic Materials, Polymers and Composites) (L0506)	Lecture	2	2			
Physical and Chemical Basics of Ma		Lecture	2	2			
Module Responsible	Prof. Jörg Weißmüller						
Admission Requirements	None						
Recommended Previous	Highschool-level physics, chemistry und mathematics						
Knowledge							
Educational Objectives	After taking part successfully, students have reached the follow	ring learning results					
Professional Competence							
Knowledge	The students have acquired a fundamental knowledge on r	netals, ceramics an	d polymers and can descr	ibe this knowledge			
	comprehensively. Fundamental knowledge here means specific						
	phase transformations, corrosion and mechanical properties. The						
	for materials and can identify relevant approaches for cha		properties. They are able	to trace materials			
	phenomena back to the underlying physical and chemical laws	of nature.					
Skills	The students are able to trace materials phenomena back t	o the underlying ph	nysical and chemical laws of	of nature. Materials			
	phenomena here refers to mechanical properties such as stre	ngth, ductility, and s	stiffness, chemical propertie	s such as corrosion			
	resistance, and to phase transformations such as solidificatio	n, precipitation, or	melting. The students can	explain the relation			
	between processing conditions and the materials microstructu	ire, and they can a	ccount for the impact of mi	crostructure on the			
	material's behavior.						
Personal Competence							
Social Competence	-						
Autonomy	-						
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84						
Credit points	6						
Course achievement	None						
Examination	Written exam						
Examination duration and	180 min						
scale							
Assignment for the	General Engineering Science (German program, 7 semester): S	pecialisation Mechan	nical Engineering: Compulso	ry			
Following Curricula	General Engineering Science (German program, 7 semester): S			-y			
	General Engineering Science (German program, 7 semester): S		. ,				
	General Engineering Science (German program, 7 semester): Specialisation Advanced Materials: Compulsory						
	Data Science: Specialisation II. Application: Elective Compulsory						
	Digital Mechanical Engineering: Core Qualification: Compulsory						
	Green Technologies: Energy, Water, Climate: Specialisation Energy Technology: Elective Compulsory						
	Green Technologies: Energy, Water, Climate: Specialisation Mai	-					
	Logistics and Mobility: Specialisation Production Management a	nu Processes: Electiv	ve compulsory				
	Mechanical Engineering: Core Qualification: Compulsory						
	Mechatronics: Core Qualification: Compulsory						
	Naval Architecture: Core Qualification: Compulsory Technomathematics: Specialisation III. Engineering Science: Ele	ective Compulsory					
	Technomathematics: Specialisation III. Engineering Science: Ele Engineering and Management - Major in Logistics and Mobilit		nduction Management and	Processes: Florting			
	Compulsory	.,. Specialisation Pit	oaaction management dilu	. rocesses. Liective			
	Compaisory						

Course L1085: Fundamentals	a of Maharinia Crianca I
Course L1085: Fundamentals	s of Materials Science i
Тур	Lecture
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Jörg Weißmüller
Language	DE
Cycle	WiSe
Content	
Literature	Vorlesungsskript
	W.D. Callister: Materials Science and Engineering - An Introduction. 5th ed., John Wiley & Sons, Inc., New York, 2000, ISBN 0-471-32013-7 P. Haasen: Physikalische Metallkunde. Springer 1994

Course L0506: Fundamentals	ourse L0506: Fundamentals of Materials Science II (Advanced Ceramic Materials, Polymers and Composites)				
Тур	Lecture				
Hrs/wk	2				
СР	2				
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28				
Lecturer	Prof. Bodo Fiedler, Prof. Gerold Schneider				
Language	DE				
Cycle	WiSe				
Content	Chemische Bindungen und Aufbau von Festkörpern; Kristallaufbau; Werkstoffprüfung; Schweißbarkeit; Herstellung von Keramiken;				
	Aufbau und Eigenschaften der Keramik; Herstellung, Aufbau und Eigenschaften von Gläsern; Polymerwerkstoffe,				
	Makromolekularer Aufbau; Struktur und Eigenschaften der Polymere; Polymerverarbeitung; Verbundwerkstoffe				
Literature	Vorlesungsskript				
	W.D. Callister: Materials Science and Engineering -An Introduction-5th ed., John Wiley & Sons, Inc., New York, 2000, ISBN 0-471-32013-7				

Course L1095: Physical and (Chemical Basics of Materials Science
Тур	Lecture
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Gregor Vonbun-Feldbauer
Language	DE
Cycle	WiSe
Content	 Motivation: "Atoms in Mechanical Engineering?" Basics: Force and Energy The electromagnetic Interaction "Detour": Mathematics (complex e-funktion etc.) The atom: Bohr's model of the atom Chemical bounds The multi part problem: Solutions and strategies Descriptions of using statistical thermodynamics Elastic theory of atoms Consequences of atomar properties on makroskopic Properties: Discussion of examples (metals, semiconductors, hybrid systems)
Literature	Für den Elektromagnetismus: • Bergmann-Schäfer: "Lehrbuch der Experimentalphysik", Band 2: "Elektromagnetismus", de Gruyter Für die Atomphysik: • Haken, Wolf: "Atom- und Quantenphysik", Springer Für die Materialphysik und Elastizität: • Hornbogen, Warlimont: "Metallkunde", Springer

Module M0956: Meas	urement Technology for Mechani	cal Engineers				
Courses						
Fitle Practical Course: Measurement and Measurement Technology for Mech		Typ Practical Course Lecture	Hrs/wk 2 2	CP 2 2		
leasurement Technology for Mech	anical Engineering (L1118)	Practical Course	2	2		
Module Responsible	Prof. Thorsten Kern					
Admission Requirements	None					
Recommended Previous	Basic knowledge of physics, chemistry and elect	rical engineering				
Knowledge Educational Objectives	After taking part successfully, students have rea	school the following learning results				
Professional Competence	After taking part successiony, students have rea	iched the following learning results				
•	Students are able to name the most important Calibration, Static and Dynamic Properties of Se		ology (Quantities an	d Units, Uncertaint		
	They can outline the most important measuring Temperature, mechanical quantities, Flow, Time		es to be maesured	Electrical Quantitie		
	They can describe important methods of chemic	al Analysis (Gas Sensors, Spectroscopy, C	Gas Chromatography)		
Skills	Students can select suitable measuring methods			•		
	The students are able to orally explain issues in place the issues into the right context and applic	·	iology and solution a	pproaches as well a		
Personal Competence Social Competence	Students can arrive at work results in groups and	d document them in a common report.				
Autonomy	Students are able to familiarize themselves with	new measurement technologies.				
Workload in Hours	Independent Study Time 96, Study Time in Lectu	ure 84				
Credit points						
Course achievement	Compulsory Bonus Form Yes None Subject theoretical a	Description				
	practical work	3110				
Examination	·					
Examination duration and	·	ments on measurements technology an	d sucessfull particip	ation in the practic		
scale	·		a sacessian particip	acion in the practic		
Assignment for the			ngineering: Compuls	ory		
Following Curricula	General Engineering Science (German program,					
	General Engineering Science (German program,	7 semester): Specialisation Advanced Ma	aterials: Elective Com	pulsory		
	Digital Mechanical Engineering: Core Qualification: Compulsory					
	Engineering Science: Specialisation Mechatronics: Compulsory					
	Engineering Science: Specialisation Mechanical E	Engineering: Compulsory				
	Engineering Science: Specialisation Biomedical Engineering: Elective Compulsory					
	Engineering Science: Specialisation Advanced M	• •				
	General Engineering Science (English program, 7 semester): Specialisation Mechatronics: Compulsory					
	General Engineering Science (English program, 7 semester): Specialisation Mechanical Engineering: Compulsory					
	General Engineering Science (English program, 7 semester): Specialisation Biomedical Engineering: Elective Compulsory					
	Logistics and Mobility: Specialisation Production Management and Processes: Elective Compulsory Mechanical Engineering: Core Qualification: Compulsory					
	Mechatronics: Specialisation Naval Engineering:					
	Mechatronics: Specialisation Electrical Systems:					
	Mechatronics: Specialisation Dynamic Systems a					
	Mechatronics: Core Qualification: Compulsory					
	Mechatronics: Specialisation Robot- and Machine	e-Systems: Compulsory				
	Mechatronics: Specialisation Medical Engineering					
	Engineering and Management - Major in Logist		on Management and	l Dragonosa, Flactic		

Course L1119: Practical Course: Measurement and Control Systems		
Тур	Practical Course	
Hrs/wk	2	
СР	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Thorsten Kern	
Language	DE	
Cycle	WiSe/SoSe	
Contont	The content of experiment 1.	

Content The content of experiment 1:

Accuracy testing of a delta robot: In the course of the experiment, the accuracy of a delta robot is tested through 3 tasks. The first task focuses on the online/offline programming of the robot. The second task deals with sensor calibration. In the third task, the radius of a sphere is determined using three different measurement methods (manual measurement, manual measurement with a sensor, automatic data acquisition and data processing).

The content of experiment 3:

The aim of the task is to enable the parallel kinematics to find objects, grasp them and place them on a static target position For this purpose, the end effector of the kinematics is equipped with an optical sensor (camera), whose characteristics are to be defined. The measuring range of the sensor is to be identified and, based on this, a movement strategy for finding the objects is to be developed and implemented. Once the objects have been found, they are to be picked up with a magnetic gripper and transported to their destination.

The content of experiment 4:

The aim of the task is to enable the parallel kinematics to find objects, grab them and deposit them on a moving platform. For this purpose, the end effector of the kinematics is equipped with an optical sensor (camera), the properties of which were worked out in experiment 3. Based on this, the parallel kinematics should now be able to follow the moving platform. For this purpose, a position control must be developed and implemented. Once the controller has been appropriately configured, the objects can be placed on the moving platform.

Literature Versuch 1:

- 1)Weck, Manfred: Brecher, Christian, Maschinenarten und Anwendungsbereiche, Springer (Werkzeugmaschinen, 1, Ed. 6).
- 2)Weck, Manfred; Brecher, Christian. Automatisierung von Maschinen und Anlagen. Springer (Werkzeugmaschinen, 4, Ed. 6). 2006
- 3)Siciliano, Bruno; Khatib, Oussama. Springer handbook of robotics. Springer. 2008
- 4)Schüppstuhl, Thorsten. VL Grundlagen der Handhabungs- und Montagetechnik. 2017

- 1)Hompel, Michael, Hubert Büchter, and Ulrich Franzke. Identifikationssysteme und Automatisierung. Springer-Verlag, 2007.
- ArUco Library Documentation, https://docs.google.com/document/d/1QU9KoBtjSM2kF6ITOjQ76xqL7H0TEtXriJX5kwi9Kgc/edit Stand 10/21
- Demant, Christian, Bernd Streicher-Abel, and Axel Springhoff, Industrielle Bildverarbeitung; wie optische Qualitätskontrolle wirklich funktioniert. Springer-Verlag, 2011.

Versuch 4:

- 1)Will, Thorsten T. C++ Das umfassende Handbuch, Rheinwerk Computing, 2020
- 2)Hildebrand, Walter. Grundkurs Regelungstechnik : Grundlagen für Bachelorstudiengänge aller technischen Fachrichtungen und Wirtschaftsingenieure, Springer Vieweg, 2013.
- 3)Erlenkötter, Helmut. C++: Objektorientiertes Programmieren von Anfang an, rororo, 2016

Bibliography:

Experiment 1

- 1)Weck, Manfred; Brecher, Christian. Maschinenarten und Anwendungsbereiche. Springer (Werkzeugmaschinen, 1, Ed. 6).
- 2)Weck, Manfred; Brecher, Christian. Automatisierung von Maschinen und Anlagen. Springer (Werkzeugmaschinen, 4, Ed.
- 3)Siciliano, Bruno: Khatib, Oussama, Springer handbook of robotics, Springer, 2008
- 4)Schüppstuhl, Thorsten. VL Grundlagen der Handhabungs- und Montagetechnik. 2017

Experiment 3:

- 1)Hompel, Michael, Hubert Büchter, and Ulrich Franzke. Identifikationssysteme und Automatisierung. Springer-Verlag, 2007.
- ArUco Library Documentation, https://docs.google.com/document/d/1QU9KoBtjSM2kF6ITOjQ76xqL7H0TEtXriJX5kwi9Kgc/edit Stand 10/21
- Demant, Christian, Bernd Streicher-Abel, and Axel Springhoff. Industrielle Bildverarbeitung: wie optische Qualitätskontrolle wirklich funktioniert. Springer-Verlag, 2011.

- 1)Will, Thorsten T. C++ Das umfassende Handbuch, Rheinwerk Computing, 2020
- 2)Hildebrand, Walter. Grundkurs Regelungstechnik : Grundlagen für Bachelorstudiengänge aller technischen Fachrichtungen und Wirtschaftsingenieure, Springer Vieweg, 2013.
- 3)Erlenkötter, Helmut. C++: Objektorientiertes Programmieren von Anfang an, rororo, 2016

Course L1116: Measurement	Technology for Mechanical Engineering			
	Lecture			
Hrs/wk	2			
СР				
Workload in Hours	ndependent Study Time 32, Study Time in Lecture 28			
	rof. Thorsten Kern, Dennis Kähler			
Language				
Cycle				
Content	1 Fundamentals			
	1.1 Quantities and Units			
	1.2 Uncertainty			
	1.3 Calibration			
	1.4 Static and Dynamic Properties of Sensors and Systems			
	2 Measurement of Electrical Quantities			
	2.1 Current and Voltage			
	2 Impedance			
	3 Amplification			
	4 Oscilloscope			
	2.5 Analog-to-Digital Conversion			
	2.6 Data Transmission			
	3 Measurement of Nonelectric Quantities			
	3.1 Temperature			
	3.2 Length, Displacement, Angle			
	3.3 Strain, Force, Pressure			
	3.4 Flow			
	3.5 Time, Frequency			
Literature	Lerch, R.: "Elektrische Messtechnik; Analoge, digitale und computergestützte Verfahren", Springer, 2006, ISBN: 978-3-540-34055-3.			
	Profos, P. Pfeifer, T.: "Handbuch der industriellen Messtechnik", Oldenbourg, 2002, ISBN: 978-3486217940.			

Course L1118: Measurement Technology for Mechanical Engineering		
Тур	Practical Course	
Hrs/wk	2	
СР	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Thorsten Kern	
Language	EN	
Cycle	WiSe/SoSe	
Content	See interlocking course	
Literature	See interlocking course	

matics III			
	Typ	Hrs/wk	СР
	2	2	
	Recitation Section (small)	1	1
	Recitation Section (large)	1	1
			2
			1
·	recitation Section (targe)		
nationalies i i ii			
After taking part successfully, students have reached	the following learning results		
accession, stadenis nave redened	tine renerring rearring results		
Students can name the basic concepts in the a	area of analysis and differential equations	. They are able t	to explain them using
appropriate examples.			
 Students can discuss logical connections between 	veen these concepts. They are capable	of illustrating th	ese connections with
the help of examples.			
They know proof strategies and can reproduce	e them.		
Students can model problems in the area of a	nalysis and differential equations with the	help of the cor	ncents studied in this
•	·	theip of the cor	reepts studied in this
		its studied in the	course
	op and execute a suitable approach, al		recarry evaluate the
. esuits.			
Students are able to work together in teams. T	They are capable to use mathematics as a	common langua	age.
• In doing so, they can communicate new conce	epts according to the needs of their coop	erating partners	. Moreover, they car
design examples to check and deepen the unc	derstanding of their peers.		
•		vn. They can sp	ecity open questions
·	ce to be able to work for longer periods		tad manner on hare
problems.		ili a goai-orien	ted manner on hard
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3 None Written exam		i iii a goai-orieri	ted manner on hard
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f	 Students can name the basic concepts in the appropriate examples. Students can discuss logical connections betwithe help of examples. They know proof strategies and can reproduce. Students can model problems in the area of a course. Moreover, they are capable of solving. Students are able to discover and verify further for a given problem, the students can devel results. Students are able to work together in teams. The lindoing so, they can communicate new concedesign examples to check and deepen the uncession. Students are capable of checking their understanding their understanding their students. 	Recitation Section (large) Herential Equations) (L1031) Herential Equations) (L1032) Recitation Section (small) Recitation Section (small) Recitation Section (small) Recitation Section (large) Prof. Marko Lindner None Mathematics I + II After taking part successfully, students have reached the following learning results • Students can name the basic concepts in the area of analysis and differential equations appropriate examples. • Students can discuss logical connections between these concepts. They are capable of the help of examples. • They know proof strategies and can reproduce them. • Students can model problems in the area of analysis and differential equations with the course. Moreover, they are capable of solving them by applying established methods. • Students are able to discover and verify further logical connections between the concept. • For a given problem, the students can develop and execute a suitable approach, ar results. • Students are able to work together in teams. They are capable to use mathematics as a lin doing so, they can communicate new concepts according to the needs of their coope design examples to check and deepen the understanding of their peers. • Students are capable of checking their understanding of complex concepts on their over precisely and know where to get help in solving them.	Lecture 2 Recitation Section (small) 1 Recitation Section (small) 1 Recitation Section (large) 1 Recitation Section (large) 1 Recitation Section (small) 1 Recitation Section (large) 1 Prof. Marko Lindner None Mathematics I + II After taking part successfully, students have reached the following learning results • Students can name the basic concepts in the area of analysis and differential equations. They are able to appropriate examples. • Students can discuss logical connections between these concepts. They are capable of illustrating the the help of examples. • They know proof strategies and can reproduce them. • Students can model problems in the area of analysis and differential equations with the help of the concourse. Moreover, they are capable of solving them by applying established methods. • Students are able to discover and verify further logical connections between the concepts studied in the For a given problem, the students can develop and execute a suitable approach, and are able to concepts. • Students are able to work together in teams. They are capable to use mathematics as a common langure. In doing so, they can communicate new concepts according to the needs of their cooperating partners design examples to check and deepen the understanding of complex concepts on their own. They can specified the students are capable of checking their understanding of complex concepts on their own. They can specified the students are capable of checking their understanding of complex concepts on their own. They can specified the students are capable of checking their understanding of complex concepts on their own. They can specified the students are capable of checking their understanding of complex concepts on their own. They can specified the students are capable of checking their understanding of complex concepts on their own. They can specified the students are capable of checking their

Course L1028: Analysis III			
Тур	ecture		
Hrs/wk			
СР	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Dozenten des Fachbereiches Mathematik der UHH		
Language	DE		
Cycle	WiSe		
Content	Main features of differential and integrational calculus of several variables		
Literature	 Differential calculus for several variables Mean value theorems and Taylor's theorem Maximum and minimum values Implicit functions Minimization under equality constraints Newton's method for multiple variables Fourier series Double integrals over general regions Line and surface integrals Theorems of Gauß and Stokes http://www.math.uni-hamburg.de/teaching/export/tuhh/index.html 		

Course L1029: Analysis III	ourse L1029: Analysis III	
Тур	Recitation Section (small)	
Hrs/wk	1	
СР	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Dozenten des Fachbereiches Mathematik der UHH	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L1030: Analysis III	
Тур	Recitation Section (large)
Hrs/wk	1
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L1031: Differential Equations 1 (Ordinary Differential Equations)			
Тур	ecture		
Hrs/wk			
СР	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Dozenten des Fachbereiches Mathematik der UHH		
Language	DE		
Cycle	WiSe		
Content	Main features of the theory and numerical treatment of ordinary differential equations		
	Introduction and elementary methods Exsitence and uniqueness of initial value problems Linear differential equations Stability and qualitative behaviour of the solution Boundary value problems and basic concepts of calculus of variations Eigenvalue problems Numerical methods for the integration of initial and boundary value problems Classification of partial differential equations		
Literature	http://www.math.uni-hamburg.de/teaching/export/tuhh/index.html		

$\label{thm:module Manual B.Sc.} \begin{tabular}{ll} Module Manual B.Sc. \\ "Engineering and Management - Major in Logistics and Mobility" \\ \end{tabular}$

Course L1032: Differential Equations 1 (Ordinary Differential Equations)		
Тур	Recitation Section (small)	
Hrs/wk	1	
СР	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Dozenten des Fachbereiches Mathematik der UHH	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L1033: Differential Equations 1 (Ordinary Differential Equations)	
Тур	Recitation Section (large)
Hrs/wk	1
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Mobility					
Module M1013: Traffi	c systems and har	ndling technolog	у		
Courses					
Title			Тур	Hrs/wk	СР
Traffic systems and handling techn	ology (L0715)		Lecture	2	3
Traffic systems and handling techn	ology (L0718)		Recitation Section (small)	2	3
Module Responsible	Prof. Carlos Jahn				
Admission Requirements	None				
Recommended Previous	none				
Knowledge					
Educational Objectives	After taking part successfu	ully, students have reac	hed the following learning results		
Professional Competence	Chudanta ana abla ta				
Knowieage	Students are able to:				
	- explain and classify the t	terms and their meaning	g in transport and handling technology		
	- reflect current political c	onditions and technical	developments in transport and handling	technology;	
	- identify actors and their	tasks in the maritime tr	ansport chain (pre-carriage, carriage, or	n-carriage);	
			ications and areas of use of transport uld it be transported? Where is the carg		•
Skills	Students can, on the basis	s of the knowledge they	have acquired:		
	- identify and evaluate key	y performance indicator	s (e.g. transport times, storage costs, et	c.) in the maritime to	ansport chain;
	- select and dimension sui	itable techniques for de	ined transport and handling tasks and c	ritically evaluate app	proaches to solutions;
			ng technologies (e.g. by calculating car p-point or hub-and-spoke freight transpo		sport times and costs
Personal Competence Social Competence	Students are able to: - successfully and respectfully discuss and organise research tasks in small groups in the context of a comprehensive writte				mprehensive written
	- describe, differentiate ar in container shipping or th	nd evaluate problems (ene establishment of diffe	nd represent them in a comprehensible e.g. in the joint compilation of factual kn erent maritime supply chains); m the transport and handling technology	owledge on topics s	uch as slow steaming
Autonomy	After completion of the m - acquire knowledge of pa - conduct a systematic lite	rts of the subject area in	ndependently and apply the acquired kn	owledge to solve ne	w problems;
	- critically reflect on the re	esults of their own work.			
Workload in Hours	Independent Study Time 1	124, Study Time in Lecti	ire 56		
Credit points			Description		
Course achievement		m itten elaboration	Description		
Examination	Written exam				
Examination duration and					
scale					
Assignment for the	Logistics and Mobility: Spe	ecialisation Traffic Plann	ing and Systems: Compulsory		
Following Curricula	Logistics and Mobility: Spe	ecialisation Production N	lanagement and Processes: Elective Cor	mpulsory	
			and Mobility: Specialisation Traffic Plani cs and Mobility: Specialisation Producti		

Course L0715: Traffic system	ns and handling technology		
Тур	Lecture		
Hrs/wk	2		
СР	3		
Workload in Hours	ndependent Study Time 62, Study Time in Lecture 28		
Lecturer	Prof. Carlos Jahn		
Language	DE		
Cycle	WiSe		
Content	In the course Transport Systems and Handling Technology the elementary basics, characteristics, possible applications and areas of expediency of transport and handling technology are taught. The students should be enabled to select, conceptualize and evaluate suitable techniques for defined transport and handling tasks. In addition to the goods to be transported and the loading units, the various means of transport, handling concepts and the necessary equipment play a special role. A basic knowledge of the relevant guidelines and standards is also built up. In addition to the transport systems road, rail, water (inland waterways and maritime shipping) and air transport, combined transport is also addressed. Contents of the lecture Basics, possible applications, usefulnes of different transport and handling techniques Overview of transported goods, loading units, means of transport, handling terminals and equipment Representation of the modes of transport: road, rail, water (inland waterway, ocean-going vessel), air, combined transport		
Literature	Clausen, Uwe; Geiger, Christiane (2013). Verkehrs- und Transportlogistik. Conrady, Roland; Fichert, Frank; Sterzenbach, Rüdiger (2019). Luftverkehr: Betriebswirtschaftliches Lehr- und Handbuch. Gleißner, Harald; Femerling, Christian (2012). Logistik: Grundlagen - Übungen - Fallbeispiele. Kranke, Andre; Schmied, Martin; Schön, Andrea D. (2011). CO2-Berechnung in der Logistik: Datenquellen, Formeln, Standards. Pachl, Jörn (2018). Systemtechnik des Schienenverkehrs: Bahnbetrieb planen, steuern und sichern. Rodrigue, Jean-Paul (2020). Geography of Transport Systems.		

Course L0718: Traffic system	ns and handling technology
Тур	Recitation Section (small)
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	WiSe
Content	The exercise of the course Traffic Systems and Handling Technology is carried out as a guided group exercise. In the exercise sessions, students receive assignment sheets on the sub-topics of the course and work on these independently. The exercise sheets mainly consist of computational tasks as well as comprehension questions. The lecturers are available to the students during the exercise to discuss calculation methods and results. There is the possibility for students to earn 10-15% bonus points on their passed exam in the course of voluntary additional work, depending on the extent. For example, by working on the worksheets in small groups and handling them in. The classroom training can be supplemented by digital exercises.
Literature	Biebig , Peter; Althof, Wolfgang.; Wagener, Norbert (2008) Seeverkehrswirtschaft : Kompendium. 4. Auflage. Geisler, Alexander; Johns, Dirk Max (2018): See Schiff Ladung: Fachbuch für Schifffahrtskaufleute: von Praktikern für Praktiker, 2. Auflage. Bänsch, Axel; Alewell, Dorothea; Moll, Tobias (2020): Wissenschaftliches Arbeiten, 12. Auflage. Voss, Rüdiger (2019): Wissenschaftliches Arbeiten: leicht verständlich. 6. Auflage.

Module M1112: Produ	iction Logistics
Courses	
Title	Typ Hrs/wk CP
Production Logistics Seminar (L125	Seminar 2 6
Module Responsible	Prof. Thorsten Blecker
Admission Requirements	None
Recommended Previous	none
Knowledge	
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Knowledge: Students will have acquired knowledge in the following areas:
	interaction of production and logistics and interdependencies
	production-related logistics topics
Skills	Skills: Students will based on the acquired knowledge be in a position to
SKIIIS	assess issues on production logistics
	to be able to deal critically with developments in production logistics and assess these critically;
	to work independently on current topics from the field of "production logistics";
Personal Competence	
Social Competence	
	Social competence: After completing the module students are capable of
	to conduct subject-specific and interdisciplinary discussions;
	present orally and in writing their results;
	respectful team work
Autonomy	After completing the module students are capable to work independently on a subject and transfer the acquired knowledge to nev
Autonomy	problems.
	produits
Workload in Hours	Independent Study Time 152, Study Time in Lecture 28
Credit points	6
Course achievement	None
Examination	Written elaboration
Examination duration and	approx. 20 pages plus presentation (20 minutes per person)
scale	
Assignment for the	Logistics and Mobility: Specialisation Production Management and Processes: Elective Compulsory
Following Curricula	Engineering and Management - Major in Logistics and Mobility: Specialisation Production Management and Processes: Elective
	Compulsory

Course L1253: Production Lo	gistics Seminar
Тур	Seminar
Hrs/wk	2
СР	6
Workload in Hours	Independent Study Time 152, Study Time in Lecture 28
Lecturer	Prof. Thorsten Blecker
Language	DE
Cycle	WiSe
Content	Within the Production Logistics Seminar the students shall compose a first term paper. In the beginning production-close logstic topics will be distributed which the students have to elaborate on their own. This workshop aims at the better motivation of the students to structure new and creative ideas and develop them to innovative solutions. This workshop contains regular meetings as well as two presentations in the middle and at the end.
Literature	Skripte und Textdokumente, die während der Vorlesung herausgegeben werden.

Module M0833: Introd	luction to Control Systems			
Courses				
Title		Тур	Hrs/wk	СР
Introduction to Control Systems (LC	654)	Lecture	2	4
Introduction to Control Systems (LC	655)	Recitation Section (small)	2	2
Module Responsible	NN			
Admission Requirements	None			
Recommended Previous	Representation of signals and systems in time and freq	uency domain, Laplace transform		
Knowledge				
Educational Objectives	After taking part successfully, students have reached th	e following learning results		
Professional Competence	•			
Knowledge				
	Students can represent dynamic system behavior	r in time and frequency domain, and	can in particular	explain properties of
	first and second order systems			
	They can explain the dynamics of simple control	loops and interpret dynamic propertie	s in terms of frec	quency response and
	root locus			
	They can explain the Nyquist stability criterion as			
	They can explain the role of the phase margin in			
	They can explain the way a PID controller affects They are a suplain increase a distance to the property of the property			-11 14 11 - 1
	They can explain issues arising when controllers	designed in continuous time domain a	re implemented	digitally
Skills				
	Students can transform models of linear dynamic		ain and vice vers	a
	They can simulate and assess the behavior of sy			
	They can design PID controllers with the help of land.			
	They can analyze and synthesize simple control			•
	They can calculate discrete-time approximation	ons of controllers designed in con	tinuous-time and	d use it for digital
	implementation	atast Taalkass Ciassiists for assasian a		
	 They can use standard software tools (Matlab Co 	ntrol 100lbox, Simulink) for carrying of	it these tasks	
Personal Competence				
Social Competence	Students can work in small groups to jointly solve techr	ical problems, and experimentally val	idate their contro	ller designs
Autonomy	Students can obtain information from provided source	es (lecture notes, software document	ation, experimen	t guides) and use it
	when solving given problems.			
	They are access their knowledge in weekly on line teets	and thereby sentral their learning my		
	They can assess their knowledge in weekly on-line tests	and thereby control their learning pro	igress.	
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Course achievement	None			
Examination	Written exam			
Examination duration and	120 min			
scale				
A - I A Ab -	Constant Familia and a Colonia and Colonia	atan) Cara Qualification Caracalan		
-	General Engineering Science (German program, 7 seme			
Following Curricula	Bioprocess Engineering: Core Qualification: Compulsory			
	Chemical and Bioprocess Engineering: Core Qualification Data Science: Core Qualification: Elective Compulsory	n: Compulsory		
		anulcar.		
	Data Science: Specialisation II. Application: Elective Cor	ripulsory		
	Electrical Engineering: Core Qualification: Compulsory Green Technologies: Energy, Water, Climate: Core Qual	ification, Compulsory		
	Computer Science in Engineering: Core Qualification: Co			
	Integrated Building Technology: Core Qualification: Elec	•		
	Logistics and Mobility: Specialisation Information Techn	• •		
	Logistics and Mobility: Specialisation Traffic Planning ar			
	Logistics and Mobility: Specialisation Production Manag		sory	
	Mechanical Engineering: Core Qualification: Compulsory	•		
	Mechatronics: Core Qualification: Compulsory			
	Technomathematics: Specialisation III. Engineering Scie	nce: Elective Compulsorv		
	Theoretical Mechanical Engineering: Technical Compler		Compulsorv	
	Process Engineering: Core Qualification: Compulsory	,		
	Engineering and Management - Major in Logistics and N	lobility: Specialisation Information Tec	hnology: Elective	Compulsory
	Engineering and Management - Major in Logistics and N	• •		
	Engineering and Management - Major in Logistics and			
	Compulsory			

Course L0654: Introduction t	co Control Systems	
Тур	Lecture	
Hrs/wk	2	
СР	4	
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28	
Lecturer	NN	
Language	DE	
Cycle	WiSe	
Content	Signals and systems	
	Linear systems, differential equations and transfer functions	
	First and second order systems, poles and zeros, impulse and step response	
	Stability	
	Facility of the state of the st	
	Feedback systems	
	Principle of feedback, open-loop versus closed-loop control	
	Reference tracking and disturbance rejection	
	Types of feedback, PID control	
	System type and steady-state error, error constants	
	Internal model principle	
	Root locus techniques	
	Root locus plots	
	Root locus design of PID controllers	
	Frequency response techniques	
	Bode diagram	
	Minimum and non-minimum phase systems	
	Nyquist plot, Nyquist stability criterion, phase and gain margin	
	Loop shaping, lead lag compensation	
	Frequency response interpretation of PID control	
	Time delay systems	
	Root locus and frequency response of time delay systems	
	Smith predictor	
	Digital control	
	 Sampled-data systems, difference equations Tustin approximation, digital implementation of PID controllers 	
	Software tools	
	Introduction to Matlab, Simulink, Control toolbox Computer-based exercises throughout the course	
Literature	 Werner, H., Lecture Notes "Introduction to Control Systems" G.F. Franklin, J.D. Powell and A. Emami-Naeini "Feedback Control of Dynamic Systems", Addison Wesley, Reading, MA, 2009 K. Ogata "Modern Control Engineering", Fourth Edition, Prentice Hall, Upper Saddle River, NJ, 2010 R.C. Dorf and R.H. Bishop, "Modern Control Systems", Addison Wesley, Reading, MA 2010 	

Course L0655: Introduction t	ourse L0655: Introduction to Control Systems	
Тур	Recitation Section (small)	
Hrs/wk	2	
СР	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	NN	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Module M1289: Logis	tical systems - Industry 4.0			
Courses				
Title		Тур	Hrs/wk	СР
Logistics systems - Industry 4.0 (L1	753)	Seminar	4	6
Module Responsible	Prof. Jochen Kreutzfeldt			
Admission Requirements	None			
Recommended Previous	Successful completion of the module "Technical	ogistics"		
Knowledge				
Educational Objectives	After taking part successfully, students have read	thed the following learning results		
Professional Competence				
Knowledge	The students will acquire the following knowledge			
	1. The students are able to understand and expla	in the concept "Logistical System".		
	2. The students are able to design a logistic syste	em conceptually.		
	3. The students can develop and implement the	control of a logistic system with python.		
Skills	The students will acquire the following skills: 1. The students are able to identify logistical syst	ems, analyze and identify potential for cl	hange and improvem	ent.
	2. The students know different technical solution	s to address problems in logistical system	ns.	
	3. The students are capable of deploying tech problems.	nical solutions and ideas from the con	cept Industry 4.0 to	deal with logistical
Personal Competence				
Social Competence	The students will acquire the following social skil 1. The students are able to develop technical solutions of the students are able to develop technical solutions.		neir contribution withi	n the team
	The technical solutions from the group can be		Ten contribution main	
	3. Students are able to present their technolomprovements.		erived from the critic	que new ideas and
Autonomy	The students will acquire the following independe 1. The students can independently develop techn		er supervision.	
	2. The students are able to evaluate their technic	al solutions and discuss the pros and cor	ns.	
	3. The students are able to assess the impact of	the concept Industry 4.0 on their own car	reer development.	
Workload in Hours	Independent Study Time 124, Study Time in Lect	ure 56		
Credit points	6			
Course achievement	None			
Examination	Written elaboration			
Examination duration and	Lab prototype with documentation (group work)			
scale				
Assignment for the	Logistics and Mobility: Specialisation Information			
Following Curricula	Logistics and Mobility: Specialisation Traffic Plant			
	Logistics and Mobility: Specialisation Production I	-		
	Engineering and Management - Major in Logistics	• •		
	Engineering and Management - Major in Logistics	• •		
	Engineering and Management - Major in Logist Compulsory	cs and Mobility: Specialisation Production	on Management and	Processes: Elective

Module Manual B.Sc. "Engineering and Management - Major in Logistics and Mobility"

Course L1753: Logistics syst	ems - Industry 4.0
Тур	Seminar
Hrs/wk	4
СР	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Prof. Jochen Kreutzfeldt
Language	DE
Cycle	WiSe
Content	The lecture gives an introduction to the concept of logistical systems with a special emphasis on the subject of Industry 4.0. Here, the system concept in logistics from a technical point of view is introduced. A logistical system is understood as a combination of transport, storage and change processes between source and sink of goods. This lecture will look at the technical aspect of these processes. Industry is a topic of this lecture. Industry 4.0 is understood as the far-reaching digitization and networking of logistical systems and the connection of logistical objects, processes and systems. The logistics industry expects Industry 4.0 to be a profound change and the realization of large improvement potentials. The lecture provides an in-depth introduction to application cases and business models of Industry 4.0 in logistics from a technical standpoint. A possible framework for Industry 4.0 is presented and several application examples are shown.
	In the exercises, students learn will learn the exemplary use of different technical solutions and know how, which can be used to improve logistical systems.
Literature	Bauernhansl, Thomas et al. (2014): Industrie 4.0 in Produktion, Automatisierung und Logistik. Anwendung, Technologien, Migration. Wiesbaden: Springer Vieweg. Hausladen, Iris (2014): IT-gestützte Logistik. Systeme - Prozesse - Anwendungen. 2. Auflage 2014. Wiesbaden: Imprint: Gabler Verlag. Hompel, Michael ten; Büchter, Hubert; Franzke, Ulrich (2008): Identifikationssysteme und Automatisierung. [Intralogistik]. Berlin, Heidelberg: Springer.
	Kaufmann, Timothy (2015): Geschäftsmodelle in Industrie 4.0 und dem Internet der Dinge. Der Weg vom Anspruch in die Wirklichkeit. Wiesbaden: Springer Fachmedien Wiesbaden. Martin, Heinrich (2014): Transport- und Lagerlogistik. Planung, Struktur, Steuerung und Kosten von Systemen der Intralogistik. 9., Auflage 2014. Wiesbaden: Imprint: Springer Vieweg. Runkler, Thomas A. (2010): Data-Mining. Methoden und Algorithmen intelligenter Datenanalyse. 1. Aufl. Wiesbaden: Vieweg + Teubner (Studium).

Module M1349: Object	t-oriented programming in log	istics			
Courses					
Title		Тур	Hrs/wk	СР	
Object-oriented programming in log	gistics (L1901)	Seminar	4	6	
Module Responsible	NN				
Admission Requirements	None				
Recommended Previous Knowledge	Basic computer skills				
Knowledge	Computer Science for Engineers - Introduction	n and Overview			
Educational Objectives	After taking part successfully, students have	reached the following learning results			
Professional Competence					
Knowledge	The students will acquire the following know	edge:			
	1. The students are able to explain the basic	s of object-oriented programming with Java.			
	2. The students know basic data types, corprogramming language.	ntrol structures and basic concepts of object	ct orientation and inh	eritance in the Java	
	3. The students know the necessary tools for	programming with Java.			
Skills	The students will acquire the following skills:				
	1. The students will be able to develop and r	un programs with Java independently.			
	2. The students will be able to develop and in	mplement own objects and classes with Java			
	3. The students are able to identify and over	come failures autonomously (debugging).			
Personal Competence					
	The students will acquire the following social	skills:			
	1. The students can explain self-developed p	rograms to other students.			
	2. The students can support others in finding	failures and mistakes in their software-code	2.		
	3. The students are able to present their pro-	grams in front of a audience.			
Autonomy	The students will acquire the following comp	etencies:			
	1. The students work independently with an	initially unknown programming language (Ja	va).		
	2. The students are able to derive independe	ently the necessary source code for a given p	problem.		
	3. The students are able to write their own so	ource code in Java based on given a problem	1.		
Workload in Hours	Independent Study Time 124, Study Time in	Lecture 56			
Credit points	6				
Course achievement	None				
Examination	Written exam				
Examination duration and	90 min				
scale	Landaria and Mahille, Co. 1997 1997	tion Technology Flori's Co			
-	Logistics and Mobility: Specialisation Information Engineering and Management - Major in Logi	**	Tochnology: Flocking	Compulsory	
Following Curricula	Engineering and Management - Major in Logi Engineering and Management - Major in Logi	, ,	3,	. ,	
	Compulsory	system and mobility. Specialisation Frouder	.o ranagement una		

Course L1901: Object-oriente	ed programming in logistics
Тур	Seminar
Hrs/wk	4
СР	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	NN
Language	DE
Cycle	WiSe
Content	The seminar provides an introduction to object-oriented programming with Java. Practical knowledge will be transferred through programming exercises parallel to theoretical content. The exercises will deal mainly with logistical problems. The seminar will be conducted as an integrated seminar with a combination of theoretical content and autonomously solved programming problems on the computer. Furthermore, the student will become familiar with the standard libraries of Java and their properties and functions. These standard objects will be used, if necessary with the assistance of an instructor, to build own programs.
	Furthermore, an introduction to the actual software development kits (SDK) of Java will be given.
Literature	Goll, Joachim; Heinisch, Cornelia (2014): Java als erste Programmiersprache. Ein professioneller Einstieg in die Objektorientierung mit Java. 7. Aufl. 2014. Wiesbaden: Imprint: Springer Vieweg. Jobst, Fritz (2015): Programmieren in Java. [aktuell zu Java 8]. 7., vollst. überarb. Aufl. München: Hanser. Abts, Dietmar (2015): Grundkurs JAVA. Von den Grundlagen bis zu Datenbank- und Netzanwendungen. 8. Aufl. Wiesbaden: Springer Vieweg.

Courses Title Interpret and Handling Systems (1352) Rectains for framport and Healting Systems (1352) Rectains framport and Healting Systems (1352) Rectains for framport and Healting Systems (1352) Rectains for Sy	<u> </u>				
Trible immidiation of Transport and Handling Systems (1.352) Module Responsible Prof. Carlos Jahn Module Responsible Prof. Carlos Jahn Admission Requirements Recommended Previous Basic knowledge Educational Objectives Professional Competence Knowledge Educational Objectives Professional Competence Knowledge Educational Objectives Professional Competence Knowledge Explain the structure and workings of standard external logistics systems - Outline the benefits of using simulation software subject to the starting situation - Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics - Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics - Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics - Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics - Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics - Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics - Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics - Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics - Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics - Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics - Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics - Present different simulation programs and kinds of simula	Module M1070: Simul	ation of Transport and Handli	ing Systems		
simulation of Transports and Handling Systems (1.3182) Module Responsible Prof. Carlos Jahn Some Recommended Previous Prof. Carlos Jahn Some Recommended Previous Prof. Carlos Jahn Some Recommended Previous Some Prof. Carlos Jahn Some Recommended Previous Some Prof. Carlos Jahn Some	Courses				
Simulation of Transport and Handling Systems (1.1318) Recitation Section (small) 3 4	Title		Тур	Hrs/wk	СР
Module Responsible Prof. Carlos Jahn None Recommended Previous Sask knowledge of transport- and handlingtechnology. Recommended Previous Sask knowledge of transport- and handlingtechnology. Recommended Previous Sask knowledge of transport- and handlingtechnology. Recommended Previous After taking part successfully, students have reached the following learning results	Simulation of Transport and Handli	ng Systems (L1352)			
Admission Requirements Recommended Previous Basic knowledge of transport- and handlingtechnology. Knowledge Educational Objectives Arrowledge Forfessional Competence Knowledge Outline the benefits of using simulation software subject to the starting situation. Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics Skills Students are able to Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. Recognize, analyze, analyze, and assemble into a model the elementary building blocks of a logistics system. Recognize, analyze, analyze, and assemble into a model the elementary building blocks of a logistics system. Recognize, analyze, analyze	Simulation of Transport and Handli	ng Systems (L1818)	Recitation Section (small)	3	4
Recommended Previous Saick knowledge of transport- and handlingtechnology. Knowledge Educational Objectives After taking part successfully, students have reached the following learning results Professional Competence Knowledge Students can Explain the structure and workings of standard external logistics systems. Outline the benefits of using simulation software subject to the starting situation. Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics Skillia Students are able to Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. Map complex external logistics process using the Plant Simulation® simulation software. Draw inferences from the results of the simulation, transfer them to the reality, and deduce action recommendations from them. Personal Competence Social Competence Social Competence Social Competence Students are capable of Solving complex tasks in a team and to document assignments accordingly. Playing different roles in the teamwork and giving each other appropriate feedback in the team. Presenting the relevant results of their project to specialists and representing them. Students are able To acquaint themselves independently with software with which they are not familiar and to use it to solve complex tasks. To define work steps independently and to acquire the knowledge required to do so. Workload in Hours Independent Study Time 124, Study Time in Lecture 56 Credit points Course achievement Course achievement Subject theoretical and practical work Examination duration and Subject theoretical and practical work Examination duration and Subject theoretical and practical work Examination duration and Management - Major in Logistics and Mobility: Specialisation Information Technology: Elective Compulsory Logistics and Mobility: Specialisation Information Technology: Elective Compulsory Engineering and Management - Major in Logistics a	Module Responsible	Prof. Carlos Jahn			
Educational Objectives	Admission Requirements	None			
Educational Objectives Professional Competence Knowledge Students can Explain the structure and workings of standard external logistics systems. Dutine the benefits of using simulation software subject to the starting situation. Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics Skills Students are able to Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. Map complex external logistics process using the Plant Simulation's simulation software. Draw inferences from the results of the simulation, transfer them to the reality, and deduce action recommendations for them. Personal Competence Social Competence Social Competence Social Competence Presenting the relevant results of the simulation, transfer them to the reality, and deduce action recommendations for them. Presenting the relevant results of their project to specialists and representing them. Autonomy Students are able To acquaint themselves independently with software with which they are not familiar and to use it to solve complex tasks. To define work steps independently and to acquire the knowledge required to do so. Workload in Hours Credit points Credit points Credit points Course achievement Compulsory Benus Form Description No 20 % Subject theoretical and practical work Examination Subject theoretical and practical work Examination and Simulation study and report with approximately 15 pages per person scale Assignment for the Bata Science: Core Qualification: Elective Compulsory Logistics and Mobility: Specialisation Information Technology: Elective Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation information Technology: Elective Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation information Technology: Elective Compulsory Engineering and Management - Major in Logistics and Mobility: Specialisation Traffic Planning and Sys	Recommended Previous	Basic knowledge of transport- and handling	technology.		
Professional Competence **Rnowledge** Students can* • Explain the structure and workings of standard external logistics systems. • Outline the benefits of using simulation software subject to the starting situation. • Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics. **Skills** Students are able to* • Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. • Map complex external logistics process using the **Plant Simulation** simulation software*. • Draw inferences from the results of the simulation, transfer them to the reality, and deduce action recommendations for them. **Presonal Competence** **Social Competen	Knowledge				
Students can	Educational Objectives	After taking part successfully, students hav	e reached the following learning results		
Explain the structure and workings of standard external logistics systems. Outline the benefits of using simulation software subject to the starting situation. Present different simulation programs and kinds of simulation that are in widespread use and explain their characteristics. Skills Students are able to Recognize, analyze, and assemble into a model the elementary building blocks of a logistics system. Map complex external logistics process using the Plant Simulation simulation software. Draw inferences from the results of the simulation, transfer them to the reality, and deduce action recommendations from them. Personal Competence Social Competence Social Competence Solving complex tasks in a team and to document assignments accordingly. Playing different roles in the teamwork and giving each other appropriate feedback in the team. Presenting the relevant results of their project to specialists and representing them. Autonomy Students are able To acquaint themselves independently with software with which they are not familiar and to use it to solve complex tasks. To define work steps independently and to acquire the knowledge required to do so. Workload in Hours Independent Study Time 124, Study Time in Lecture 56 Credit points Course achievement Course achievement Subject theoretical and practical work Examination duration and scale Assignment for the Plant procession of the procession of	Professional Competence				
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Course L1352: Simulation of	Transport and Handling Systems
Тур	Lecture
Hrs/wk	1
СР	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	WiSe
Content	The lecture deals with the simulation of external logistics systems. The focus is therefore on the consideration of logistical
	processes between companies or on transhipment systems, such as ports or individual terminals.
	In the first part of the lecture, students will first acquire basic knowledge of external logistics systems and the advantages of using
	simulations to present them. Then an overview of existing simulation types and programs is given and examples for existing
	simulation models of logistic systems in science and practice are shown. Some simulation models will be demonstrated.
	In the second part of the lecture the students learn the basic handling of the simulation software Plant Simulation®. They receive
	theoretical explanations of the general functionality of the simulation tool, which are further deepened through the use of
	extensive, interactive examples. At the same time, five exercises, which build on each other, offer students the opportunity to
	implement the course content they have learnt alone and in small groups. The exercises can be completed during the supervised
	lecture periods as well as at other times.
	The acquired knowledge is to be applied in the third part in the course of group work. The students will be divided into groups,
	each of which will then work on a relevant problem from the field of (external) logistic systems by means of simulation. The
	students are given a defined period of time for their work. During this time at least one person is always available for questions
	and suggestions. The results of the group work are to be documented in a simulation report and handed in at the end of the
	processing time. Finally, the individual groups present the problems they have worked on and their results in a presentation.
Literature	Bangsow, Steffen (2011): Praxishandbuch Plant Simulation und SimTalk. Anwendung und Programmierung in über 150 Beispiel-
	Modellen. München: Hanser Verlag.
	Eley, Michael (2012): Simulation in der Logistik. Einführung in die Erstellung ereignisdiskreter Modelle unter Verwendung des
	Werkzeuges "Plant Simulation". Berlin, Heidelberg: Springer.
	3pg
	Engelhardt-Nowitzki, Corinna; Nowitzki, Olaf; Krenn, Barbara (2008): Management komplexer Materialflüsse mittels Simulation.
	State-of-the-Art und innovative Konzepte. Wiesbaden: Deutscher Universitäts-Verlag / GWV Fachverlage GmbH, Wiesbaden.
	Rabe, Markus; Spieckermann, Sven; Wenzel, Sigrid (2008): Verifikation und Validierung für die Simulation in Produktion und
	Logistik. Vorgehensmodelle und Techniken. Berlin, Heidelberg: Springer.
	Sargent, Robert G. (2010): Verification and Validation of Simulation Models. In: B. Johansson, S. Jain, J. Montoya-Torres, J. Hugan,
	and E. Yücesan, eds.: Proceedings of the 2010 Winter Simulation Conference.
	VDI-Richlinie: VDI 3633. Simulation von Logistik-, Materialfluß-und Produktionssystemen
	Wenzel, Sigrid; Rabe, Markus; Spieckermann, Sven (2006): Verifikation und Validierung für die Simulation in Produktion und
	Logistik. Vorgehensmodelle und Techniken. 1. Aufl. Berlin: Springer Berlin.

Course L1818: Simulation of Transport and Handling Systems		
Тур	Recitation Section (small)	
Hrs/wk	3	
СР	4	
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42	
Lecturer	Prof. Carlos Jahn	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Module M0980: Logis	tics, Transport and Environment			
Courses				
Title Logistics, Transport and Environme Environmental Management and Co		Typ Project-/problem-based Learning Seminar	Hrs/wk 2 2	CP 4 2
Module Responsible	Prof. Heike Flämig			
Admission Requirements				
Recommended Previous Knowledge	Introduction to logistics and mobility Foundations of Management			
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence Knowledge	Students are able to explain basic terms of transport logistics, com describe actors and system boundaries, challe reflect standards of sustainability management	enges and goals of transport logistics	bility	
Skills	Students are able to • design logistics systems independently • differentiate sustainability, CR, CSR and envirc • critically evaluate measures for sustainable lo			
Personal Competence Social Competence	Students can creatively develop solutions in teams and worl present their knowledge and skills to other stu	•		
Autonomy	Students can carry out small research studies independently apply theoretical knowledge in practical projec apply presentation techniques such as free Whiteboard, Metaplan)	cts	² oint), use of	media (Flip-Charts
Workload in Hours	Independent Study Time 124, Study Time in Lecture	56		
Credit points	6			
Course achievement	None			
Examination	Written elaboration			
Examination duration and	Written assignment with short presentation			
scale				
Assignment for the Following Curricula		agement and Processes: Elective Compulsor hnology: Elective Compulsory d Mobility: Specialisation Traffic Planning and	d Systems: Elec	
	Engineering and Management - Major in Logistics and	d Mobility: Specialisation Information Techno	ology: Elective	Compulsory

Course L0009: Logistics, Tra	nsport and Environment				
Тур	Project-/problem-based Learning				
Hrs/wk					
СР	4				
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28				
Lecturer	Prof. Heike Flämig				
Language	DE				
Cycle	SoSe				
Content	Application and creative development of professional knowledge within the framework of the case study "Environmental impacts of				
	supply chains" using a specific company as example.				
	Depending on the chosen focus of the academic year:				
	characteristics of different transport systems				
	technologies, structures and processes of transport logistics systems (nodes, network, interactions)				
	location and route planning				
	connections of information flow and material flows in transport chains				
	• interrelation between private and private (contract logistics) and private and public (business policy, transport policy) and				
	their (diverging)				
	design approaches for sustainable logistics				
Literature	Ihde, Gösta B.: Transport, Verkehr, Logistik. Gesamtwirtschaftliche Aspekte und einzelwirtschaftliche Handhabung. 3. überarbeitete Auflage. Vahlen, München 2001				

Course L1160: Environmenta	Il Management and Corporate Responsibilty
Тур	Seminar
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	SoSe
Content	 Imparting knowledge about standards (e.g. EMAS and ISO 14.001) as important methodological approaches for the integration of environmental and sustainability management in business companies Explaination of theoretical concepts of corporate sustainability management Imparting practical knowledge from different stakeholder views: consulting company, trading enterprise, NGO, financial market
Literature	

Title Transport Mechanies and Antanoris (1973) Recitation Section (Bargo) 2 3 2 **Bestination Mechanies and Antanoris (1974) Recitation Section (Bargo) 2 3 2 **Meduals Repressable Provides Business (1974) Recitation Section (Bargo) 2 3 2 **Meduals Repressable Provides Business (1974) Recitation Section (Bargo) 2 3 2 **Meduals Repressable Provides Business (1974) Recitation Section (Bargo) 2 3 **Meduals Repressable Provides Business (1974) Recitation (Bargo) Recitation (Bargo) **Educational Objectives Recitation (Bargo) Recitation (Bargo) Recitation (Bargo) **Educational Objectives Recitation (Bargo) Recitation (Bargo) **Education (Bargo) Recitation (Bargo) Recitation (Bargo) Recitation (Bargo) **Education (Bargo) Recitation (Bargo) Recitation (Bargo) Recitation (Bargo) **Education (Bargo) Recitation (Bar	Module M0610: Electi	rical Machines and Actuators			
Lesture 3 4	Courses				
Recross Monthes and Actuations (2020) Module Responsible Mort Thorston Korn Port Thorsto	Title		Тур	Hrs/wk	СР
Module Responsible Admission Requirements None Recommended Priviles Sacisc of instrematics, in particular complexe numbers, integrals, differentials Knowledge Beducational Objectives After taking part successfully, students have reached the following learning results Professional Competence Anowledge Suddents can to draw and explain the basic principles of electric and magnetic fields. Suddents can to draw and explain the basic principles of electric machines and present the corresponding equations and characteristic curves. For typically used drives they can explain the major parameters of the energy efficiency of the whole system from the power and to the driven engine. Subject to the control of the driven engine. Subject and a sacial to calculate two-dimensional electric and magnetic fields in particular ferromagnetic circuits with air gap. For this they apply the usual methods of the design and electric machines from their given characteristic data and selected quantifies and characteristic curves. They apply the usual equivalent circuits and graphical methods. Personal Competence Social Competence Autonomy Suddents are able independently to calculate electric and magnetic fields for applications. They are able to analyse independently the operational performance of electric machines from the characteristic data and they can calculate thereof selected quantifies and characteristic curves. Workfood in Neurs Course achievement Workfood in Neurs Computed in Neurs	Electrical Machines and Actuators ((L0293)		3	4
Recommended Previous Knowledge Busiss of relational objectives Recommended Previous Resident Reputational Competence Frofessional Competence Resident Reputational Objectives After taking part successfully, students have reached the following learning results They can describe the function of the standard types of electric machines and present the corresponding equations and characteristic curves for typically used drives they can explain the major parameters of the energy efficiency of the whole system from the power grid to the driven engine. Station Students are able to calculate two dimensional electric and magnetic fields in particular ferromagnetic circuits with air gap. For this they again public usual methods of the design and electric machines from their glaven characteristic curves. They apply the usual methods of the design and electric machines from their glaven characteristic curves. They apply the usual requivalent circuits and graphical methods. Personal Competence Social Competenc	Electrical Machines and Actuators ((L0294)	Recitation Section (large)	2	2
Recommended Previous and seases of mathematics, in particular complexe numbers, integrals, differentials successfully suddens have reached the following learning results: Professional Competence **Renowledge** Suddens can describe the function of the standard types of electric and magnetic fields. They can describe the function of the standard types of electric machines and present the corresponding equations and characteristic curves. For typically used drives they can explain the major parameters of the energy efficiency of the whole system from the power grid to the driven engine. **Sillis** Suddens are able to calculate two-dimensional electric and magnetic fields in particular ferromagnetic circuits with air gap, For this they apply the usual methods of the design and electric machines. They can collulate the operational performance of electric machines from their given characteristic data and selected quantities and characteristic curves. They apply the usual equivalent circuits and graphical methods. **Personal Competence** **Social Competence** **Social Competence** **Automorphy** **Automorphy** **Automorphy** **Automorphy** **Budens are able independently to calculate electric and magnetic fields for applications. They are able to analyse independently the operational performance of electric machines from the characteristic data and theycan calculate thereof selected quantities and characteristic curves. **Workload in Hours** **Overlat points** **Credit points** **Credit points** **Credit points** **Credit points** **Credit points** **Examination duration and Social selections and actuators, review of design files scale and precipitations are actually as a selection of the characteristic curves. **Examination duration and Social selections and actuators, review of design files scale and precipitations are program. To semester): Specialisation Mechanical Engineering. Focus Mechanical Engineering Science (German program. 7 semester): Specialisation Mechanical Engineering. Focus Mec	Module Responsible	Prof. Thorsten Kern			
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	Credit points Course achievement Examination Examination duration and scale Assignment for the	Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semester): Compulsory General Engineering Science (German program, 7 semester): Compulsory General Engineering Science (German program, 7 semester): Spengineering: Elective Compulsory General Engineering Science (German program, 7 semester): Spengineering: Elective Compulsory General Engineering Science (German program, 7 semester): Spengineering: Elective Compulsory Electrical Engineering: Core Qualification: Elective Compulsory Engineering Science: Specialisation Electrical Engineering: Electical Engineering: Energy, Water, Climate: Specialisation Energeneer Technologies: Energy, Water, Climate: Specialisation Maricomputer Science in Engineering: Specialisation Traffic Planning and System Logistics and Mobility: Specialisation Production Management and Mechanical Engineering: Core Qualification: Elective Compulsory Mechatronics: Specialisation Naval Engineering: Compulsory Mechatronics: Specialisation Robot- Specialisation Electrical Systems: Elective Compul Technomathematics: Specialisation III. Engineering Science: Electineering and Management - Major in Logistics and Mobility: Engineering and Management - Major in Logistics and Mobility: Engineering and Management - Major in Logistics and Mobility: Engineering and Management - Major in Logistics and Mobility: Engineering and Management - Major in Logistics and Mobility: Engineering and Management - Major in Logistics and Mobility: Engineering and Management - Major in Logistics and Mobility: Engineering and Management - Major in Logistics and Mobility: Engineering and Management - Major in Logistics and Mobility: Engineering and Management - Major in Logistics and Mobility: Engineering and Management - Major in Logistics and Mobility: Engineering and Management - Major in Logistics and Mobility: Engineering and Management - Major in Logistics and Mobility: Engineering and Management - Major in Logistics and M	r): Specialisation Mechanical Engineericalisation Mechanical Engineericalisation Electrical Engineericalisation Electrical Engineericalisation Electrical Engineericalisation Electrical Engineericalisation Electrical Electrical Engineering Science: Electricalisation Electricalisation Traffic Planning and pecialisation Information Technicalisation Information Infor	Engineering, Fering, Focus The ering, Focus The ering: Elective Corns	ctive Compulsory
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Course L0293: Electrical Mac	chines and Actuators
Тур	Lecture
Hrs/wk	3
СР	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Thorsten Kern, Dennis Kähler
Language	DE
Cycle	SoSe
Content	Electric field: Coulomb´s law, flux (field) line, work, potential, capacitor, energy, force, capacitive actuators
	Magnetic field: force, flux line, Ampere's law, field at bounderies, flux, magnetic circuit, hysteresis, induction, self-induction, mutual inductance, transformer, electromagnetic actuators
	Synchronous machines, construction and layout, equivalent single line diagrams, no-load and short-cuircuit characteristics, vector diagrams, motor and generator operation, stepper motors
	DC-Machines: Construction and layout, torque generation mechanismen, torque vs speed characteristics, commutation,
	Asynchronous Machines. Magnetic field, construction and layout, equivalent single line diagram, complex stator current diagram (Heylands 'diagram), torque vs. speed characteristics, rotor layout (squirrel-cage vs. sliprings),
	Drives with variable speed, inverter fed operation, special drives
Literature	Hermann Linse, Roland Fischer: "Elektrotechnik für Maschinenbauer", Vieweg-Verlag; Signatur der Bibliothek der TUHH: ETB 313
	Ralf Kories, Heinz Schmitt-Walter: "Taschenbuch der Elektrotechnik"; Verlag Harri Deutsch; Signatur der Bibliothek der TUHH: ETB 122
	"Grundlagen der Elektrotechnik" - anderer Autoren
	Fachbücher "Elektrische Maschinen"

Course L0294: Electrical Mac	ourse L0294: Electrical Machines and Actuators			
Тур	Recitation Section (large)			
Hrs/wk	2			
СР	2			
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28			
Lecturer	Prof. Thorsten Kern, Dennis Kähler			
Language	DE			
Cycle	SoSe			
Content	See interlocking course			
Literature	See interlocking course			

Module M1290: Simul	ation of intra logistics					
Courses						
Title		Тур	Hrs/wk	СР		
Simulation of intra logistics (L1755)	Seminar	4	6		
Module Responsible	NN					
Admission Requirements	None					
	Successful completion of the module "Technical Lo	gistics"				
Knowledge	After the live and the second of the second	ad black a Harrison Laboration manufacture				
	After taking part successfully, students have reach	ed the following learning results				
Professional Competence	The students will acquire the following knowledge:					
Kilowieuge	The students are able to explain the significance model in intralogistics.		of an event- and object	t-oriented simulation		
	2. The students are able to reflect and explain the model in intralogistics.	process of creating and programming	ng an event- and object	t-oriented simulation		
	3. The students are able to view critically the stren	gths and weaknesses of event- and o	object-oriented simulation	on model.		
Skills	The students will acquire the following skills: 1. The students will be able to derive the necessary parameters for the development of an event- and object-oriented simulation model in intralogistics from an existing logistics system.					
	2. The students will be able to program and run Plant Simulation simulation models independently.					
	3. The students can evaluate and interpret the res	ults from a simulation model.				
Personal Competence						
Social Competence	The students will acquire the following social skills. 1. The students are able to develop a complex sim					
	The students know the different roles in joint development of a simulation model and can give feedback to their respective role The students are able to process the simulation results and present them in front of a audience.					
Autonomy	The students will acquire the following independent competencies: 1. The students work independently in an initially unknown software (Plant Simulation).					
	2. The students are able to derive independently the necessary simulation parameters from information about a logistics system.					
	3. The students are able to develop and program a	n event- and object-oriented simulat	ion models from given p	parameters.		
Workload in Hours	Independent Study Time 124, Study Time in Lectur	re 56	-			
Credit points	6					
Course achievement	None					
Examination						
Examination duration and scale	90 min					
Assignment for the	Logistics and Mobility: Specialisation Production Ma	anagement and Processes: Elective C	Compulsory			
Following Curricula						
	Engineering and Management - Major in Logistic Compulsory	s and Mobility: Specialisation Produc	ction Management and	Processes: Elective		
	Engineering and Management - Major in Logistics a	and Mobility: Specialisation Information	on Technology: Elective	Compulsory		

Course L1755: Simulation of	intra logistics
Тур	Seminar
Hrs/wk	4
СР	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	NN
Language	DE
Cycle	SoSe
	The seminar provides an introduction to the development and programming of event and object-oriented simulation models based on the Plant Simulation software. The simulation models are focused on issues and problems in the field of intralogistics. The seminar will be conducted as a combination of theoretical content and autonomously solving simulation tasks on the computer. The students learn the ideal development workflow, programming and evaluation of a simulation model. Furthermore, the student will become familiar with the standard objects of a simulation model in Plant Simulation and their properties and functions. These standard objects will be used, if necessary with the assistance of the instructor, to build simulation models and analyze and evaluate the results. Furthermore, an introduction to the individual programming of simulation models is given on the basis of Sim Talk language.
Literature	Bangsow, Steffen (2011): Praxishandbuch Plant Simulation und SimTalk, Hanser Verlag, München. Bangsow, Steffen (2015): Tecnomatix plant simulation: modeling and programming by means of examples, Springer, Berlin. Eley, Michael (2012): Simulation in der Logistik: Einführung in die Erstellung ereignisdiskreter Modelle unter Verwendung des Werkzeuges "Plant Simulation", Springer, Berlin.

Module M1014: Logist	tics Service Provider Management			
Courses				
Title		Тур	Hrs/wk	СР
Logistics Service Provider Managen	nent (L1240)	Seminar	3	6
Module Responsible	Prof. Heike Flämig			
Admission Requirements	None			
Recommended Previous	 Introduction to Logistics and Mobility 			
Knowledge	Transport and cross-docking Technology			
	 Logistics Management 			
_	After taking part successfully, students have reache	ed the following learning results		
Professional Competence				
Knowledge	Students are able to			
	 integrate LSPs into the concept of business lo 	ogistics		
	 tell the specifics of business services and log 	istics Services and their derived ch	aracteristics	
	 describe logistics functions as LSP service pa 	ckages		
	 explain, why companies outsource logistics S 		in Business	
	 describe basic outsorucing processes and te 	-		
	describe and analyze intra- and intermodal	transport institutions as well as	tasks, challenges and o	pportunities for the
	Management of LSPs			
Skills	Students can			
	 support the sub-segment specific business 	functions and management Tasks	(o.g. for Poad Transpor	t Airlines SeaPort
	Providers etc.)	Turictions and management lasks	(e.g. for Road franspor	t, Allilles, Searoit
	 categorize LSPs regarding strategic product-r 	market-positioning		
	derive action plans regarding management to			
Personal Competence	6			
Social Competence	Students can			
	 discuss case studies in Groups (within and out 	itside of the classroom), reaching a	common understanding	and result
	 prepare and deliver Business presentations 			
	 give and discuss Feedbacks in the large grou 	р		
Autonomy	Students can			
riaconomy	Students Can			
	 produce written reports independently 			
Workload in Hours	Independent Study Time 138, Study Time in Lecture	e 42		
Credit points				
Course achievement				
Examination	Written elaboration			
Examination duration and	2 scientific written papers of approx. 20 pages each	n. Presentation (approx. 15 pages)	with 20-minute closing le	ecture in groups of 3
	to max. 5 persons. Grading of 4 partial grades of 2			
	member.			
Assignment for the	Logistics and Mobility: Specialisation Traffic Planning	g and Systems: Elective Compulsor	у	
Following Curricula	Logistics and Mobility: Specialisation Production Ma	nagement and Processes: Elective	Compulsory	
	Engineering and Management - Major in Logistics ar	nd Mobility: Specialisation Traffic Pl	anning and Systems: Ele	ctive Compulsory
	Engineering and Management - Major in Logistics ar	, ,	3,	. ,
	Engineering and Management - Major in Logistics	and Mobility: Specialisation Produ	iction Management and	Processes: Elective
	Compulsory	144100 6 10 0		
	Engineering and Management - Major in Logistics	and Mobility: Specialisation Produ	iction Management and	Processes: Elective
	Compulsory			

urse L1240: Logistics Serv	ice Provider Management			
Тур	Seminar			
Hrs/wk	3			
СР	6			
Workload in Hours	Independent Study Time 138, Study Time in Lecture 42			
Lecturer	Prof. Stephan Freichel			
Language	DE			
Cycle	SoSe			
Content	1 Concept and Functions			
	Define the role of logistics services providers in the overall concept and functions of logistics services providers. Workshop on th role of logistics services providers in the economy, based on up-to-date topics in the field and in the news.			
	2 Outsourcing and Cooperation			
	Make or buy, forms and management of inter-organizational relations			
	3 Institutions			
	Special business management features of carriers, haulage contractors, CEP services			
	4 Trends, Strategies and Management Functions			
	Market trends, requirements, basic business management and management functions (operations, business development, HR, IT finance/planning and control, organization, leadership)			
	5 Strategic Developments and Case Studies			
	Selected aspects (e.g. risk and innovation management, global and regional networking, greenwashing and sustainability)			
	Examples:			
	Case Study A) Types of company (such as haulage contractors, railway operators, road transport companies, heavy goods, textile and refrigerated goods specialists, CEPs, etc) will be introduced and discussed in the context of a presentation.			
	Case Study B) Individual companies will be analyzed on the basis of accessible material such as company reports, websites an possibly telephone interviews and case studies will be explained and discussed with regard to the functions of the logistic services provider and the management task of the corporate managements of the selected cases.			
Literature	Pfohl, HChr.: Logistiksysteme. Betriebswirtschaftliche Grundlagen. 8., neu bearbeite und aktualisierte Auflage, Berlin u.a. 2009			
	Eßig, M. / Hofmann, E. / Stölzle, W.: Supply Chain Management. München 2013.			
	Freichel, S.L.K.: Organisation von Logistikservice-Netzwerken. Reihe: Logistik und Unternehmensführung, hrsg. von Prof. Dr. H. Chr. Pfohl, Bd. 4. Berlin 1993.			
	Aberle, G.: Transportwirtschaft. Einzelwirtschaftliche und gesamtwirtschaftliche Grundlagen, 4. überarbeitete und erweitert Auflage, München/Wien 2006.			
	Buchholz, J./Clausen, U./Vastag, A. (Hrsg): Handbuch der Verkehrslogistik, Heidelberg 1998.			
	Corsten, H.: Dienstleistungsmanagement, 3. Auflage, München 1997.			
	Müller-Daupert, B. (Hrsg.): Logistik-Outsourcing, 2. Auflage, München, Vogel, 2009			
	lhde, G. B.: Transport, Verkehr, Logistik. Gesamtwirtschaftliche Aspekte und einzelwirtschaftliche Handhabung, 3. völlig überart und erw. Auflage, München 2001.			

van Suntum. U., Verkehrspolitik, München 1986

Specialization Traffic Planning and Systems

Module M1897: New 7	Fechnologies and Markets				
Courses					
Title		Тур	Hrs/wk	СР	
Data-driven marketing and sales (L	3138)	Lecture	3	4	
New technologies and market oppo	ortunities (L3139)	Project-/problem-based Learning	1	2	
Module Responsible	Prof. Christian Lüthje				
Admission Requirements	None				
Recommended Previous					
Knowledge					
Educational Objectives	After taking part successfully, students have reached	d the following learning results			
Professional Competence					
Knowledge					
Skills					
Personal Competence					
Social Competence					
Autonomy					
Workload in Hours	Independent Study Time 124, Study Time in Lecture	56			
Credit points	6				
Course achievement	None				
Examination	Subject theoretical and practical work				
Examination duration and	Written elaboration, exercises, presentation, oral participation				
scale					
Assignment for the	Engineering and Management - Major in Logistics and Mobility: Specialisation Information Technology: Elective Compulsory				
Following Curricula	Engineering and Management - Major in Logistics and Mobility: Specialisation Traffic Planning and Systems: Elective Compulsory				
	Engineering and Management - Major in Logistics	and Mobility: Specialisation Production Mar	nagement and	d Processes: Elective	
	Compulsory				

Course L3138: Data-driven m	ourse L3138: Data-driven marketing and sales			
Тур	Lecture			
Hrs/wk	3			
СР	4			
Workload in Hours	dependent Study Time 78, Study Time in Lecture 42			
Lecturer	Prof. Christian Lüthje			
Language	DE			
Cycle	SoSe			
Content				
Literature				

Course L3139: New technologies and market opportunities		
Тур	oject-/problem-based Learning	
Hrs/wk	1	
СР	2	
Workload in Hours	dependent Study Time 46, Study Time in Lecture 14	
Lecturer	of. Christian Lüthje	
Language	DE	
Cycle	SoSe	
Content		
Literature		

Module M0986: Introd	duction to Transportation Eco	nomics			
Courses					
Title		Тур	Hrs/wk	СР	
Introduction to Transportation Ecor	nomics (L1188)	Lecture	3	6	
Module Responsible	Prof. Heike Flämig				
Admission Requirements	None				
Recommended Previous	none				
Knowledge					
Educational Objectives	After taking part successfully, students have	ve reached the following learning results			
Professional Competence					
Knowledge	Students are able to				
	evolain hasic connections between to	explain basic connections between transport, traffic and logistics			
	explain basic connections between transport, trainc and logistics explain the macroeconomic relevance of logistics				
	state the relevance of different modes of transport for the economy				
	describe the development and challenges of transport policy				
	explain trends and developments in transport industry				
		can develop ideas for political decisions and de	esign questions in the	transport industry.	
Personal Competence					
,	Students can discuss small tasks in groups and find solutions together.				
		Students are able to solve small tasks on their own with given literature.			
Workload in Hours	Independent Study Time 138, Study Time i	n Lecture 42			
Credit points					
Course achievement	None				
Examination	Written exam				
Examination duration and	60 minutes				
scale					
Assignment for the	Logistics and Mobility: Specialisation Traffic	Planning and Systems: Compulsory			
Following Curricula	Engineering and Management - Major in Lo	gistics and Mobility: Specialisation Traffic Plant	ning and Systems: Cor	npulsory	

Course L1188: Introduction t	to Transportation Economics
	Lecture
Hrs/wk	3
СР	6
Workload in Hours	Independent Study Time 138, Study Time in Lecture 42
Lecturer	Karl Michael Probst
Language	DE
Cycle	SoSe
Content	 Functions of transport Macroeconomic developments of transport Special characteristics of transport Transport infrastructure policy International transport policy Transport policy in the EU External costs of transport Market entry into transport markets
Literature	-

riobility							
Module M0983: Mobil	ity Concepts						
Courses							
Title			Тур		Hrs/wk	СР	
Mobility Research and Transportation	on Projects (L1181)			em-based Learning	3	3	
Mobility in Megacities and Developi	ng Countries (L1182)		Seminar		3	3	
Module Responsible	Dr. Philine Gaffron						
Admission Requirements	None						
Recommended Previous	Module Transportation Planning	and Traffic Engine	ering				
Knowledge							
Educational Objectives	After taking part successfully, s	tudents have reach	ed the following learning re	sults			
Professional Competence							
Knowledge	Students are able to:						
	name the different urbanexplain the transport cha						
	recognise and relate integrate problem areas on the other controls.	eractions between t		ne hand and ecolo	gical, socio-co	ultural and economic	
	outline specific issues an		n develonment and transno	rt (in Germany and	develoning c	ountries)	
	explain the effects of ext				developing e	ountries).	
Chille	Students are able to:						
Skills	Students are able to.						
	 analyse and evaluate giv 	en case studies.					
	 transfer learning results 						
	analyse specific issues an						
	critically assess actors, p		planned measures and the	e implementation (of transport p	rojects in the light of	
	 the UN Millennium Devel develop and present sus 		raical poverty eriented as	andor halancod an	d oconomical) colutions for urban	
	personal and goods trans		igical, poverty offerited, ge	ender balanced an	u economicai) solutions for urban	
	personar and goods trans	5,501.2					
Personal Competence							
	Students are able to:						
•							
	present and explain inde						
	constructively discuss potentially controversial topics in a group context.						
Autonomy	Students are able to:						
Autonomy	stadents are able to.						
	 carry out independent lit 						
	 independently author a v 	written report on a g	jiven topic.				
Worldand in Harris	Indopondent Study Time CC St	udy Timo in Lastrica	94				
Workload in Hours	Independent Study Time 96, St	uuy Tiine iii Lecture	04				
Credit points	6						
Course achievement	Compulsory Bonus Form Yes None Participa	ation in excursions	Description Exkursion innerhalb Hambi	urgs abhängig von	aktuellen The	men im Modul	
Examination	Written elaboration		Tarana				
	All assignments in groups (2-4 s	students): written re	eport, 2000 words (incl. 2 st	nort presentations	of 10 mins):	final presentation 20	
scale	mins. plus discussion (incl. slide		•	•	o. 10 mms./,	ar presentation, 20	
Assignment for the	Civil- and Environmental Engine		· · · · · · · · · · · · · · · · · · ·				
Following Curricula	Civil- and Environmental Engine			-			
	Civil- and Environmental Engine				-y		
	Logistics and Mobility: Specialis				-		
	Engineering and Management -	Major in Logistics a	nd Mobility: Specialisation	Traffic Planning an	d Systems: Co	mpulsory	

Course L1181: Mobility Rese	arch and Transportation Projects
Тур	Project-/problem-based Learning
Hrs/wk	3
СР	3
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42
Lecturer	Dr. Philine Gaffron
Language	DE
Cycle	SoSe
Content	This course places its focus on transport and mobility in Germany. It deals with questions such as:
	 Which external factors - like e.g. energy costs, availability of renewable and fossil fuels, environmental and climate protection objectives - influence current developments in the transport sector? Which external effects in turn are caused by mobility choices and traffic? How should these interactions be evaluated, how and by whom can they be influenced? Which measures at the municipal level can contribute to a more sustainable transport system? During the course, these questions will be illustrated and discussed with reference to different examples and current developments. Participants will also provide input on specific topics. Potential core subjects of the course could be: Environmental Justice: which population groups are disproportionately affected by transport emissions and who causes them? Municipal cycle planning Transport and Climate Protection: can, want, act - everything could be, nothing must be?
Literature	Die Literaturempfehlungen sind abhängig von den jeweiligen, wechselnden Themenschwerpunkten und werden rechtzeitig vor Beginn der Veranstaltung bekannt gegeben.

Course L1182: Mobility in Me	gacities and Developing Countries
Тур	Seminar
Hrs/wk	3
СР	3
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42
Lecturer	Dr. Jürgen Perschon, Christof Hertel
Language	DE
Cycle	SoSe
Content	The course provides and overview over different transport projects in the metropolitan areas of developing countries. Considering different perspectives on urban growth, social justice, economic development, environmental and climate protection as well as the economic viability of public transport, the specific situation in the urban conglomerates of Asia, Latin America and Africa will be analysed and placed in a regional and global context. Specific public transport systems will be examined to establish, whether they are a suitable example for sustainable urban development. The following examples could be suitable case studies: Singapore (Metro), Lagos (BRT Light), Guanghzou, Bogota, Jakarta (Full BRT), Sao Paulo, Medellin (Cable Car Systems), Johannesburg (Minibus-Taxi). The course will be designed interactively with the students and will partly be in English as is the majority of the literature in this area (also: Skype online interviews with international experts in the transport sector). An English language presentation is also part of the course work.
Literature	

Mobility					
Module M1013: Traffi	c systems and har	ndling technolog	у		
Courses					
Title			Тур	Hrs/wk	СР
Traffic systems and handling techn	ology (L0715)		Lecture	2	3
Traffic systems and handling techn	ology (L0718)		Recitation Section (small)	2	3
Module Responsible	Prof. Carlos Jahn				
Admission Requirements	None				
Recommended Previous	none				
Knowledge					
Educational Objectives	After taking part successfu	ully, students have reac	hed the following learning results		
Professional Competence	Chudanta ana abla ta				
Knowieage	Students are able to:				
	- explain and classify the t	terms and their meaning	g in transport and handling technology		
	- reflect current political c	onditions and technical	developments in transport and handling	technology;	
	- identify actors and their	tasks in the maritime tr	ansport chain (pre-carriage, carriage, or	n-carriage);	
			ications and areas of use of transport uld it be transported? Where is the carg		•
Skills	Students can, on the basis	s of the knowledge they	have acquired:		
	- identify and evaluate key	y performance indicator	s (e.g. transport times, storage costs, et	c.) in the maritime to	ansport chain;
	- select and dimension sui	itable techniques for de	ined transport and handling tasks and c	ritically evaluate app	proaches to solutions;
			ng technologies (e.g. by calculating car p-point or hub-and-spoke freight transpo		sport times and costs
Personal Competence Social Competence			nise research tasks in small groups in nd represent them in a comprehensible		mprehensive written
	- describe, differentiate ar in container shipping or th	nd evaluate problems (ene establishment of diffe	e.g. in the joint compilation of factual kn rrent maritime supply chains); m the transport and handling technology	owledge on topics s	uch as slow steaming
Autonomy	 After completion of the module students capable to: acquire knowledge of parts of the subject area independently and apply the acquired knowledge to solve new problems; conduct a systematic literature search and record this in a scientific text; 				w problems;
	- critically reflect on the re	esults of their own work.			
Workload in Hours	Independent Study Time 1	124, Study Time in Lecti	ire 56		
Credit points			Description		
Course achievement		m itten elaboration	Description		
Examination	Written exam				
Examination duration and					
scale					
Assignment for the	Logistics and Mobility: Spe	ecialisation Traffic Plann	ing and Systems: Compulsory		
Following Curricula	Logistics and Mobility: Spe	ecialisation Production N	lanagement and Processes: Elective Cor	mpulsory	
			and Mobility: Specialisation Traffic Plani cs and Mobility: Specialisation Producti		

Course L0715: Traffic system	ns and handling technology
Тур	Lecture
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	WiSe
Content	In the course Transport Systems and Handling Technology the elementary basics, characteristics, possible applications and areas of expediency of transport and handling technology are taught. The students should be enabled to select, conceptualize and evaluate suitable techniques for defined transport and handling tasks. In addition to the goods to be transported and the loading units, the various means of transport, handling concepts and the necessary equipment play a special role. A basic knowledge of the relevant guidelines and standards is also built up. In addition to the transport systems road, rail, water (inland waterways and maritime shipping) and air transport, combined transport is also addressed. Contents of the lecture Basics, possible applications, usefulnes of different transport and handling techniques Overview of transported goods, loading units, means of transport, handling terminals and equipment Representation of the modes of transport: road, rail, water (inland waterway, ocean-going vessel), air, combined transport
Literature	Clausen, Uwe; Geiger, Christiane (2013). Verkehrs- und Transportlogistik. Conrady, Roland; Fichert, Frank; Sterzenbach, Rüdiger (2019). Luftverkehr: Betriebswirtschaftliches Lehr- und Handbuch. Gleißner, Harald; Femerling, Christian (2012). Logistik: Grundlagen - Übungen - Fallbeispiele. Kranke, Andre; Schmied, Martin; Schön, Andrea D. (2011). CO2-Berechnung in der Logistik: Datenquellen, Formeln, Standards. Pachl, Jörn (2018). Systemtechnik des Schienenverkehrs: Bahnbetrieb planen, steuern und sichern. Rodrigue, Jean-Paul (2020). Geography of Transport Systems.

Course L0718: Traffic system	ns and handling technology
Тур	Recitation Section (small)
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	WiSe
Content	The exercise of the course Traffic Systems and Handling Technology is carried out as a guided group exercise. In the exercise sessions, students receive assignment sheets on the sub-topics of the course and work on these independently. The exercise sheets mainly consist of computational tasks as well as comprehension questions. The lecturers are available to the students during the exercise to discuss calculation methods and results. There is the possibility for students to earn 10-15% bonus points on their passed exam in the course of voluntary additional work, depending on the extent. For example, by working on the worksheets in small groups and handling them in. The classroom training can be supplemented by digital exercises.
Literature	Biebig , Peter; Althof, Wolfgang.; Wagener, Norbert (2008) Seeverkehrswirtschaft : Kompendium. 4. Auflage. Geisler, Alexander; Johns, Dirk Max (2018): See Schiff Ladung: Fachbuch für Schifffahrtskaufleute: von Praktikern für Praktiker, 2. Auflage. Bänsch, Axel; Alewell, Dorothea; Moll, Tobias (2020): Wissenschaftliches Arbeiten, 12. Auflage. Voss, Rüdiger (2019): Wissenschaftliches Arbeiten: leicht verständlich. 6. Auflage.

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Module M0608: Basic	s of Electrical E	ingineering				
Courses						
Title				Тур	Hrs/wk	СР
Basics of Electrical Engineering (L0	290)			Lecture	3	4
Basics of Electrical Engineering (L0	292)			Recitation Section (small)	2	2
Module Responsible	Prof. Thorsten Kern					
Admission Requirements	None					
Recommended Previous	Basics of mathematic	S				
Knowledge						
Educational Objectives	After taking part succ	essfully, students have re	eached the fol	lowing learning results		
Professional Competence		•				
Knowledge	Students can to draw	and explain circuit dia	grams for elec	tric and electronic circuits with	n a small number	of components. They
	can describe the bas	ic function of electric an	d electronic c	omponentes and can present	the corresponding	equations. They can
	demonstrate the use	of the standard methods	for calculation	ns.		
Skills	Students are able to	analyse electric and e	lectronic circu	its with few components and	to calculate selec	ted quantities in the
	circuits. They apply th	ne ususal methods of the	electrical eng	ineering for this.		
Damanal Commistance						
Personal Competence	Chudonto ovo ovoblod	to collaborate in interdic	ainlinen (been	a with alastrias and and accine		
Social Competence	Students are enabled	to collaborate in interdis	cipililary team	s with electrical engineering as	a common langua	ige
	With this, they are	learning communication	in a target-o	riented communication style,	are able to unde	erstand interfaces to
	neighboring engineer	ing disciplines and learn	about commoi	nalities but also limits in the dif	ferent directions of	engineering.
Autonomy	Students are able independently to analyse electric and electronic circuits and to calculate selected quantities in the circuits.					
Workload in Hours		me 110, Study Time in Le	ecture 70			
Credit points	6					
Course achievement	No 20 %	Form Subject theoretical	Description	ı des Semesters werden Hai	sarboiton in For	m von alaktrischen
	100 20 %	practical work		n vergeben, für die durch Si		
		practical work		iesen werden muss.	mulation enle Lo.	sung entwicker und
Examination	Subject theoretical ar	nd practical work	acrigeW			
Examination duration and	-					
scale	155 111114165					
Assignment for the	Bioprocess Engineering	ng: Core Qualification: Co	mpulsorv			
Following Curricula		gineering: Core Qualifica		ory		
	-	Energy, Water, Climate: (
	_			t and Processes: Elective Comp	oulsory	
				stems: Elective Compulsory	-	
	Mechanical Engineeri	ng: Core Qualification: Co	mpulsory			
	Orientation Studies: O	Core Qualification: Electiv	e Compulsory			
	Naval Architecture: C	ore Qualification: Compu	sory			
	Process Engineering:	Core Qualification: Comp	ulsory			
	Engineering and Mar	nagement - Major in Log	istics and Mol	oility: Specialisation Production	Management and	d Processes: Elective
	Compulsory					
	Engineering and Mana	agement - Major in Logist	ics and Mobili	ty: Specialisation Traffic Plannir	ng and Systems: El	ective Compulsory

Course L0290: Basics of Elec	trical Engineering
Тур	Lecture
Hrs/wk	3
СР	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Thorsten Kern
Language	DE
Cycle	WiSe
Content	DC networks: Current, voltage, power, Kirchhoff's laws, equivalent sources, network analysis
	AC: Characteristics, RMS, complexe representation, phasor diagrams, power
	Three phase AC: Characterisitics, star-delta- connection, power, transformer
	Elektronics: Principle, operating behaviour and application of electronic devises as diode, Zener-diode, thyristor, transistor operational amplifier
Literature	Alexander von Weiss, Manfred Krause: "Allgemeine Elektrotechnik"; Viweg-Verlag, Signatur der Bibliothek der TUHH: ETB 309
	Ralf Kories, Heinz Schmitt - Walter: "Taschenbuch der Elektrotechnik"; Verlag Harri Deutsch; Signatur der Bibliothek der TUHH:
	ETB 122
	"Grundlagen der Elektrotechnik" - andere Autoren

Course L0292: Basics of Elec	trical Engineering
Тур	Recitation Section (small)
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Thorsten Kern, Weitere Mitarbeiter
Language	DE
Cycle	WiSe
Content	Excercises to the analysis of circuits and the calculation of electrical quantities th the topics:
	DC networks: Current, voltage, power, Kirchhoff's laws, equivalent sources, network analysis AC: Characteristics, RMS, complexe representation, phasor diagrams, power Three phase AC: Characterisitics, star-delta- connection, power, transformer Elektronics: Principle, operating behaviour and application of electronic devises as diode, Zener-diode, thyristor, transistor operational amplifier
Literature	Alexander von Weiss, Manfred Krause: "Allgemeine Elektrotechnik"; Viweg-Verlag, Signatur der Bibliothek der TUHH: ETB 309
	Ralf Kories, Heinz Schmitt - Walter: "Taschenbuch der Elektrotechnik"; Verlag Harri Deutsch; Signatur der Bibliothek der TUHH: ETB 122
	"Grundlagen der Elektrotechnik" - andere Autoren

Module M0740: Struc	tural Analysis I					
Courses						
Title				Тур	Hrs/wk	СР
Structural Analysis I (L0666)				Lecture	2	3
Structural Analysis I (L0667) Structural Analysis I (L3133)				Recitation Section (large) Recitation Section (small)	1	1
-	Prof. Bastian Oesterle			Recitation Section (smail)	1	1
Module Responsible Admission Requirements	None					
Recommended Previous		atics I				
Knowledge	Mechanics I, Mathema	itics i				
	After taking part succ	essfully, students have r	eached the following	na learnina results		
Professional Competence	Arter taking part sace	essiany, students nave i	ederied the followin	ng rearring results		
· ·	After successfully con	anloting this modulo, stu	idonte can overces	the basic aspects of linear fra	amo analysis of s	tatically dotorminato
Knowieuge	and indeterminate sys	· -	idents can express	the basic aspects of linear in	arrie ariarysis or s	tatically determinate
	and indeterminate sy.	stems.				
Skills	After successful comp	letion of this module, th	ne students are abl	e to distinguish between stat	ically determinat	e and indeterminate
	structures. They are	able to analyze state v	ariables and to co	nstruct influence lines of sta	tically determina	te plane and spatial
	frame and truss struc	tures.				
Personal Competence						
Social Competence	Students can					
		ubject-specific and inter		sions,		
		n work results in front of				
	·	ientific development of	-	wystiya suitisisma		
	• Furtnermore, ti	ney can give and accept	professional const	ructive criticism		
Autonomy	The students are able	e work in-term homewo	rk assignments. D	ue to the in-term feedback,	they are enabled	I to self-assess their
	learning progress dur	ing the lecture period, a	lready.			
Workload in Hours		me 110, Study Time in L	ecture 70			
Credit points						
Course achievement	No 10 %	Form Written elaboration	Description	a mait Tantat hatmant durch Ct	udantiacha Tutar	an (Tutarium)
F		Wiltell elaboration	паизиринден	n mit Testat, betreut durch St	udentische rutor	en (Tutorium)
Examination	Written exam					
Examination duration and	90 minutes					
scale	Consul Facility 1	S-1 (C	7 · · · · ·	- delication Chall Facility	Communication	
Assignment for the				ecialisation Civil Engineering:	Compulsory	
Following Curricula		tal Engineering: Core Qu				
		: Specialisation Traffic Pl				
		Specialisation III. Engine				ation Commission
	Engineering and Mana	agement - Major in Logis	tics and Mobility: S	pecialisation Traffic Planning	and Systems: Ele	ective Compulsory

Course L0666: Structural Ana	alysis I
Тур	Lecture
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Bastian Oesterle
Language	DE
Cycle	WiSe
Content	 modeling of structures theory of plane and spacial structures assessment of structural behaviour, degree of static indeterminacy and kinematics analysis of forces and moments, as well as diplscements and rotations principle of virtual work influence lines Force Method for statically indeterminate structures
Literature	 Vorlesungsmanuskript Bletzinger et al.: Aufgabensammlung zur Baustatik: Übungsaufgaben zur Berechnung ebener Stabtragwerke. Hanser. Dinkler: Grundlagen der Baustatik. Springer. Marti: Baustatik. Ernst und Sohn.

Course L0667: Structural Analysis I		
Тур	Recitation Section (large)	
Hrs/wk	2	
СР	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Bastian Oesterle	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L3133: Structural Analysis I		
Тур	Recitation Section (small)	
Hrs/wk	1	
СР	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Bastian Oesterle	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Module M1890: Strate	egic Manageme	ent of Technolog	jical Innovatio	on		
Courses						
Title				Тур	Hrs/wk	СР
Strategic Management of Technolo	gical Innovation (L3127)			Lecture	3	3
Strategic Management of Technolo	gical Innovation (L3128)			Project-/problem-based Learning	2	3
Module Responsible	Prof. Tim Schweisfurth	h				
Admission Requirements	None					
Recommended Previous						
Knowledge						
Educational Objectives	After taking part succ	essfully, students have	reached the following	ng learning results		
Professional Competence						
Knowledge						
Skills						
Personal Competence						
Social Competence						
Autonomy						
Workload in Hours	Independent Study Tir	me 110, Study Time in	Lecture 70			
Credit points	6					
Course achievement	Compulsory Bonus	Form	Description			
	Yes 20 %	Subject theoretical	andsemesterbegl	leitende Mini-Tests, Gruppenarb	eiten	
		practical work				
Examination	Written exam					
Examination duration and	60 minutes					
scale						
				pecialisation Information Techno		
Following Curricula	Engineering and Man	nagement - Major in Lo	ogistics and Mobility	: Specialisation Production Mar	agement and	Processes: Elective
	Compulsory					
	Engineering and Mana	agement - Major in Logi	stics and Mobility: S	pecialisation Traffic Planning and	d Systems: Ele	ective Compulsory

Course L3127: Strategic Man	se L3127: Strategic Management of Technological Innovation		
Тур	Lecture		
Hrs/wk	3		
СР	3		
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42		
Lecturer	Prof. Tim Schweisfurth		
Language	EN		
Cycle	WiSe		
Content			
Literature			

Course L3128: Strategic Man	rse L3128: Strategic Management of Technological Innovation		
Тур	Project-/problem-based Learning		
Hrs/wk	2		
СР	3		
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28		
Lecturer	Prof. Tim Schweisfurth		
Language	EN		
Cycle	WiSe		
Content			
Literature			

	ematics III			
Courses				
Title		Тур	Hrs/wk	CP
Analysis III (L1028)		Lecture	2	2
Analysis III (L1029)	Recitation Section (small) 1 1			
Analysis III (L1030)	Recitation Section (large) 1			
	al Equations 1 (Ordinary Differential Equations) (L1031) Lecture 2 2 al Equations 1 (Ordinary Differential Equations) (L1032) Recitation Section (small) 1 1			
Differential Equations 1 (Ordinary I		Recitation Section (small) Recitation Section (large)	1	1
Module Responsible	·	recitation Section (large)		-
Admission Requirements				
Recommended Previous				
Knowledge				
	After taking part successfully, students have reached	the following learning results		
Professional Competence		tale lone may learning results		
Knowledge				
Miowicage	Students can name the basic concepts in the a	area of analysis and differential equations	. They are able t	o explain them using
	appropriate examples.			
	Students can discuss logical connections between	veen these concepts. They are capable of	of illustrating th	ese connections with
	the help of examples.			
	They know proof strategies and can reproduce	e them.		
Skills	 Students can model problems in the area of a 	nalysis and differential equations with the	help of the cor	cents studied in this
	course. Moreover, they are capable of solving	·	ricip of the cor	icepts studied in this
	Students are able to discover and verify further		its studied in the	course
	For a given problem, the students can devel			
	results.	op and execute a suitable approach, al		raceany evaluate and
	- Courter			
Personal Competence				
Social Competence				
30ciai competence	Students are able to work together in teams. 1	They are capable to use mathematics as a	common langua	age.
	In doing so, they can communicate new conce	epts according to the needs of their coope	erating partners	. Moreover, they can
	design examples to check and deepen the unc	derstanding of their peers.		
Autonomy	- Chudanta are sanable of sheeking their under	standing of complex concepts on their co	They can en	acifu anan susatiana
	Students are capable of checking their understanding of complex concepts on their own. They can specify open questions precisely and know where to get help in solving them.			
	precisely and know where to get help in solving them. Students have developed sufficient persistence to be able to work for larger periods in a goal griented manner on hard			
	Students have developed sufficient persistence to be able to work for longer periods in a goal-oriented manner on hard archiera.			tod mannor on hard
	· · · · · · · · · · · · · · · · · · ·		in a goal-orien	ted manner on hard
	problems.		in a goal-orien	ted manner on hard
	· · · · · · · · · · · · · · · · · · ·		in a goal-orien	ted manner on hard
Workload in Hours	problems.	ce to be able to work for longer periods	in a goal-orien	ted manner on hard
	problems. Independent Study Time 128, Study Time in Lecture	ce to be able to work for longer periods	in a goal-orien	ted manner on hard
Credit points	problems. Independent Study Time 128, Study Time in Lecture	ce to be able to work for longer periods	in a goal-orien	ted manner on hard
Credit points Course achievement	problems. Independent Study Time 128, Study Time in Lecture 8 None	ce to be able to work for longer periods	in a goal-orien	ted manner on hard
Credit points Course achievement Examination	problems. Independent Study Time 128, Study Time in Lecture 8 None Written exam	ce to be able to work for longer periods	in a goal-orien	ted manner on hard
Credit points Course achievement Examination Examination duration and	problems. Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations	ce to be able to work for longer periods	in a goal-orien	ted manner on hard
Credit points Course achievement Examination Examination duration and scale	problems. Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations	ce to be able to work for longer periods 112	in a goal-orien	ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	problems. Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations	te to be able to work for longer periods 112 1) mester): Core Qualification: Compulsory	in a goal-orien	ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	problems. Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat	112 1) mester): Core Qualification: Compulsory cion: Compulsory	in a goal-orien	ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	problems. Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se	112 In mester): Core Qualification: Compulsory cion: Compulsory cory	in a goal-orien	ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	problems. Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulse	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory	in a goal-orien	ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	problems. Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulse Chemical and Bioprocess Engineering: Core Qualifica	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory ompulsory	in a goal-orien	ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	problems. Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulse Chemical and Bioprocess Engineering: Core Qualificat Digital Mechanical Engineering: Core Qualification: C	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory ompulsory ompulsory y	in a goal-orien	ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	problems. Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualification: C Electrical Engineering: Core Qualification: C Electrical Engineering: Core Qualification: Compulsor	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory ompulsory ompulsory y ualification: Compulsory	in a goal-orien	ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	problems. Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualification: C Electrical Engineering: Core Qualification: C Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qualification: Core Qualification: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qualification: Compul	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory ompulsory ompulsory y ualification: Compulsory Compulsory Compulsory	in a goal-orien	ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualificat Digital Mechanical Engineering: Core Qualification: C Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qu Computer Science in Engineering: Core Qualification:	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory ompulsory ompulsory y ualification: Compulsory Compulsory compulsory ompulsory ompulsory ompulsory ompulsory ompulsory ompulsory ompulsory ompulsory	in a goal-orien	ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualificat Digital Mechanical Engineering: Core Qualification: C Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qu Computer Science in Engineering: Core Qualification: Integrated Building Technology: Core Qualification: C	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory ompulsory ompulsory y ualification: Compulsory Compulsory ompulsory ompulsory ompulsory ompulsory and Systems: Elective Compulsory		ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualificat Digital Mechanical Engineering: Core Qualification: C Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qu Computer Science in Engineering: Core Qualification: Integrated Building Technology: Core Qualification: C Logistics and Mobility: Specialisation Traffic Planning	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory ompulsory ompulsory compulsory ompulsory ompulsory ompulsory ompulsory ompulsory ompulsory and Systems: Elective Compulsory agement and Processes: Elective Compulsory agement and Processes: Elective Compulsory		ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualificat Digital Mechanical Engineering: Core Qualification: C Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qu Computer Science in Engineering: Core Qualification: Integrated Building Technology: Core Qualification: C Logistics and Mobility: Specialisation Traffic Planning Logistics and Mobility: Specialisation Production Man	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory ompulsory ompulsory compulsory ompulsory ompulsory ompulsory ompulsory ompulsory and Systems: Elective Compulsory agement and Processes: Elective Compulsory hnology: Compulsory		ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualificat Digital Mechanical Engineering: Core Qualification: C Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qu Computer Science in Engineering: Core Qualification: Integrated Building Technology: Core Qualification: C Logistics and Mobility: Specialisation Traffic Planning Logistics and Mobility: Specialisation Information Tec	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory ompulsory ompulsory compulsory ompulsory ompulsory ompulsory ompulsory ompulsory and Systems: Elective Compulsory agement and Processes: Elective Compulsory hnology: Compulsory		ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualificat Digital Mechanical Engineering: Core Qualification: C Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qu Computer Science in Engineering: Core Qualification: Integrated Building Technology: Core Qualification: C Logistics and Mobility: Specialisation Traffic Planning Logistics and Mobility: Specialisation Information Tec Mechanical Engineering: Core Qualification: Compuls	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory ompulsory ompulsory compulsory ompulsory ompulsory ompulsory ompulsory ompulsory and Systems: Elective Compulsory agement and Processes: Elective Compulsory hnology: Compulsory		ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualificat Digital Mechanical Engineering: Core Qualification: C Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qu Computer Science in Engineering: Core Qualification: Integrated Building Technology: Core Qualification: C Logistics and Mobility: Specialisation Traffic Planning Logistics and Mobility: Specialisation Information Tec Mechanical Engineering: Core Qualification: Compuls Mechatronics: Core Qualification: Compulsory	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory ompulsory ompulsory compulsory ompulsory ompulsory ompulsory ompulsory ompulsory and Systems: Elective Compulsory agement and Processes: Elective Compulsory hnology: Compulsory		ted manner on hard
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualificat Digital Mechanical Engineering: Core Qualification: C Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qu Computer Science in Engineering: Core Qualification: Integrated Building Technology: Core Qualification: C Logistics and Mobility: Specialisation Traffic Planning Logistics and Mobility: Specialisation Production Man Logistics and Mobility: Specialisation Information Tec Mechanical Engineering: Core Qualification: Compulsory Naval Architecture: Core Qualification: Compulsory	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory ompulsory ompulsory compulsory ompulsory ompulsory ompulsory ompulsory and Systems: Elective Compulsory agement and Processes: Elective Compulsory ory	sory	
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualificat Digital Mechanical Engineering: Core Qualification: C Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qu Computer Science in Engineering: Core Qualification: Integrated Building Technology: Core Qualification: C Logistics and Mobility: Specialisation Traffic Planning Logistics and Mobility: Specialisation Production Man Logistics and Mobility: Specialisation Information Tec Mechanical Engineering: Core Qualification: Compulsory Naval Architecture: Core Qualification: Compulsory Process Engineering: Core Qualification: Compulsory	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory ompulsory ompulsory compulsory y ualification: Compulsory compulsory and Systems: Elective Compulsory agement and Processes: Elective Compuls hnology: Compulsory ory d Mobility: Specialisation Traffic Planning and Mobility: Specialisation Traffic Plan	sory	ective Compulsory
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 128, Study Time in Lecture 8 None Written exam 60 min (Analysis III) + 60 min (Differential Equations General Engineering Science (German program, 7 se Civil- and Environmental Engineering: Core Qualificat Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualificat Digital Mechanical Engineering: Core Qualification: C Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qu Computer Science in Engineering: Core Qualification: Integrated Building Technology: Core Qualification: C Logistics and Mobility: Specialisation Traffic Planning Logistics and Mobility: Specialisation Production Man Logistics and Mobility: Specialisation Information Tec Mechanical Engineering: Core Qualification: Compulsory Naval Architecture: Core Qualification: Compulsory Process Engineering: Core Qualification: Compulsory Engineering and Management - Major in Logistics and	112 1) mester): Core Qualification: Compulsory cion: Compulsory ory tion: Compulsory ompulsory ompulsory compulsory y ualification: Compulsory compulsory and Systems: Elective Compulsory agement and Processes: Elective Compuls hnology: Compulsory ory d Mobility: Specialisation Traffic Planning and Mobility: Specialisation Traffic Plan	sory	ective Compulsory

Course L1028: Analysis III		
Тур	Lecture	
Hrs/wk	2	
СР		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Dozenten des Fachbereiches Mathematik der UHH	
Language	DE	
Cycle	WiSe	
Content	Main features of differential and integrational calculus of several variables	
Literature	Differential calculus for several variables Mean value theorems and Taylor's theorem Maximum and minimum values Implicit functions Minimization under equality constraints Newton's method for multiple variables Fourier series Double integrals over general regions Line and surface integrals Theorems of Gauß and Stokes	
	http://www.math.uni-hamburg.de/teaching/export/tuhh/index.html	

Course L1029: Analysis III	ourse L1029: Analysis III		
Тур	Recitation Section (small)		
Hrs/wk	1		
СР			
Workload in Hours	dependent Study Time 16, Study Time in Lecture 14		
Lecturer	ozenten des Fachbereiches Mathematik der UHH		
Language	E		
Cycle	WiSe		
Content	ee interlocking course		
Literature	ee interlocking course		

Course L1030: Analysis III		
Тур	Recitation Section (large)	
Hrs/wk	1	
СР	1	
Workload in Hours	pendent Study Time 16, Study Time in Lecture 14	
Lecturer	ozenten des Fachbereiches Mathematik der UHH	
Language	E	
Cycle	liSe	
Content	ee interlocking course	
Literature	ee interlocking course	

Course L1031: Differential Equations 1 (Ordinary Differential Equations)			
Тур	ecture		
Hrs/wk			
СР	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Dozenten des Fachbereiches Mathematik der UHH		
Language	DE		
Cycle	WiSe		
Content	Main features of the theory and numerical treatment of ordinary differential equations Introduction and elementary methods Exsitence and uniqueness of initial value problems Linear differential equations Stability and qualitative behaviour of the solution Boundary value problems and basic concepts of calculus of variations Eigenvalue problems Numerical methods for the integration of initial and boundary value problems Classification of partial differential equations		
Literature	http://www.math.uni-hamburg.de/teaching/export/tuhh/index.html		

Course L1032: Differential Equations 1 (Ordinary Differential Equations)		
Тур	Recitation Section (small)	
Hrs/wk	1	
СР		
Workload in Hours	dependent Study Time 16, Study Time in Lecture 14	
Lecturer	ozenten des Fachbereiches Mathematik der UHH	
Language)E	
Cycle	/iSe	
Content	ee interlocking course	
Literature	iee interlocking course	

Course L1033: Differential Ed	Course L1033: Differential Equations 1 (Ordinary Differential Equations)		
Тур	ecitation Section (large)		
Hrs/wk	1		
СР			
Workload in Hours	dependent Study Time 16, Study Time in Lecture 14		
Lecturer	ozenten des Fachbereiches Mathematik der UHH		
Language	E		
Cycle	WiSe		
Content	ee interlocking course		
Literature	See interlocking course		

Module M0728: Hydro	omechanics and	Hydrology				
Courses						
Title Hydrology (L0909) Hydrology (L0956) Hydromechanics (L0615) Hydromechanics (L0616)				Typ Lecture Project-/problem-based Learning Lecture Project-/problem-based Learning	Hrs/wk 1 1 2	CP 1 2 2
Module Responsible	Prof Peter Fröhle			Troject-/problem-based Learning	1	1
Admission Requirements						
Recommended Previous	Mathematics I, II and	II				
Knowledge	Mechanics I und II					
Educational Objectives	After taking part succ	essfully, students have r	eached the followi	ng learning results		
Professional Competence						
Knowledge	They are able to derivand quantify the rele	The students are able to define the basic terms of hydromechanics, hydrology groundwater hydrology and water management. They are able to derive the basic formulations of i) hydrostatics, ii) kinematics of flows and iii) conservation laws and to describe and quantify the relevant processes of the hydrological water cycle. Besides, the students can describe the main aspects of rainfall-run-off-modelling and of established reservoir / storage models as well as the concepts of the determination of a unit-hydrograph.				
Skills		to apply the fundament nd document basic hydra		hydromechanics to basic practica	al problems. F	urthermore, they are
	Besides, they are able to apply basic hydrological approaches and methods to simple hydrological problems. The students have the capability to exemplarily apply simple reservoir/storage models and a unit-hydrograph to given problems. In addition, the basic concepts of field-measurements of hydrological and hydrodynamic values can be described and the students are able to perform, analyze and assess respective measurements.					
Personal Competence						
_	The students are able to work in groups in a goal-orientated, structured manner. They can explain their results sustainably in plenary sessions by use of peer learning approaches. Furthermore, they are able to prepare and present technical presentations for given topics in groups.					
Autonomy	Students are capable of organising their individual work flow to contribute to the conduct of experiments and to present discipline- specific knowledge. They can provide each other with feedback and suggestions on their results. They are capable of reflecting their study techniques and learning strategy on an individual basis.					
Workload in Hours	Independent Study Ti	me 110, Study Time in L	ecture 70			
Credit points	6					
Course achievement	Yes None Yes None Yes None	Form Subject theoretical practical work Group discussion Excercises	Hydromecha Erstellung e Hydrologie ir	g, Dokumentation und Präs nik oder Hydraulik in Gruppen ine Posters zu einer Themat I Gruppen und Präsentation Iben Hydrologie		
Examination	Written exam					
Examination duration and scale	150 minutes					
Assignment for the				ecialisation Civil Engineering: Co	mpulsory	
Following Curricula	Logistics and Mobility	tal Engineering: Core Qu Specialisation Traffic Pl	anning and Systen	ns: Elective Compulsory	d Cooks	ativa Carry
	Engineering and Mana	igernent - Major in Logis	ucs and Mobility: S	Specialisation Traffic Planning and	u systems: Ele	ective Compulsory

Course L0909: Hydrology	Course L0909: Hydrology		
Тур	ecture		
Hrs/wk	1		
СР	1		
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14		
Lecturer	Prof. Peter Fröhle		
Language	DE		
Cycle	WiSe		
Content	Introduction to basics of hydrology and groundwater hydrology: Hydrological cycle Data acquisition in hydrology Data analyses and statistical assessment Statistics of extremes Regionalization methods for hydrological values rainfall-run-off modelling on the basis of a unit hydrograph concept		
Literature	Maniak, U. (2017). Hydrologie und Wasserwirtschaft: Eine Einführung für Ingenieure. Springer Vieweg. Skript "Hydrologie und Gewässerkunde"		

Course L0956: Hydrology			
Тур	oject-/problem-based Learning		
Hrs/wk	1		
СР	2		
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14		
Lecturer	Prof. Peter Fröhle		
Language	DE		
Cycle	WiSe		
Content	Introduction to basics of Hydrology: Hydrological cycle Data acquisition Data analyses and statistical assessment Statistics of extremes Regionalization methods for hydrological values Rainfall-run-off modelling on the basis of a unit hydrograph conceps		
Literature	Maniak, Hydrologie und Wasserwirtschaft, Eine Einführung für Ingenieure, Springer Skript Hydrologie und Gewässerkunde		

1000 11 11 11 11			
Course L0615: Hydromechanics			
Тур	Lecture		
Hrs/wk	2		
СР	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Peter Fröhle		
Language	DE		
Cycle	WiSe		
Content	Fundamentals of Hydromechanics		
	Characteristics of fluids Hydrostatics Kinematics of flows, laminar and turbulent flows Conservation laws Conservation of mass Conservation of Energy Momentum Equation Application of conservation laws to flow conditions		
Literature	Skript zur Vorlesung Hydromechanik/Hydraulik, Kapitel 1-2 Truckenbrodt, E.: Lehrbuch der angewandten Fluidmechanik, Springer Verlag, Berlin, 1998. Truckenbrodt, E.: Grundlagen und elementare Strömungsvorgänge dichtebeständiger Fluide / Fluidmechanik, Springer Verlag, Berlin, 1996.		

Course L0616: Hydromechanics		
Тур	oject-/problem-based Learning	
Hrs/wk	1	
СР		
Workload in Hours	ndependent Study Time 16, Study Time in Lecture 14	
Lecturer	of. Peter Fröhle	
Language	E	
Cycle	iSe	
Content	ee interlocking course	
Literature	see interlocking course	

Module M1289: Logist	tical systems - Industry 4.0			
Courses				
Title		Тур	Hrs/wk	СР
Logistics systems - Industry 4.0 (L1	753)	Seminar	4	6
Module Responsible	Prof. Jochen Kreutzfeldt			
Admission Requirements	None			
Recommended Previous	Successful completion of the module "Technical	Logistics"		
Knowledge				
Educational Objectives	After taking part successfully, students have rea	ached the following learning results		
Professional Competence				
Knowledge	The students will acquire the following knowled	ge:		
	1. The students are able to understand and exp	lain the concept "Logistical System".		
	2. The students are able to design a logistic sys	tem conceptually.		
	2. The statems and able to design a logistic sys	comedpadiny.		
	3. The students can develop and implement the	control of a logistic system with pythor	١.	
Skills	The students will acquire the following skills:			
	1. The students are able to identify logistical sys	stems, analyze and identify potential for	r change and improvem	ent.
	2. The students know different technical solutio	ns to address problems in logistical syst	ems.	
	3. The students are capable of deploying tec	hnical solutions and ideas from the c	oncept Industry 4.0 to	deal with logistical
	problems.			
Personal Competence				
Social Competence	The students will acquire the following social sk	ills:		
	1. The students are able to develop technical so	lutions for logistical systems and reflec	t their contribution withi	n the team.
	2. The technical solutions from the group can be	e jointly documented and presented.		
	Students are able to present their technological solutions to an audience and derived from the critique new ideas and improvements.			
	provenienie.			
Autonomy	The students will acquire the following independ	dent competencies:		
	1. The students can independently develop tech	nical solutions for logistical problems u	nder supervision.	
	2. The students are able to evaluate their techn	ical solutions and discuss the pros and	cons.	
	3. The students are able to assess the impact of	the concept Industry 4.0 on their own	career development.	
Workload in Hours	Independent Study Time 124, Study Time in Lec	ture 56		
Credit points	· · · · · · · · · · · · · · · · · · ·			
Course achievement				
	Written elaboration			
	Lab prototype with documentation (group work)			
scale	235 p. storype with documentation (group work)			
	Logistics and Mobility: Specialisation Informatio	n Technology: Elective Compulsory		
Following Curricula	Logistics and Mobility: Specialisation Traffic Plan		/	
	Logistics and Mobility: Specialisation Production			
	Engineering and Management - Major in Logistic			Compulsory
	Engineering and Management - Major in Logistic	• •		
	Engineering and Management - Major in Logis	• •		
	Compulsory	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	J = 1 1 1 1 1 1 1 1 1 1	

Course L1753: Logistics syst	ems - Industry 4.0			
Тур	Seminar			
Hrs/wk	4			
СР				
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Lecturer	Prof. Jochen Kreutzfeldt			
Language	DE			
Cycle	WiSe			
Content	The lecture gives an introduction to the concept of logistical systems with a special emphasis on the subject of Industry 4.0. Here, the system concept in logistics from a technical point of view is introduced. A logistical system is understood as a combination of transport, storage and change processes between source and sink of goods. This lecture will look at the technical aspect of these processes. Industry is a topic of this lecture. Industry 4.0 is understood as the far-reaching digitization and networking of logistical systems and the connection of logistical objects, processes and systems. The logistics industry expects Industry 4.0 to be a profound change and the realization of large improvement potentials. The lecture provides an in-depth introduction to application cases and business models of Industry 4.0 in logistics from a technical standpoint. A possible framework for Industry 4.0 is presented and several application examples are shown.			
	In the exercises, students learn will learn the exemplary use of different technical solutions and know how, which can be used to improve logistical systems.			
Literature	Bauernhansl, Thomas et al. (2014): Industrie 4.0 in Produktion, Automatisierung und Logistik. Anwendung, Technologien, Migration. Wiesbaden: Springer Vieweg. Hausladen, Iris (2014): IT-gestützte Logistik. Systeme - Prozesse - Anwendungen. 2. Auflage 2014. Wiesbaden: Imprint: Gabler Verlag. Hompel, Michael ten; Büchter, Hubert; Franzke, Ulrich (2008): Identifikationssysteme und Automatisierung. [Intralogistik]. Berlin, Heidelberg: Springer.			
	Kaufmann, Timothy (2015): Geschäftsmodelle in Industrie 4.0 und dem Internet der Dinge. Der Weg vom Anspruch in die Wirklichkeit. Wiesbaden: Springer Fachmedien Wiesbaden. Martin, Heinrich (2014): Transport- und Lagerlogistik. Planung, Struktur, Steuerung und Kosten von Systemen der Intralogistik. 9., Auflage 2014. Wiesbaden: Imprint: Springer Vieweg. Runkler, Thomas A. (2010): Data-Mining. Methoden und Algorithmen intelligenter Datenanalyse. 1. Aufl. Wiesbaden: Vieweg + Teubner (Studium).			

Module M0706: Geote	echnics I					
Courses						
Title				Тур	Hrs/wk	СР
Soil Mechanics (L0550)				Lecture	2	2
Soil Mechanics (L0551)				Recitation Section (large)	2	2
Soil Mechanics (L1493)				Recitation Section (small)	2	2
Module Responsible	Prof. Jürgen Grabe					
Admission Requirements	None					
Recommended Previous	Modules :					
Knowledge	Mechanics I-II					
Educational Objectives	After taking part succ	essfully, students	have reached the followi	ng learning results		
Professional Competence						
Knowledge	The students know th	e basics of soil m	echanics as the structure	and characteristics of soil, s	tress distribution	due to weight, water
	or structures, consolid	dation and settlen	nent calculations, as well	as failure of the soil due to g	round- or slope fa	ilure.
Skills	After the successful of	completion of the	module the students sho	uld be able to describe the r	mechanical prope	rties and to evaluate
	them with the help of	of geotechnical st	tandard tests. They can	calculate stresses and defor	rmation in the so	oils due to weight or
	influence of structure	s. They are are ab	ole to prove the usability (settlements) for shallow four	ndations.	
Danis and Comments and						
Personal Competence						
Social Competence						
Autonomy						
	Independent Study Ti	me 96, Study Tim	ie in Lecture 84			
Credit points						
Course achievement	Compulsory Bonus No 20 %	Form Attestation	Description			
Examination		Attestation				
Examination duration and	90 minutes					
scale	0 15 1 1		7		<u> </u>	
Assignment for the				ecialisation Civil Engineering	: Compulsory	
Following Curricula			Core Qualification: Compu	•		
		•	raffic Planning and Systen			
		•	Engineering Science: Elec			antina Cananalan
	Engineering and Mana	agement - Major II	n Logistics and Mobility: S	Specialisation Traffic Planning	and Systems: Ele	ective Compulsory

Course L0550: Soil Mechanic	s
Тур	Lecture
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Jürgen Grabe
Language	DE
Cycle	WiSe
Content	 Structure of the soil Ground surveying Compstition and properties of the soil Groundwater One-dimensional compression Spreading of stresses Settlement calculation Consolidation Shear strength Earth pressure Slope failure Ground failure Suspension based earth tenches
Literature	 Vorlesungsumdruck, s. ww.tu-harburg.de/gbt Grabe, J. (2004): Bodenmechanik und Grundbau Gudehus, G. (1981): Bodenmechanik Kolymbas, D. (1998): Geotechnik - Bodenmechanik und Grundbau Grundbau-Taschenbuch, Teil 1, aktuelle Auflage

Course L0551: Soil Mechanics		
Тур	Recitation Section (large)	
Hrs/wk	2	
СР	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Jürgen Grabe	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L1493: Soil Mechanics		
Тур	Recitation Section (small)	
Hrs/wk	2	
СР	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Jürgen Grabe	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

	duction to Control Systems			
Courses				
itle		Тур	Hrs/wk	CP
ntroduction to Control Systems (LC		Lecture	2	4
ntroduction to Control Systems (LC)655)	Recitation Section (small)	2	2
Module Responsible	NN			
Admission Requirements	None			
Recommended Previous	Representation of signals and systems in time and fi	requency domain, Laplace transform		
Knowledge				
Educational Objectives	After taking part successfully, students have reached	d the following learning results		
Professional Competence				
Knowledge				
	Students can represent dynamic system behavior	avior in time and frequency domain, and o	can in particular	explain properties
	first and second order systems			
	They can explain the dynamics of simple cont	rol loops and interpret dynamic propertie	s in terms of frec	quency response a
	root locus			
	They can explain the Nyquist stability criterion	• •		
	They can explain the role of the phase margin			
	They can explain the way a PID controller affe			
	They can explain issues arising when controlled.	ers designed in continuous time domain a	re implemented	digitally
Skills				
	Students can transform models of linear dyna	mic systems from time to frequency doma	ain and vice vers	a
	They can simulate and assess the behavior of	systems and control loops		
	They can design PID controllers with the help	of heuristic (Ziegler-Nichols) tuning rules		
	They can analyze and synthesize simple contri	rol loops with the help of root locus and fro	equency respons	e techniques
	They can calculate discrete-time approxim	nations of controllers designed in cont	inuous-time and	d use it for dig
	implementation			
	They can use standard software tools (Matlab	Control Toolbox, Simulink) for carrying ou	it these tasks	
Personal Competence				
Social Competence	Students can work in small groups to jointly solve te	chnical problems, and experimentally vali	date their contro	ller designs
•				
Autonomy	Students can obtain information from provided sou	arces (lecture flotes, software documents	ation, experimen	it guides) and use
	when solving given problems.			
	They can assess their knowledge in weekly on-line to	ests and thereby control their learning pro	gress.	
Workload in Hours	Independent Study Time 124, Study Time in Lecture	56		
	Independent Study Time 124, Study Time in Lecture	56		
Credit points	6	56		
Credit points Course achievement	6 None	56		
Credit points Course achievement Examination	6 None Written exam	56		
Credit points Course achievement Examination Examination duration and	6 None Written exam	56		
Credit points Course achievement Examination	6 None Written exam 120 min			
Credit points Course achievement Examination Examination duration and	6 None Written exam 120 min			
Credit points Course achievement Examination Examination duration and scale	6 None Written exam 120 min General Engineering Science (German program, 7 se	emester): Core Qualification: Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Written exam 120 min General Engineering Science (German program, 7 se Bioprocess Engineering: Core Qualification: Compuls Chemical and Bioprocess Engineering: Core Qualification: Core Qualification: Core Qualific	emester): Core Qualification: Compulsory ory ation: Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Written exam 120 min General Engineering Science (German program, 7 se Bioprocess Engineering: Core Qualification: Compuls Chemical and Bioprocess Engineering: Core Qualification: Science: Core Qualification: Elective Compulsor	emester): Core Qualification: Compulsory ory ation: Compulsory 'Y		
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Written exam 120 min General Engineering Science (German program, 7 se Bioprocess Engineering: Core Qualification: Compuls Chemical and Bioprocess Engineering: Core Qualification: Core Qualification: Core Qualific	emester): Core Qualification: Compulsory ory ation: Compulsory 'Y		
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Written exam 120 min General Engineering Science (German program, 7 se Bioprocess Engineering: Core Qualification: Compuls Chemical and Bioprocess Engineering: Core Qualification: Elective Compulsor Data Science: Core Qualification: Elective Compulsor Data Science: Specialisation II. Application: Elective Electrical Engineering: Core Qualification: Compulsor	emester): Core Qualification: Compulsory ory ation: Compulsory 'Y Compulsory ry		
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Written exam 120 min General Engineering Science (German program, 7 se Bioprocess Engineering: Core Qualification: Compuls Chemical and Bioprocess Engineering: Core Qualification: Elective Compulsor Data Science: Core Qualification: Elective Compulsor Data Science: Specialisation II. Application: Elective	emester): Core Qualification: Compulsory ory ation: Compulsory 'Y Compulsory ry		
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Written exam 120 min General Engineering Science (German program, 7 se Bioprocess Engineering: Core Qualification: Compuls Chemical and Bioprocess Engineering: Core Qualification: Elective Compulsor Data Science: Core Qualification: Elective Compulsor Data Science: Specialisation II. Application: Elective Electrical Engineering: Core Qualification: Compulsor	emester): Core Qualification: Compulsory ory ation: Compulsory 'Y Compulsory ry ualification: Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Written exam 120 min General Engineering Science (German program, 7 set Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualification: Blactive Compulsor Data Science: Core Qualification: Elective Compulsor Data Science: Specialisation II. Application: Elective Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qualification Integrated Building Technology: Core Qualification: Electron Integrated Building Integr	emester): Core Qualification: Compulsory ory stion: Compulsory 'y Compulsory ry ualification: Compulsory : Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Written exam 120 min General Engineering Science (German program, 7 se Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualification: Elective Compulsor Data Science: Core Qualification: Elective Compulsor Data Science: Specialisation II. Application: Elective Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qualification: Computer Science in Engineering: Core Qualification	emester): Core Qualification: Compulsory ory stion: Compulsory 'y Compulsory ry ualification: Compulsory : Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Written exam 120 min General Engineering Science (German program, 7 set Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualification: Blactive Compulsor Data Science: Core Qualification: Elective Compulsor Data Science: Specialisation II. Application: Elective Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qualification Integrated Building Technology: Core Qualification: Electron Integrated Building Integr	emester): Core Qualification: Compulsory ory stion: Compulsory 'y Compulsory ry ualification: Compulsory : Compulsory compulsory : Compulsory		
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Credit points Course achievement Examination Examination duration and scale Assignment for the	6 None Written exam 120 min General Engineering Science (German program, 7 set Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualification: Elective Compulsor Data Science: Core Qualification: Elective Compulsor Data Science: Specialisation II. Application: Elective Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qualification Integrated Building Technology: Core Qualification: Electives and Mobility: Specialisation Information Technologis: and Mobility: Specialisation Traffic Planning	emester): Core Qualification: Compulsory ory stion: Compulsory 'y Compulsory ty ualification: Compulsory : Compulsory Elective Compulsory : Innology: Elective Compulsory and Systems: Elective Compulsory lagement and Processes: Elective Compul	sory	
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Credit points Course achievement Examination Examination duration and scale Assignment for the	None Written exam 120 min General Engineering Science (German program, 7 set Bioprocess Engineering: Core Qualification: Compulso Chemical and Bioprocess Engineering: Core Qualification: Elective Compulsor Data Science: Core Qualification: Elective Compulsor Data Science: Specialisation II. Application: Elective Electrical Engineering: Core Qualification: Compulsor Green Technologies: Energy, Water, Climate: Core Qualification Integrated Building Technology: Core Qualification: Logistics and Mobility: Specialisation Information Teclogistics and Mobility: Specialisation Traffic Planning Logistics and Mobility: Specialisation Production Mar Mechanical Engineering: Core Qualification: Compulsory Technomathematics: Specialisation III. Engineering: Theoretical Mechanical Engineering: Technical Compusory Engineering and Management - Major in Logistics and	emester): Core Qualification: Compulsory ory stion: Compulsory 'y Compulsory 'r ualification: Compulsory : Compulsory : Compulsory : Hective Compulsory : Compuls	Compulsory nnology: Elective and Systems: Ele	ective Compulsory

Course L0654: Introduction t	o Control Systems	
Тур	Lecture	
Hrs/wk	2	
СР	4	
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28	
Lecturer	NN	
Language	DE	
Cycle	WiSe	
Content	Signals and systems	
	Linear systems, differential equations and transfer functions	
	First and second order systems, poles and zeros, impulse and step response	
	Stability	
	Feedback systems	
	Principle of feedback, open-loop versus closed-loop control	
	Reference tracking and disturbance rejection	
	Types of feedback, PID control	
	System type and steady-state error, error constants	
	Internal model principle	
	Root locus techniques	
	Root locus plots	
	Root locus design of PID controllers	
	Frequency response techniques	
	Bode diagram	
	Minimum and non-minimum phase systems	
	Nyquist plot, Nyquist stability criterion, phase and gain margin	
	Loop shaping, lead lag compensation	
	Frequency response interpretation of PID control	
	Time delay systems	
	Root locus and frequency response of time delay systems	
	Smith predictor	
	Digital control	
	Sampled-data systems, difference equations	
	Tustin approximation, digital implementation of PID controllers	
	Software tools	
	Introduction to Matlab, Simulink, Control toolbox	
	Computer-based exercises throughout the course	
Literature		
	Werner, H., Lecture Notes "Introduction to Control Systems"	
	G.F. Franklin, J.D. Powell and A. Emami-Naeini "Feedback Control of Dynamic Systems", Addison Wesley, Reading, MA, 2009 C.	
	K. Ogata "Modern Control Engineering", Fourth Edition, Prentice Hall, Upper Saddle River, NJ, 2010 D. C. Barfand B. H. Bishan, "Modern Control Control Medicine Wesley, Booding MA 2010.	
	R.C. Dorf and R.H. Bishop, "Modern Control Systems", Addison Wesley, Reading, MA 2010	

ourse L0655: Introduction to Control Systems		
Тур	Recitation Section (small)	
Hrs/wk	2	
СР	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	NN	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Module M1070: Simul	lation of Transport and Handl	ing Systems		
Courses				
Title		Тур	Hrs/wk	СР
Simulation of Transport and Handli	ng Systems (L1352)	Lecture	1	2
Simulation of Transport and Handli	ng Systems (L1818)	Recitation Section (small)	3	4
Module Responsible	Prof. Carlos Jahn			
Admission Requirements	None			
Recommended Previous	Basic knowledge of transport- and handling	gtechnology.		
Knowledge				
Educational Objectives	After taking part successfully, students have	ve reached the following learning results		
Professional Competence				
Knowledge	Students can			
	Explain the structure and workings of the structure and			
		ion software subject to the starting situation.		
	Present different simulation program	ns and kinds of simulation that are in widespread	use and explain tr	neir characteristics.
Skills	Students are able to			
	Recognize, analyze, and assemble in	nto a model the elementary building blocks of a l	ogistics system.	
		ess using the <i>Plant Simulation</i> ® simulation softw		
	_ · · · · ·	the simulation, transfer them to the reality, and		commendations from
	them.	,		
Personal Competence				
•	Students are capable of			
Social competence	Stadents are capable of			
	 Solving complex tasks in a team and 	d to document assignments accordingly.		
	 Playing different roles in the teamwork 	ork and giving each other appropriate feedback i	n the team.	
	 Presenting the relevant results of the 	eir project to specialists and representing them.		
Autonomy	Students are able			
		itly with software with which they are not familia	r and to use it to so	live complex tasks.
	To define work steps independently	and to acquire the knowledge required to do so.		
	Independent Study Time 124, Study Time i	in Lecture 56		
Credit points				
Course achievement		Description		
	No 20 % Subject theoretic practical work	aı allu		
	·			
Examination	Subject theoretical and practical work			
Examination duration and	Simulation study and report with approxim	ately 15 pages per person		
scale		, , , ,		
	Data Science: Core Qualification: Elective C	Compulsory		
-	Logistics and Mobility: Specialisation Inforn	• •		
		c Planning and Systems: Elective Compulsory		
	3 .	gistics and Mobility: Specialisation Information T	echnology: Elective	e Compulsory
		registics and Mobility: Specialisation Traffic Planni		
		Logistics and Mobility: Specialisation Production		
	Compulsory	andosmey. opecialisation froduction		
	· · ·	Logistics and Mobility: Specialisation Production	Management and	Processes: Flective
	Compulsory	and . lobiney. Specialisation 110ddetion		
	paison,			

Course L1352: Simulation of	Transport and Handling Systems
Тур	Lecture
Hrs/wk	1
СР	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Carlos Jahn
Language	DE
Cycle	WiSe
Content	The lecture deals with the simulation of external logistics systems. The focus is therefore on the consideration of logistical
	processes between companies or on transhipment systems, such as ports or individual terminals.
	In the first part of the lecture, students will first acquire basic knowledge of external logistics systems and the advantages of using
	simulations to present them. Then an overview of existing simulation types and programs is given and examples for existing
	simulation models of logistic systems in science and practice are shown. Some simulation models will be demonstrated.
	In the second part of the lecture the students learn the basic handling of the simulation software Plant Simulation®. They receive
	theoretical explanations of the general functionality of the simulation tool, which are further deepened through the use of
	extensive, interactive examples. At the same time, five exercises, which build on each other, offer students the opportunity to
	implement the course content they have learnt alone and in small groups. The exercises can be completed during the supervised
	lecture periods as well as at other times.
	The acquired knowledge is to be applied in the third part in the course of group work. The students will be divided into groups,
	each of which will then work on a relevant problem from the field of (external) logistic systems by means of simulation. The
	students are given a defined period of time for their work. During this time at least one person is always available for questions
	and suggestions. The results of the group work are to be documented in a simulation report and handed in at the end of the
	processing time. Finally, the individual groups present the problems they have worked on and their results in a presentation.
Literature	Bangsow, Steffen (2011): Praxishandbuch Plant Simulation und SimTalk. Anwendung und Programmierung in über 150 Beispiel-
	Modellen. München: Hanser Verlag.
	Eley, Michael (2012): Simulation in der Logistik. Einführung in die Erstellung ereignisdiskreter Modelle unter Verwendung des
	Werkzeuges "Plant Simulation". Berlin, Heidelberg: Springer.
	3pg
	Engelhardt-Nowitzki, Corinna; Nowitzki, Olaf; Krenn, Barbara (2008): Management komplexer Materialflüsse mittels Simulation.
	State-of-the-Art und innovative Konzepte. Wiesbaden: Deutscher Universitäts-Verlag / GWV Fachverlage GmbH, Wiesbaden.
	Rabe, Markus; Spieckermann, Sven; Wenzel, Sigrid (2008): Verifikation und Validierung für die Simulation in Produktion und
	Logistik. Vorgehensmodelle und Techniken. Berlin, Heidelberg: Springer.
	Sargent, Robert G. (2010): Verification and Validation of Simulation Models. In: B. Johansson, S. Jain, J. Montoya-Torres, J. Hugan,
	and E. Yücesan, eds.: Proceedings of the 2010 Winter Simulation Conference.
	VDI-Richlinie: VDI 3633. Simulation von Logistik-, Materialfluß-und Produktionssystemen
	Wenzel, Sigrid; Rabe, Markus; Spieckermann, Sven (2006): Verifikation und Validierung für die Simulation in Produktion und
	Logistik. Vorgehensmodelle und Techniken. 1. Aufl. Berlin: Springer Berlin.

ourse L1818: Simulation of Transport and Handling Systems		
Тур	Recitation Section (small)	
Hrs/wk	3	
СР	4	
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42	
Lecturer	Prof. Carlos Jahn	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Module M0852: Graph	n Theory and Optimization			
Module Moosz. Grapi	Triedry and Optimization			
Courses				
Title		Тур	Hrs/wk	CP
Graph Theory and Optimization (L1		Lecture Recitation Section (small)	2	3 3
Graph Theory and Optimization (L1 Module Responsible		Recitation Section (Smail)	2	3
Admission Requirements	None			
Recommended Previous	None			
Knowledge	Discrete Algebraic Structures Mathematics I			
Educational Objectives	After taking part successfully, students ha	ve reached the following learning results		
Professional Competence				
Knowledge Skills	Students can name the basic conce examples. Students can discuss logical connecthe help of examples. They know proof strategies and can		le of illustrating th	nese connections with
	 Students can model problems in Graph Theory and Optimization with the help of the concepts studied in this cour Moreover, they are capable of solving them by applying established methods. Students are able to discover and verify further logical connections between the concepts studied in the course. For a given problem, the students can develop and execute a suitable approach, and are able to critically evaluate to results. 			e course.
Personal Competence Social Competence	In doing so, they can communicate	in teams. They are capable to use mathematics a new concepts according to the needs of their co pen the understanding of their peers.		
Autonomy	precisely and know where to get he	cheir understanding of complex concepts on their elp in solving them. t persistence to be able to work for longer perio		
Workload in Hours	Independent Study Time 124, Study Time	in Lecture 56		
Credit points				
Course achievement				
Examination	Written exam			
Examination duration and scale	120 min			
Assignment for the	General Engineering Science (German pro	gram, 7 semester): Specialisation Computer Scier	nce: Compulsory	·
Following Curricula		gram, 7 semester): Specialisation Data Science: E	lective Compulsor	У
	Computer Science: Core Qualification: Cor Data Science: Core Qualification: Compuls	• •		
	Engineering Science: Specialisation Data S	•		
		isation II. Mathematics & Engineering Science: Ele	ctive Compulsory	
		ic Planning and Systems: Elective Compulsory		
	Logistics and Mobility: Specialisation Inform	mation Technology: Elective Compulsory		
	Technomathematics: Specialisation I. Math			
		ogistics and Mobility: Specialisation Traffic Plannin ogistics and Mobility: Specialisation Information Te		

Course L1046: Graph Theory	and Optimization
Тур	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Anusch Taraz
Language	DE/EN
Cycle	SoSe
Content	Graphs, search algorithms for graphs, trees planar graphs shortest paths minimum spanning trees maximum flow and minimum cut theorems of Menger, König-Egervary, Hall NP-complete problems backtracking and heuristics linear programming duality integer linear programming
Literature	 M. Aigner: Diskrete Mathematik, Vieweg, 2004 T. Cormen, Ch. Leiserson, R. Rivest, C. Stein: Algorithmen - Eine Einführung, Oldenbourg, 2013 J. Matousek und J. Nesetril: Diskrete Mathematik, Springer, 2007 A. Steger: Diskrete Strukturen (Band 1), Springer, 2001 A. Taraz: Diskrete Mathematik, Birkhäuser, 2012 V. Turau: Algorithmische Graphentheorie, Oldenbourg, 2009 KH. Zimmermann: Diskrete Mathematik, BoD, 2006

Course L1047: Graph Theory	ourse L1047: Graph Theory and Optimization		
Тур	Recitation Section (small)		
Hrs/wk	2		
СР	3		
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28		
Lecturer	Prof. Anusch Taraz		
Language	DE/EN		
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		

MODILLY				
Module M0536: Funda	amentals of Fluid Mechanics			
Courses				
Title		Тур	Hrs/wk	СР
Fundamentals of Fluid Mechanics (Lecture	2	2
Fundamentals on Fluid Mechanics (Recitation Section (small) Recitation Section (large)	2	2
Fluid Mechanics for Process Engine		Recitation Section (large)	2	2
Module Responsible				
Admission Requirements	None			
Recommended Previous	Mathematics I+II+III			
Knowledge	Technical Mechanics I+II			
	Technical Thermodynamics I+II			
	Working with force balances			
	Simplification and solving of partial differential	equations		
	Integration			
Educational Objectives	After taking part successfully, students have reached	the following learning results		
	After taking part successiuny, students have reached	the following learning results		
Professional Competence	Students are able to:			
Knowieuge	Students are able to.			
	explain the difference between different types of	of flow		
	 give an overview for different applications of the 	e Reynolds Transport-Theorem in proce	ss engineering	
	 explain simplifications of the Continuity- and Na 	vier-Stokes-Equation by using physical	boundary condit	ions
Skills	The students are able to			
Skiiis	The stadents are able to			
	 describe and model incompressible flows mathe 	ematically		
	 reduce the governing equations of fluid mechan 	ics by simplifications to archive quantit	ative solutions e	.g. by integration
	notice the dependency between theory and tec	hnical applications		
	use the learned basics for fluid dynamical applic	cations in fields of process engineering		
Personal Competence				
Social Competence	The students			
	are capable to gather information from subject	related, professional publications and i	relate that inforn	nation to the context
	of the lecture and	in and the second of the second of the second		effectively in Facility
	able to work together on subject related tasks	in small groups. They are able to prese	ent their results	errectively in English
	(e.g. during small group exercises)	hamaaliyaa ta disayyaa tha aaliytiana ayal	Us and to process	h tha vaculta
	 are able to work out solutions for exercises by t 	nemserves, to discuss the solutions oral	ny and to presen	t the results.
Autonomy	The students are able to			
	a secure further literature for each tenic and to	reand their treasulades with this literatur		
	 search further literature for each topic and to ex work on their exercises by their own and to eva 			
	work on their exercises by their own and to eva	radic their actual knowledge with the re	edback.	
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
Credit points	6			
Course achievement		cription		
	No 5 % Midterm			
	Written exam			
Examination duration and scale	3 hours			
	Canaval Faminacuing Science (Carreen program 7 com	vastavi). Spanjalisation Croop Tashpalasi	as. Campulaan.	
Assignment for the				
Following Curricula	Bioprocess Engineering: Core Qualification: Compulsor		engineering. Cor	iipuisui y
	Chemical and Bioprocess Engineering: Core Qualification: Compulsor	•		
	Green Technologies: Energy, Water, Climate: Core Qualification	• •		
	Integrated Building Technology: Core Qualification: Co Logistics and Mobility: Specialisation Traffic Planning a			
	Technomathematics: Specialisation III. Engineering Sc			
	Process Engineering: Core Qualification: Compulsory	chec. Elective Compulsory		
	Engineering and Management - Major in Logistics and	Mobility: Specialisation Traffic Planning	and Systems: Fla	ective Compulsory
	Engineering and Management - Major in Logistics and	Mobility. Specialisation Traffic Flamining	and Systems. Lit	ective compaisory

Course L0091: Fundamentals	s of Fluid Mechanics		
Тур	Lecture		
Hrs/wk	?		
СР			
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Michael Schlüter		
Language	DE		
Cycle	SoSe		
Content	 fluid properties hydrostatic overall balances - theory of streamline overall balances- conservation equations differential balances - Navier Stokes equations irrotational flows - Potenzialströmungen flow around bodies - theory of physical similarity turbulent flows compressible flows 		
Literature	 Crowe, C. T.: Engineering fluid mechanics. Wiley, New York, 2009. Durst, F.: Strömungsmechanik: Einführung in die Theorie der Strömungen von Fluiden. Springer-Verlag, Berlin, Heidelberg, 2006. Fox, R.W.; et al.: Introduction to Fluid Mechanics. J. Wiley & Sons, 1994. Herwig, H.: Strömungsmechanik: Eine Einführung in die Physik und die mathematische Modellierung von Strömungen. Springer Verlag, Berlin, Heidelberg, New York, 2006. Herwig, H.: Strömungsmechanik: Einführung in die Physik von technischen Strömungen: Vieweg+Teubner Verlag / GWV Fachverlage GmbH, Wiesbaden, 2008. Kuhlmann, H.C.: Strömungsmechanik: Grundlagen, Grundgleichungen, Lösungsmethoden, Softwarebeispiele. Vieweg+ Teubner Verlag / GWV Fachverlage GmbH, Wiesbaden, 2009. Schade, H.; Kunz, E.: Strömungslehre. Verlag de Gruyter, Berlin, New York, 2007. Truckenbrodt, E.: Fluidmechanik 1: Grundlagen und elementare Strömungsvorgänge dichtebeständiger Fluide. Springer-Verlag, Berlin, Heidelberg, 2008. Schlichting, H.: Grenzschicht-Theorie. Springer-Verlag, Berlin, 2006. van Dyke, M.: An Album of Fluid Motion. The Parabolic Press, Stanford California, 1882. 		

Course L2933: Fundamentals	s on Fluid Mechanics
Тур	Recitation Section (small)
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Michael Schlüter
Language	DE
Cycle	SoSe
Content	In the group exercise, the contents of the lecture are taken up and deepened by means of exercises. The exercise tasks correspond in quality and scope to the tasks of the written exam. Topics: Reynolds transport-theorem, pipe flow, free jet, angular momentum, Navier-Stokes equations, potential theory, mock exam, pipe hydraulics, pump design.
Literature	Heinz Herwig: Strömungsmechanik, Eine Einführung in die Physik und die mathematische Modellierung von Strömungen, Springer Verlag, Berlin, 978-3-540-32441-6 (ISBN) Herbert Oertel, Martin Böhle, Thomas Reviol: Strömungsmechanik für Ingenieure und Naturwissenschaftler, Springer Verlag, Berlin, ISBN: 978-3-658-07786-0 Joseph Spurk, Nuri Aksel: Strömungslehre, Einführung in die Theorie der Strömungen, Springer Verlag, Berlin, ISBN: 978-3-642-13143-1.

Course L0092: Fluid Mechani	ics for Process Engineering
Тур	Recitation Section (large)
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Michael Schlüter
Language	DE
Cycle	SoSe
Content	In the exercise-lecture the topics from the main lecture are discussed intensively and transferred into application. For that, the students receive example tasks for download. The students solve these problems based on the lecture material either independently or in small groups. The solution is discussed with the students under scientific supervision and parts of the solutions are presented on the chalk board. At the end of each exercise-lecture, the correct solution is presented on the chalk board. Parallel to the exercise-lecture tutorials are held where the student solve exam questions under a set time-frame in small groups and discuss the solutions afterwards.
Literature	 Crowe, C. T.: Engineering fluid mechanics. Wiley, New York, 2009. Durst, F.: Strömungsmechanik: Einführung in die Theorie der Strömungen von Fluiden. Springer-Verlag, Berlin, Heidelberg, 2006. Fox, R.W.; et al.: Introduction to Fluid Mechanics. J. Wiley & Sons, 1994 Herwig, H.: Strömungsmechanik: Eine Einführung in die Physik und die mathematische Modellierung von Strömungen. Springer Verlag, Berlin, Heidelberg, New York, 2006 Herwig, H.: Strömungsmechanik: Einführung in die Physik von technischen Strömungen: Vieweg+Teubner Verlag / GWV Fachverlage GmbH, Wiesbaden, 2008 Kuhlmann, H.C.: Strömungsmechanik: Grundlagen, Grundgleichungen, Lösungsmethoden, Softwarebeispiele. Vieweg+ Teubner Verlag / GWV Fachverlage GmbH, Wiesbaden, 2009 Schade, H.; Kunz, E.: Strömungslehre. Verlag de Gruyter, Berlin, New York, 2007 Truckenbrodt, E.: Fluidmechanik 1: Grundlagen und elementare Strömungsvorgänge dichtebeständiger Fluide. Springer-Verlag, Berlin, Heidelberg, 2008 Schlichting, H.: Grenzschicht-Theorie. Springer-Verlag, Berlin, 2006 van Dyke, M.: An Album of Fluid Motion. The Parabolic Press, Stanford California, 1882. White, F.: Fluid Mechanics, Mcgraw-Hill, ISBN-10: 0071311211, ISBN-13: 978-0071311212, 2011

Module M0767: Aeror	nautical Systems			
Courses				
Title		Тур	Hrs/wk	СР
Fundamentals of Aircraft Systems ((L0741)	Lecture	2	2
Fundamentals of Aircraft Systems ((L0742)	Recitation Section (small)	1	1
Air Transportation Systems (L0591		Lecture	2	2
Air Transportation Systems (L0816)	Recitation Section (large)	1	1
Module Responsible	Prof. Frank Thielecke			
Admission Requirements	None			
Recommended Previous	Basics of mathematics, mechanics and thermodynam	nics		
Knowledge				
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence				
Knowledge	Students get a basic understanding of the structure	e and design of an aircraft, as well as a	n overview of th	ne systems inside an
	aircraft. In addition, a basic knowledge of the relation	nchips, the key parameters, roles and wa	ys of working in	different subsystems
	in the air transport is acquired.			•
Skills	Due to the learned cross-system thinking students	can gain a deeper understanding of	different system	concepts and their
	technical system implementation. In addition, they can apply the learned methods for the design and assessment of subsystems of			
	the air transportation system in the context of the ov		,	•
Personal Competence	and a sumple series of the content of the original system.			
Social Competence	Students are made aware of interdisciplinary commu	nication in groups.		
Autonomy	Students are able to independently analyze different system concepts and their technical implementation as well as to think			
	system oriented.	,	·	
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84	4		
Credit points	6			
Course achievement				
Examination	Written exam			
Examination duration and	150 min			
scale				
Assignment for the	General Engineering Science (German program, 7	semester): Specialisation Mechanical	Engineering, Foo	cus Aircraft Systems
Following Curricula	Engineering: Compulsory	•		
	Data Science: Specialisation II. Application: Elective C	Compulsory		
	Logistics and Mobility: Specialisation Traffic Planning	and Systems: Elective Compulsory		
	Mechanical Engineering: Specialisation Aircraft System	ms Engineering: Compulsory		
	Engineering and Management - Major in Logistics and	Mobility: Specialisation Traffic Planning	and Systems: Ele	ective Compulsory

Course L0741: Fundamentals	s of Aircraft Systems
Тур	Lecture
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Frank Thielecke
Language	DE
Cycle	SoSe SoSe
Content	 Development of aircrafts, fundamentals of flight physics, propulsion systems, analysis of ranges and loads, aircraft-structures and materials Hydraulic and electrical power systems, landing gear systems, flight-control and high-lift systems, air conditioning systems
Literature	Shevell, R. S.: Fundamentals of Flight TÜV Rheinland: Luftfahrtzeugtechnik in Theorie und Praxis Wild: Transport Category Aircraft Systems

Course L0742: Fundamentals	ourse L0742: Fundamentals of Aircraft Systems	
Тур	Recitation Section (small)	
Hrs/wk	1	
СР	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Frank Thielecke	
Language	DE	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L0591: Air Transportation Systems		
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Volker Gollnick	
Language	DE	
Cycle	SoSe	
Content	 Air transport as part of the global transportation system Legal basis of air transportation Safety and security aspects Aircraft basics The role of the aircraft amnufacturer The role of the aircraft operator Airport operation The principles of air traffic management Environmental aspects of air transportation 	
Literature	 V. Gollnick, D. Schmitt: "Air Transport System", Springer-Verlag, ISBN 978-3-7091-1879-5 H. Mensen: "Handbuch der Luftfahrt", Springer-Verlag, 2003 J.P. Clark: "Buying the Big Jets", ISBN 9781317170341, Taylor & Francis, 2017 Mike Hirst: The Air Transport System, AIAA, 2008 D.P. Raymer: "Aircraft Design - A Conceptual Approach", AIAA Education Series, 2006, ISBN 1-56347-281-3 N. Ashford: "Airport Operations", McGraw-Hill, 1997, ISBN 0-07-003077-4 P. Maurer: "Luftverkehrsmanagement", Oldenbourg-Verlag, ISBN 3-486-27422-8 H. Mensen: "Moderne Flugsicherung", Springer-Verlag, 2004, ISBN 3-540-20581-0 	

Course L0816: Air Transporta	ourse L0816: Air Transportation Systems	
Тур	Recitation Section (large)	
Hrs/wk	1	
СР	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Volker Gollnick	
Language	DE	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	

Module M1633: Planning Law and Environmental Law/ Sustainable Urban Development				
Courses				
Title		Тур	Hrs/wk	СР
Sustainable Urban Development (L	2474)	Lecture	2	3
Planning law and Environmental law	N (L2473)	Lecture	2	3
Module Responsible	Prof. Ralf Otterpohl			
Admission Requirements	None			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students	have reached the following learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 124, Study Tir	me in Lecture 56		
Credit points	6			
Course achievement	None			
Examination	Subject theoretical and practical work			
Examination duration and	Written-theoretical part and report			
scale				
Assignment for the	Civil- and Environmental Engineering: S	Specialisation Civil Engineering: Elective Compu	ulsory	
Following Curricula	Civil- and Environmental Engineering: 5	Specialisation Water and Environment: Elective	Compulsory	
	Civil- and Environmental Engineering: 9	Specialisation Traffic and Mobility: Elective Com	npulsory	
	Logistics and Mobility: Specialisation Tr	raffic Planning and Systems: Elective Compulso	ory	
	Engineering and Management - Major is	n Logistics and Mobility: Specialisation Traffic P	Planning and Systems: Ele	ective Compulsory

Course L2474: Sustainable U	ourse L2474: Sustainable Urban Development		
Тур	Lecture		
Hrs/wk	2		
СР	3		
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28		
Lecturer	Prof. Irene Peters		
Language	DE		
Cycle	SoSe		
Content			
Literature			

Course L2473: Planning law	Course L2473: Planning law and Environmental law	
Тур	Lecture	
Hrs/wk	2	
СР	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Prof. Martin Wickel	
Language	DE	
Cycle	SoSe	
Content		
Literature		

Module M1014: Logist	tics Service Provider Management			
Courses				
Title		Тур	Hrs/wk	СР
Logistics Service Provider Managem	nent (L1240)	Seminar	3	6
Module Responsible	Prof. Heike Flämig			
Admission Requirements	None			
Recommended Previous	Introduction to Logistics and Mobility			
Knowledge	Transport and cross-docking Technology			
	Logistics Management			
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence	Arter taking part successions, students have reached	d the following learning results		
_	Students are able to			
	integrate LSPs into the concept of business lo			
	tell the specifics of business services and logic describe logicities functions as LSB services and		aracteristics	
	 describe logistics functions as LSP service pace explain, why companies outsource logistics Se 		in Business	
	describe basic outsorucing processes and ter			
	describe and analyze intra- and intermodal	-		pportunities for the
	Management of LSPs			
Skills	Students can			
	• support the sub-segment specific business f	unctions and management Tasks	(e.g. for Road Transpor	t, Airlines, SeaPort
	Providers etc.) • categorize LSPs regarding strategic product-market-positioning			
	 derive action plans regarding management ta 	sks depending on contigencies		
Personal Competence				
Social Competence	Students can			
	diama and and an ordination of the control of the c			
	 discuss case studies in Groups (within and out prepare and deliver Business presentations 	tside of the classroom), reaching a	a common understanding	and result
	give and discuss Feedbacks in the large group)		
	g			
Autonomy	Students can			
	produce written reports independently			
Workload in Hours	Independent Study Time 138, Study Time in Lecture	42		
Credit points				
Course achievement	None			
Examination	Written elaboration			
Examination duration and	2 scientific written papers of approx. 20 pages each	. Presentation (approx. 15 pages)	with 20-minute closing le	ecture in groups of 3
scale	to max. 5 persons. Grading of 4 partial grades of 25	5% each (2 seminar papers, 2 pre	esentation documents) in	dividually per group
	member.			
=	Logistics and Mobility: Specialisation Traffic Planning			
Following Curricula	Logistics and Mobility: Specialisation Production Man	-		
	Engineering and Management - Major in Logistics an	, ,	,	, ,
	Engineering and Management - Major in Logistics an Engineering and Management - Major in Logistics	, ,	3,	, ,
	Compulsory	and Mobility. Specialisation Produ	action management and	Trucesses. Elective
	Engineering and Management - Major in Logistics	and Mobility: Specialisation Produ	uction Management and	Processes: Elective
	Compulsory			, IIIII Zicolive
	• •			

Course L1240: Logistics Serv	rice Provider Management
	Seminar
Hrs/wk	
СР	6
Workload in Hours	Independent Study Time 138, Study Time in Lecture 42
Lecturer	Prof. Stephan Freichel
Language	DE
Cycle	SoSe
Content	1 Concept and Functions
	Define the role of logistics services providers in the overall concept and functions of logistics services providers. Workshop on the role of logistics services providers in the economy, based on up-to-date topics in the field and in the news.
	2 Outsourcing and Cooperation
	Make or buy, forms and management of inter-organizational relations
	3 Institutions
	Special business management features of carriers, haulage contractors, CEP services
	4 Trends, Strategies and Management Functions
	Market trends, requirements, basic business management and management functions (operations, business development, HR, IT, finance/planning and control, organization, leadership)
	5 Strategic Developments and Case Studies
	Selected aspects (e.g. risk and innovation management, global and regional networking, greenwashing and sustainability)
	Examples:
	Case Study A) Types of company (such as haulage contractors, railway operators, road transport companies, heavy goods, textile and refrigerated goods specialists, CEPs, etc) will be introduced and discussed in the context of a presentation.
	Case Study B) Individual companies will be analyzed on the basis of accessible material such as company reports, websites and possibly telephone interviews and case studies will be explained and discussed with regard to the functions of the logistics services provider and the management task of the corporate managements of the selected cases.
Literature	Pfohl, HChr.: Logistiksysteme. Betriebswirtschaftliche Grundlagen. 8., neu bearbeite und aktualisierte Auflage, Berlin u.a. 2009
	Eßig, M. / Hofmann, E. / Stölzle, W.: Supply Chain Management. München 2013.
	Freichel, S.L.K.: Organisation von Logistikservice-Netzwerken. Reihe: Logistik und Unternehmensführung, hrsg. von Prof. Dr. HChr. Pfohl, Bd. 4. Berlin 1993.
	Aberle, G.: Transportwirtschaft. Einzelwirtschaftliche und gesamtwirtschaftliche Grundlagen, 4. überarbeitete und erweiterte Auflage, München/Wien 2006.
	Buchholz, J./Clausen, U./Vastag, A. (Hrsg): Handbuch der Verkehrslogistik, Heidelberg 1998.
	Corsten, H.: Dienstleistungsmanagement, 3. Auflage, München 1997.
	Müller-Daupert, B. (Hrsg.): Logistik-Outsourcing, 2. Auflage, München, Vogel, 2009
	Ihde, G. B.: Transport, Verkehr, Logistik. Gesamtwirtschaftliche Aspekte und einzelwirtschaftliche Handhabung, 3. völlig überarb. und erw. Auflage, München 2001.

van Suntum, U., Verkehrspolitik, München 1986

Module M0610: Electi	trical Machines and Actuators		
Courses			
Title	Тур	Hrs/wk	СР
Electrical Machines and Actuators (3	4
Electrical Machines and Actuators ((L0294) Recitation Section (large)	2	2
Module Responsible	Prof. Thorsten Kern		
Admission Requirements	s None		
Recommended Previous	Basics of mathematics, in particular complexe numbers, integrals, differentials		
Knowledge	Basics of electrical engineering and mechanical engineering		
Educational Objectives	After taking part successfully, students have reached the following learning results		
Professional Competence			
Knowledge	e Students can to draw and explain the basic principles of electric and magnetic fields.		
	They are describe the function of the standard toward of clastic machines and present	the serves	dina saustions and
	They can describe the function of the standard types of electric machines and present characteristic curves. For typically used drives they can explain the major parameters of the en		
	from the power grid to the driven engine.	ergy efficiency	of the whole system
	from the power grid to the driven engine.		
Skills	s Students are able to calculate two-dimensional electric and magnetic fields in particular ferro	magnetic circu	its with air gap. For
	this they apply the usual methods of the design auf electric machines.		
	They can calulate the operational performance of electric machines from their given character	aristic data and	selected quantities
	and characteristic curves. They apply the usual equivalent circuits and graphical methods.	eristic data aria	sciected quantities
	and characteristic curves. They apply the assure equivalent circuits and graphical interious.		
Personal Competence			
Social Competence			
	y Students are able independently to calculate electric and magnatic fields for applications. They	are able to an	alvse independently
Autonomy	the operational performance of electric machines from the characteristic data and theycan ca		
	and characteristic curves.	arearace crierco.	selected qualities
Workload in Hours	s Independent Study Time 110, Study Time in Lecture 70		
Credit points Course achievement	s 6		
Credit points Course achievement	s 6 t None		
Credit points Course achievement Examination	s 6		
Credit points Course achievement Examination	s 6 t None Subject theoretical and practical work Design of four machines and actuators, review of design files		
Credit points Course achievement Examination Examination duration and	s 6 t None Subject theoretical and practical work Design of four machines and actuators, review of design files	gineering, Focu	us Eneray Systems:
Credit points Course achievement Examination Examination duration and scale	s 6 t None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semester): Specialisation Mechanical En	gineering, Focu	us Energy Systems:
Credit points Course achievement Examination Examination duration and scale Assignment for the	s 6 t None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semester): Specialisation Mechanical En		
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Credit points Course achievement Examination Examination duration and scale Assignment for the	s 6 t None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semester): Specialisation Mechanical Engineering Engineering Science (German program, 7 semester): Specialisation Mechanical Compulsory General Engineering Science (German program, 7 semester): Specialisation Mechanical Compulsory	Engineering, F	ocus Mechatronics:
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Credit points Course achievement Examination Examination duration and scale Assignment for the	s 6 t None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semester): Specialisation Mechanical Engineering Engineering Science (German program, 7 semester): Specialisation Mechanical Compulsory General Engineering Science (German program, 7 semester): Specialisation Mechanical Compulsory General Engineering Science (German program, 7 semester): Specialisation Mechanical Engineering: Elective Compulsory	Engineering, F	ocus Mechatronics:
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Credit points Course achievement Examination Examination duration and scale Assignment for the	s 6 t None Subject theoretical and practical work Design of four machines and actuators, review of design files General Engineering Science (German program, 7 semester): Specialisation Mechanical Engineerial Engineering Science (German program, 7 semester): Specialisation Mechanical Compulsory General Engineering Science (German program, 7 semester): Specialisation Mechanical Compulsory General Engineering Science (German program, 7 semester): Specialisation Mechanical Engineering: Elective Compulsory General Engineering Science (German program, 7 semester): Specialisation Electrical Engineering Digital Mechanical Engineering: Core Qualification: Compulsory Electrical Engineering: Core Qualification: Elective Compulsory Engineering Science: Specialisation Electrical Engineering: Elective Compulsory Green Technologies: Energy, Water, Climate: Specialisation Energy Technology: Elective Compulsory	Engineering, Fering, Focus The	ocus Mechatronics:
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Course L0293: Electrical Machines and Actuators		
Тур	Lecture	
Hrs/wk	3	
СР	4	
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42	
Lecturer	Prof. Thorsten Kern, Dennis Kähler	
Language	DE	
Cycle	SoSe	
Content	Electric field: Coulomb´s law, flux (field) line, work, potential, capacitor, energy, force, capacitive actuators	
	Magnetic field: force, flux line, Ampere´s law, field at bounderies, flux, magnetic circuit, hysteresis, induction, self-induction, mutual inductance, transformer, electromagnetic actuators	
	Synchronous machines, construction and layout, equivalent single line diagrams, no-load and short-cuircuit characteristics, vector diagrams, motor and generator operation, stepper motors	
	DC-Machines: Construction and layout, torque generation mechanismen, torque vs speed characteristics, commutation,	
	Asynchronous Machines. Magnetic field, construction and layout, equivalent single line diagram, complex stator current diagram (Heylands 'diagram), torque vs. speed characteristics, rotor layout (squirrel-cage vs. sliprings),	
	Drives with variable speed, inverter fed operation, special drives	
Literature	Hermann Linse, Roland Fischer: "Elektrotechnik für Maschinenbauer", Vieweg-Verlag; Signatur der Bibliothek der TUHH: ETB 313	
	Ralf Kories, Heinz Schmitt-Walter: "Taschenbuch der Elektrotechnik"; Verlag Harri Deutsch; Signatur der Bibliothek der TUHH: ETB 122	
	"Grundlagen der Elektrotechnik" - anderer Autoren	
	Fachbücher "Elektrische Maschinen"	

Course L0294: Electrical Mac	ourse L0294: Electrical Machines and Actuators	
Тур	Recitation Section (large)	
Hrs/wk	2	
СР	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Thorsten Kern, Dennis Kähler	
Language	DE	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	

Module M0985: Introd	duction to Railways			
Courses				
Title		Тур	Hrs/wk	СР
Introduction to Railways (L1184)		Lecture	2	4
Introduction to Railways (L1185)		Recitation Section (large)	1	2
Module Responsible	Prof. Carsten Gertz			
Admission Requirements	None			
Recommended Previous	none			
Knowledge				
Educational Objectives	After taking part successfully, students have reached t	he following learning results		
Professional Competence				
Knowledge	Students can			
	 give definitions for basic terms related to railway 	vs		
	explain specifics concerning the handling of goo			
	explain the required infrastructure			
	describe the work at the track super structure			
Skills				
Personal Competence				
Social Competence	Students can			
	 work at tasks in groups and come to results together. 	ether		
	 discuss contents in groups, summarize them and 	d present them in front of others		
	convey contents to other by processing them in	writing		
Autonomy	Students can work out and understand contents thems	selves during the lecture through liter	ature research	
Workload in Hours	Independent Study Time 138, Study Time in Lecture 42	2		
Credit points	6			
Course achievement	None			
Examination	Written exam			
Examination duration and	90 min			
scale				
Assignment for the	Civil- and Environmental Engineering: Specialisation Tr	affic and Mobility: Compulsory		
Following Curricula	Civil- and Environmental Engineering: Specialisation Ci	vil Engineering: Elective Compulsory		
	Civil- and Environmental Engineering: Specialisation W	ater and Environment: Elective Comp	ulsory	
	Logistics and Mobility: Specialisation Traffic Planning a	nd Systems: Elective Compulsory		
	Engineering and Management - Major in Logistics and I	Mobility: Specialisation Traffic Plannin	g and Systems: Ele	ective Compulsory

Course I 1104, Introduction	Pollunus
Course L1184: Introduction t	
Тур	Lecture
Hrs/wk	2
СР	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	André Schoppe
Language	DE
Cycle	SoSe
Content	Lecture:
	The module provides a basic knowledge of the field of railroad engineering. An overview of railroad operations, control and safety technology, railroad superstructure, structural engineering, project management as well as maintenance and design of infrastructure facilities is given. The aim of this module is to give students as much insight as possible into railroad infrastructure. The module is examined by means of a written exam at the end of the semester. Lecture Hall Exercise: In order to give the students practical examples, full-day practical excursions are carried out. New handling techniques and currently available hardware will be presented by visiting the marshalling yard "die Zugbildungsanlage Maschen (ZBA)". Furthermore, the training center for track construction and civil engineering as well as the operations center in Hanover will be visited, where facilities and tasks will be presented. Questionnaires will also be provided for practice purposes. In addition, study papers can be handed out and supervised as required.
Literature	Die maßgebliche Literatur wird in StudIP veröffentlicht. Weitere Hinweise werden in der Veranstaltung gegeben.

Course L1185: Introduction to Railways	
Тур	Recitation Section (large)
Hrs/wk	1
СР	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	André Schoppe
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Module M0980: Logis	tics, Transport and Environment			
Courses				
Title Logistics, Transport and Environme Environmental Management and Co		Typ Project-/problem-based Learning Seminar	Hrs/wk 2 2	CP 4 2
Module Responsible				
Admission Requirements	None			
Recommended Previous				
Knowledge	Introduction to logistics and mobility Foundations of Management			
Educational Objectives	After taking part successfully, students have reached the	e following learning results		
Professional Competence				
Knowledge	Students are able to			
	explain basic terms of transport logistics, commer describe actors and system boundaries, challenge reflect standards of sustainability management		bility	
Skills	Students are able to			
	design logistics systems independently differentiate sustainability, CR, CSR and environm critically evaluate measures for sustainable logisti			
Personal Competence				
Social Competence	Students can			
	creatively develop solutions in teams and work ou present their knowledge and skills to other studen	·		
Autonomy	Students can			
	carry out small research studies independently			
	apply theoretical knowledge in practical projects			
	apply presentation techniques such as free spe Whiteboard, Metaplan)	eech, designing charts (i.e. in Power-P	roint), use of	media (Flip-Charts
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points				
Course achievement				
Examination	Written elaboration			
Examination duration and	Written assignment with short presentation			
scale				
Assignment for the	Logistics and Mobility: Specialisation Traffic Planning and	Systems: Elective Compulsory		
Following Curricula	Logistics and Mobility: Specialisation Production Manager	ment and Processes: Elective Compulsor	у	
	Logistics and Mobility: Specialisation Information Techno	logy: Elective Compulsory		
	Engineering and Management - Major in Logistics and Mo	bility: Specialisation Traffic Planning and	d Systems: Ele	ctive Compulsory
	Engineering and Management - Major in Logistics and Compulsory			
	Engineering and Management - Major in Logistics and Mo	bility: Specialisation Information Techno	logy: Elective	Compulsory

$\label{eq:module Manual B.Sc.} \mbox{\tt "Engineering and Management - Major in Logistics and Mobility"}$

Course L0009: Logistics, Tra	nsport and Environment
Тур	Project-/problem-based Learning
Hrs/wk	2
СР	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	SoSe
Content	Application and creative development of professional knowledge within the framework of the case study "Environmental impacts of
	supply chains" using a specific company as example.
	Depending on the chosen focus of the academic year:
	characteristics of different transport systems
	 technologies, structures and processes of transport logistics systems (nodes, network, interactions)
	location and route planning
	connections of information flow and material flows in transport chains
	• interrelation between private and private (contract logistics) and private and public (business policy, transport policy) and
	their (diverging)
	design approaches for sustainable logistics
Literature	Ihde, Gösta B.: Transport, Verkehr, Logistik. Gesamtwirtschaftliche Aspekte und einzelwirtschaftliche Handhabung. 3. überarbeitete Auflage. Vahlen, München 2001

Course L1160: Environmenta	l Management and Corporate Responsibilty
Тур	Seminar
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	SoSe
Content	 Imparting knowledge about standards (e.g. EMAS and ISO 14.001) as important methodological approaches for the integration of environmental and sustainability management in business companies Explaination of theoretical concepts of corporate sustainability management Imparting practical knowledge from different stakeholder views: consulting company, trading enterprise, NGO, financial market
Literature	-

The state of the s	Module M0671: Technical Thermodynamics I		
Courses			
Title	Typ Hrs/wk CP		
Technical Thermodynamics I (L043	.7) Lecture 2 4		
Technical Thermodynamics I (L043	9) Recitation Section (large) 1 1		
Technical Thermodynamics I (L044)	1) Recitation Section (small) 1 1		
Module Responsible	Prof. Arne Speerforck		
Admission Requirements	None		
Recommended Previous	Elementary knowledge in Mathematics and Mechanics		
Knowledge			
Educational Objectives	After taking part successfully, students have reached the following learning results		
Professional Competence			
Knowledge			
Knowledge	Stadents are farmed with the farmed frames. They know the relation of the kinds of chergy decorating to 1		
	Thermodynamics and are aware about the limits of energy conversions according to 2 nd law of Thermodynamics. They are able distinguish between state variables and process variables and know the meaning of different state variables like temperaturenthalpy, entropy and also the meaning of exergy and anergy. They are able to draw the Carnot cycle in a Thermodynamic related diagram. They know the physical difference between an ideal and a real gas and are able to use the related equations state. They know the meaning of a fundamental state of equation and know the basics of two phase Thermodynamics.		
Skills	Students are able to calculate the internal energy, the enthalpy, the kinetic and the potential energy as well as work and heat f simple change of states and to use this calculations for the Carnot cycle. They are able to calculate state variables for an ideal ar for a real gas from measured thermal state variables.		
D			
Personal Competence			
Social Competence	The students can discuss in small groups and work out a solution. You can answer comprehension questions about the content the are provided in the lecture with the ClickerOnline tool "TurningPoint" after discussions with other students.		
Autonomy			
	exercise to solve problems and apply them independently to different types of tasks.		
Workload in Hours			
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56		
Credit points	Independent Study Time 124, Study Time in Lecture 56		
Credit points Course achievement	Independent Study Time 124, Study Time in Lecture 56 6 None		
Credit points Course achievement Examination	Independent Study Time 124, Study Time in Lecture 56 6 None Written exam		
Credit points Course achievement Examination Examination duration and	Independent Study Time 124, Study Time in Lecture 56 6 None Written exam		
Credit points Course achievement Examination Examination duration and scale	Independent Study Time 124, Study Time in Lecture 56 6 None Written exam 90 min		
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 124, Study Time in Lecture 56 6 None Written exam 90 min General Engineering Science (German program, 7 semester): Core Qualification: Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 124, Study Time in Lecture 56 6 None Written exam 90 min General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 124, Study Time in Lecture 56 6 None Written exam 90 min General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 124, Study Time in Lecture 56 6 None Written exam 90 min General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Digital Mechanical Engineering: Core Qualification: Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 124, Study Time in Lecture 56 6 None Written exam 90 min General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Digital Mechanical Engineering: Core Qualification: Compulsory Engineering Science: Specialisation Mechanical Engineering: Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 124, Study Time in Lecture 56 6 None Written exam 90 min General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Digital Mechanical Engineering: Core Qualification: Compulsory Engineering Science: Specialisation Mechanical Engineering: Compulsory Engineering Science: Specialisation Mechanics: Elective Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 124, Study Time in Lecture 56 6 None Written exam 90 min General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Digital Mechanical Engineering: Core Qualification: Compulsory Engineering Science: Specialisation Mechanical Engineering: Compulsory Engineering Science: Specialisation Mechatronics: Elective Compulsory Engineering Science: Specialisation Biomedical Engineering: Compulsory		
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Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 124, Study Time in Lecture 56 6 None Written exam 90 min General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Digital Mechanical Engineering: Core Qualification: Compulsory Engineering Science: Specialisation Mechanical Engineering: Compulsory Engineering Science: Specialisation Mechatronics: Elective Compulsory Engineering Science: Specialisation Biomedical Engineering: Compulsory Engineering Science: Specialisation Advanced Materials: Elective Compulsory Engineering Science: Specialisation Advanced Materials: Elective Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 124, Study Time in Lecture 56 6 None Written exam 90 min General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Digital Mechanical Engineering: Core Qualification: Compulsory Engineering Science: Specialisation Mechanical Engineering: Compulsory Engineering Science: Specialisation Mechatronics: Elective Compulsory Engineering Science: Specialisation Biomedical Engineering: Compulsory Engineering Science: Specialisation Advanced Materials: Elective Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 124, Study Time in Lecture 56 6 None Written exam 90 min General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Digital Mechanical Engineering: Core Qualification: Compulsory Engineering Science: Specialisation Mechanical Engineering: Compulsory Engineering Science: Specialisation Mechanical Engineering: Compulsory Engineering Science: Specialisation Biomedical Engineering: Compulsory Engineering Science: Specialisation Advanced Materials: Elective Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Integrated Building Technology: Core Qualification: Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 124, Study Time in Lecture 56 None Written exam 90 min General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Digital Mechanical Engineering: Core Qualification: Compulsory Engineering Science: Specialisation Mechanical Engineering: Compulsory Engineering Science: Specialisation Mechatronics: Elective Compulsory Engineering Science: Specialisation Biomedical Engineering: Compulsory Engineering Science: Specialisation Advanced Materials: Elective Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Integrated Building Technology: Core Qualification: Compulsory Logistics and Mobility: Specialisation Traffic Planning and Systems: Elective Compulsory		
Credit points Course achievement Examination Examination duration and scale Assignment for the	Independent Study Time 124, Study Time in Lecture 56 None Written exam 90 min General Engineering Science (German program, 7 semester): Core Qualification: Compulsory Bioprocess Engineering: Core Qualification: Compulsory Chemical and Bioprocess Engineering: Core Qualification: Compulsory Digital Mechanical Engineering: Core Qualification: Compulsory Engineering Science: Specialisation Mechanical Engineering: Compulsory Engineering Science: Specialisation Mechatronics: Elective Compulsory Engineering Science: Specialisation Biomedical Engineering: Compulsory Engineering Science: Specialisation Advanced Materials: Elective Compulsory Green Technologies: Energy, Water, Climate: Core Qualification: Compulsory Integrated Building Technology: Core Qualification: Compulsory Logistics and Mobility: Specialisation Traffic Planning and Systems: Elective Compulsory Mechanical Engineering: Core Qualification: Compulsory		
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Course L0437: Technical Thermodynamics I	
Тур	Lecture
Hrs/wk	2
СР	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	Prof. Arne Speerforck
Language	DE
Cycle	SoSe
Content	1. Introduction
	1. Introduction
	2. Fundamental terms
	3. Thermal Equilibrium and temperature
	3.1 Thermal equation of state
	4. First law
	4.1 Heat and work
	4.2 First law for closed systems
	4.3 First law for open systems
	4.4 Examples
	5. Equations of state and changes of state
	5.1 Changes of state
	5.2 Cycle processes
	6. Second law
	6.1 Carnot process
	6.2 Entropy
	6.3 Examples
	6.4 Exergy
	7. Thermodynamic properties of pure fluids
	7.1 Fundamental equations of Thermodynamics
	7.2 Thermodynamic potentials
	7.3 Calorific state variables for arbritary fluids
	7.4 state equations (van der Waals u.a.)
Literature	Schmitz, G.: Technische Thermodynamik, TuTech Verlag, Hamburg, 2009
	Baehr, H.D.; Kabelac, S.: Thermodynamik, 15. Auflage, Springer Verlag, Berlin 2012
	Potter, M.; Somerton, C.: Thermodynamics for Engineers, Mc GrawHill, 1993
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ourse L0439: Technical Thermodynamics I	
Тур	Recitation Section (large)
Hrs/wk	1
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Arne Speerforck
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L0441: Technical Thermodynamics I	
Тур	Recitation Section (small)
Hrs/wk	1
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Arne Speerforck
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Thesis

Module M1800: Bache	elor thesis (dual study program)
Module M1000. Bacile	eior thesis (duar study program)
Courses	
Title	Typ Hrs/wk CP
Module Responsible	Professoren der TUHH
Admission Requirements	None
Recommended Previous	
Knowledge	
-	After taking part successfully, students have reached the following learning results
Professional Competence	Durkstudente
Knowleage	 Dual students choose central theoretical principles from their field of study (facts, theories, methods) in relation to problems and applications, present them and discuss them critically. further develop their subject-related and practical knowledge as appropriate and link both areas of knowledge together. present the current research available on a chosen topic or on a chosen operational issue linked to their subject.
Skills	Oual students evaluate both the basic knowledge linked to their field of study acquired at the university and professional knowledge gained through the company, then purposefully use it to solve technical and application-related problems. analyse questions and problems using the methods learned throughout their studies (including practical phases), reach factually justifiable decisions and develop application-specific solutions. critically analyse the results of their own research work from a subject-specific and professional perspective.
Personal Competence	
Social Competence	Dual students
	 present a professional problem in the form of an academic question for a specialist audience in a structured, comprehensible and factually correct manner, both orally and in writing. respond to questions as part of a specialist discussion and answer them appropriately. In doing so, they argue their own evaluations and points of view convincingly.
Autonomy	Dual students
	 structure a comprehensive, chronological workflow and work independently on a question to a high academic level within a given period of time. identify, develop and link necessary knowledge and material to handle an academic and application-related problem. apply the essential techniques of academic work when conducting their own research on an operational issue.
Workload in Hours	Independent Study Time 360, Study Time in Lecture 0
Credit points	
Course achievement	None
Examination	Thesis
Examination duration and scale	According to General Regulations
	General Engineering Science (German program, 7 semester): Thesis: Compulsory
Following Curricula	Civil- and Environmental Engineering: Thesis: Compulsory
	Chemical and Bioprocess Engineering: Thesis: Compulsory
	Computer Science: Thesis: Compulsory
	Data Science: Thesis: Compulsory
	Electrical Engineering: Thesis: Compulsory Engineering Science: Thesis: Compulsory
	Green Technologies: Energy, Water, Climate: Thesis: Compulsory
	Computer Science in Engineering: Thesis: Compulsory
	Mechanical Engineering: Thesis: Compulsory
	Mechatronics: Thesis: Compulsory
	Naval Architecture: Thesis: Compulsory Technomorphics: Thesis: Compulsory
	Technomathematics: Thesis: Compulsory Engineering and Management - Major in Logistics and Mobility: Thesis: Compulsory
	Ендинестну или пинидентень - пирт не содъясь ани порянця. Птель, сотпривоту