Faculty of Automotive Systems and Production

Module Catalog
Production and Logistics
(Industrial Engineering and Management)

Bachelor of Engineering (B.Eng.)

This is a translation of the original document in German. For all legal purposes, only the German version of the module catalog shall be considered binding.

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Technology
Arts Sciences
TH Köln

Content

Module Catalog | Production and Logistics, Bachelor of Engineering

1 Description of the Degree Program

The degree program B. Eng. Production and Logistics covers essential contents of the scientific disciplines of economics and engineering for the education of engineers. In accordance with the system of subject areas and review boards established by the German Research Foundation[1], the degree program is predominantly assigned to the engineering sciences (4) with a focus on production technology (401) and computer science, systems and electrical engineering (44), as well as on humanities and social sciences (1) with a special focus on economics (112). In addition to logistics, the field systems engineering (407) also includes automation technology, robotics and human factors.

The German National Academy of Science and Engineering[2] defined the formative characteristics of the technical sciences as follows: "Technical sciences create cognitive conditions for innovation in technology and the application of technical knowledge and lay the foundations for reflection on its implications and consequences". This means that the main technical features of the Industrial Engineering degree program are recognizing, analyzing as well as designing, synthesizing activities, which are oriented towards the respective areas of application for which corresponding solutions are developed. However, engineering sciences must be "agile and flexible" in order to be able to react to the rapidly changing demands and needs of society with explicit solutions. Furthermore, the consequences of new technologies must be assessed and reported to society.

Economic sciences deal with theoretical, descriptive, normative and pragmatic aspects of economic activity (rational use of scarce resources) and are historically divided into the sub-disciplines of economics and business administration. The application of business administration is usually the main focus. From a procedural point of view, the focus is on activities in the field of industrial production of goods and related logistical processes, which in turn are shaped from an institutional point of view, especially by industrial companies.

The degree program comprises seven semesters including an internship semester and the bachelor thesis. In terms of methodology, project-based learning is particularly applied in the Bachelor's program. The combination of technical and methodological competences with social and personal competences is based on different teaching/learning settings in which students can try out later professional situations (e.g. project work, case studies, business games, simulations, etc.) as well as different examination formats (e.g. presentation, term paper, homework, draft, learning portfolio or internship report). The examination regulations for the program Production and Logistics (Industrial Engineering and Management) include the following examination types: Written examinations (§ 19), written examinations with multiple or single choice questions (§ 20), oral examinations (§ 21) as well as other examination forms (§ 22), such as term papers (e.g. case study, research), oral contribution (e.g. report, presentation, negotiation, moderation), project work, draft, learning portfolio or internship report (e.g. protocols). These should ensure that developments in the various competence areas can be tracked. In the first semester, the project week "imPuLs" allows a project-

[1] German Research Foundation (2020): Classification of subject areas and review boards of the DFG for the term of office 2020; https://www.dfg.de/en/dfg_profile/statutory_bodies/review_boards/subject_areas/index.jsp [last access 21/09/2020]

[2] German Academy of Science and Engineering (ed.) (2013): Technikwissenschaften: Erkennen – Gestalten – Verantworten; acatech IMPULS; Berlin; Springer Verlag, S. 18

oriented start into the degree program. In the further course of studies, at least one module with project-based teaching has been integrated in each semester.

In the first three semesters, students are taught mathematical, scientific, technical and humanities basics such as Mathematics, Physics, Design, Technical Mechanics, Business Organization, Industrial Business Management and Information Technology to create a uniform starting level within the group of students. Particularly worth mentioning is the internship semester in the 4th semester, which gives an insight into the professional fields and the real work life. It serves as a professional orientation for the students and they can test the competences acquired during their studies in engineering and commercial-organizational activities. Building on the first three semesters and a subsequent internship phase in the production or logistics industry, the semesters 5 to 7 are devoted to specialization in production technology and logistics. On the one hand, engineering skills are offered, with modules such as automation and manufacturing systems, and on the other hand organizational, planning and business management skills with modules along the logistics chain from procurement to disposal within a company. The degree program B. Eng. Production and Logistics enables graduates to independently apply and further develop technical and scientific methods and knowledge in solving tasks in logistics, production engineering, production planning and control, quality management and production-relevant information technologies.

2 Graduate Profile

Explanations of the taxonomy levels:

Levels of competence

The levels of the learning outcomes with the corresponding cognitive process dimension are described in the degree program B. Eng. Production and Logistics according to the learning taxonomy levels described by Anderson & Krathwohl (2014) (cf. Bloom et al., 1956; cf. Gröblinghoff, 2013):

Table 1: Learning taxonomy levels according to Anderson & Krathwohl (2014)

Competence level	Levels of learning outcomes (English)	Levels of learning outcomes (German)
1.	**remember**	**Erinnern**
1.1	recognize	Erkennen
1.2	recall	Wiedergeben
2.	**understand**	**Verstehen**
2.1	interpret	Interpretieren
2.2	exemplify	Veranschaulichen
2.3	classify	Klassifizieren
2.4	summarize	Zusammenfassen
2.5	interfere	Eingreifen
2.6	compare	Vergleichen

Competence level	Levels of learning outcomes (English)	Levels of learning outcomes (German)
2.7	explain	Erklären
3.	**apply**	**Anwenden**
3.1	execute	Ausführen
3.2	implementing	Implementieren
4.	**analyze**	**Analysieren**
4.1	differentiate	Unterscheiden
4.2	organize	Strukturieren
4.3	attribute	Zuordnen
5.	**evaluate**	**Beurteilen**
5.1	check	Prüfen
5.2	criticize	Kritisieren
6.	**create**	**Erfinden**
6.1	generate	Entwickeln
6.2	plan	Planen
6.3	produce	Produzieren

The graduate profile provides that students will have the following competences after the successful completion of their studies:

- understand engineering principles,
- understand business management basics,
- apply models and/or methods of systemic management, process management and/or information technology,
- plan, evaluate, control and/or develop operational procedures,
- identify and/or solve problems and
- make systematic decisions.

Through the interconnected acquisition of relevant mathematical, scientific, technical and humanities fundamentals, graduates of the program are able to make systematic decisions in both technological and economic contexts [taxonomy level 5]. Especially in the interface area between business and technology, graduates of the B. Eng. Production and Logistics are able to plan, evaluate, control and develop operating processes for socio-technological systems in accordance with efficiency, effectiveness, sustainability and ethical premises [taxonomy levels 4-6]. The specific application of models and methods of systemic management, process management and information technology is fundamental for the integration of the various sub-disciplines [taxonomy levels 3-4]. By means of a relevant and broad understanding of the technical and business management aspects of all phases of the product life cycle, from product development and procurement, through production and distribution of goods, to maintenance and disposal [taxonomy levels 1-3], graduates of the B. Eng. Production and Logistics get the opportunity to identify technically and economically relevant issues in science and business and to deal with them with a high qualitative self-image [taxonomy levels 4-6]. This primarily concerns the research fields "technological innovations", "future of work", "resource efficiency" and "digital transformation".

With these competences acquired in the degree program, graduates of the B. Eng. Production and Logistics are able to serve the professional fields of activity and thus meet the needs of society.

3 Fields of Activity

As a result of the growth in knowledge in contemporary history, the economic sector is now characterized by highly technical processes based on the division of labor and by a high degree of professional specialization of the workforce. As a result, tasks and problems at the interfaces between the specialist disciplines are becoming more numerous and complex in organizations and require integrative management. The Faculty of Automotive Systems and Production at TH Köln educates B. Eng. Production and Logistics Industrial Engineers, who are especially capable of developing and designing work processes at the interface between engineering and business sciences along the product life cycle. Graduates of the degree program B. Eng. Production and Logistics acquire a (first) qualifying university degree, which, due to the generalist orientation of the program, opens up the currently largest field of work in industry and further secondary fields of activity (e.g. service sector). Thanks to their broad professional knowledge, graduates of the Production and Logistics program are able to understand and assess, for example, operating procedures, processes, machines, mechanical sequences and optimization requirements. In addition to this specialist expertise, graduates are qualified to work in or lead heterogeneous, interdisciplinary teams in industry and research by acquiring key skills and project work.

In this context, the following professional fields of activity were identified:

- apply competences in the field of logistics processes,
- apply competences in the field of production processes,
- collaboration in heterogeneous, interdisciplinary teams and team leadership,
- understanding and assessment of e.g. operating procedures, processes, machines, mechanical procedures, optimization needs.

4 Study Plan

Table 2: Study plan B.Eng. Production and Logistics (Industrial Engineering and Management)

Semester	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Credits	**31**	**30**	**30**	**30**	**31**	**30**	**28**
Obligatory Modules							
English for Production Engineering and Logistics	5						
Industrial Business Administration	5						
Design Theory I	5						
Mathematics for Engineers I	5						
Technical Mechanics I	5						
Information Technology	5						
Fundamentals of Cost and Investment Accounting		5					
Fundamentals of Logistics		5					
Mathematics for Engineers II		5					
Physics I		5					
Control Engineering		5					
Project Management I		5					
Materials Science I			5				
Business Theory			5				
Production Controlling			5				
Manufacturing Processes			5				
Fundamentals of Production Planning and Controlling			5				
Statistics			5				
Manufacturing Equipment					5		
Quality Management						5	
Moderation/Negotiation (3rd part of Soft Skills)							3
Practical Phases							
Project I (interdisciplinary project)							5
Project II (individual project)							5
Internship semester				30			
First semester project week (1st part of Soft Skills)	1						
Interdisciplinary project week (2nd part of Soft Skills)					1		
Electives							
Elective modules of Production Engineering and Logistics					15	10	
Free of choice elective modules					10	15	
Bachelor's Thesis							12
Final oral examination (“Kolloquium”)							3

Electives

Table 3: Electives and free-of-choice modules of the B.Eng. Production and Logistics (Industrial Engineering and Management)

Semester	1st	2nd	3rd	4th	5th	6th	7th
Required electives of Production Engineering and Logistics							
Production Engineering (at least 2 modules)							
Automation					5		
Manufacturing Measurement Technology					5		
Manufacturing Systems						5	
Production Planning and Controlling						5	
Forming Technology						5	
Logistics (at least 2 modules)							
Distribution Logistics					5		
Production Logistics					5		
Procurement Logistics						5	
Waste Management Logistics						5	
Logistics IT and ERP Systems						5	
Electives of free choice (5 modules)							
3D-CAD						5	
Work Science					5		
Fatigue Strength					5		
Waste Management Technology					5		
Factory Planning						5	
Human Resources						5	
Mathematics for Engineers III					5		
Design Theory II						5	
Optimization and Mathematical Modeling						5	
Physics II					5		
Project Management II						5	
Technical Mechanics II						5	
Corporate Governance						5	
Materials Testing (Materials Science II)						5	
Business Law					5		

5 Alternative Study Plan

The degree program Production and Logistics can also be studied in a flexible way. The accompanying alternative study plan is intended to relieve the burden on students who, for example,

- are regularly employed or work in a block for a semester to finance their studies,
- are single parents and cannot regularly attend the offered lectures,
- care for close relatives and need to prolong their studies due to the additional time required,
- cannot finish within the standard program duration due to chronic illness or disability, and/or
- are competitive athletes and need to extend the duration of their studies due to the associated training.

The content, scope of studies and examination elements are identical with those of the full-time program. Only the time regulations in the previous examination regulations will be postponed in accordance with the extended standard program duration. How students plan their studies depends on their living conditions. It is possible to change "semester by semester", to study on certain days of the week, to change the time of the day or to take different "workloads" (credits) during the semesters. The average study performance per semester is reduced to 50% of the workload compared to the seven-semester program, although the load varies slightly during the semesters due to the system.

The academic advisors will assist you in the preparation of your individual study plan.

Table 4: Study plan B.Eng. Production and Logistics (Industrial Engineering and Management)

Semester	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**	**11.**	**12.**	**13.**	**14.**
Credits	**16**	**15**	**15**	**15**	**16**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**13**	**15**
Required Modules														
English for Production Engineering and Logistics	5													
Industrial Business Administration		5												
Design Theory I		5												
Mathematics for Engineers I	5													
Technical Mechanics I	5													
Information Technology		5												
Fundamentals of Cost and Investment Accounting			5											
Fundamentals of Logistics			5											
Mathematics for Engineers II			5											
Physics I				5										
Control Engineering				5										
Materials Science I				5										
Business Theory					5									

Production Controlling						5								
Manufacturing Processes						5								
Fundamentals of Production Planning and Controlling						5								
Project Management I					5									
Statistics					5									
Manufacturing Equipment									5					
Quality Management										5				
Moderation/Negotiation (3rd part of Soft Skills)														3
Practical Phases														
Project I (interdisciplinary project)													5	
Project II (individual project)													5	
Internship semester							15	15						
First semester project week (1st part of Soft Skills)	1													
Interdisciplinary project week (2nd part of Soft Skills)					1									

Electives														
Elective modules of Production Engineering and Logistics									5	5	10	5		
Free of choice elective modules									5	5	5	10		

Bachelor's Thesis														12
Final oral examination (“Kolloquium”)														3

6 Modules

6.1 3D-CAD (Computer Aided Design)

Module number:	3018
Module title in German:	3D-CAD (Computer Aided Design)
Type of module:	elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr.-Ing. Alexander Stekolschik
Lecturer(s):	Prof. Dr.-Ing. Alexander Stekolschik
Learning outcome:	The students can • effectively apply a 3D CAD system, • coordinate the introduction of a technical software system, • carry out project work with CAD, by • designing the 3D CAD model structure, deriving a corresponding CAD methodology and modeling 3D assemblies, • analyzing the advantages and disadvantages of CAD systems, deriving the importance of 2D/3D CAD technology and analyzing the requirements of downstream processes, • applying the methods of project management, analyzing and solving difficulties that arise, in order to later • carry out a project work in the field of CAD design, • optimize the technical product life cycle, • implement design-related customer requirements [in accordance with taxonomy level 5].
Module contents:	• theoretical basics of 3D CAD modeling, 3D CAD systems and CAD hardware • methods for the introduction of CAD systems and cost-benefit calculation • single part and assembly modeling, sketch creation, CAD model analysis • parametric and direct control of 3D CAD models • basics of free-form surface modeling, 3D CAD data exchange A large part of the course is carried out in small groups in the form of a project. The course takes place in the 3D CAD laboratory with the modern 3D CAD system NX.
Teaching and learning methods:	lecture, exercise, project work, project presentation
Assessment methods:	project work (50%) and presentation (50%), intermediate test as examination admission
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	60 h

Individual preparation and follow up:	90 h
Recommended prerequisites:	passed examination in Design Theory I (compulsory)
Recommended literature:	Further literature will be communicated during the course.
Use of the module in other programs:	…
Particularities:	intermediate test in the 3D CAD system after approx. 5 weeks
Latest update:	09/2020

6.2 **Work Science** (incl. basic REFA license)

Module number:	2050
Module title in German:	Work Science
Type of module:	elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	5th semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. Helmut Abels
Lecturer(s):	Prof. Dr.-Ing. Helmut Abels / assistant lecturer
Learning outcome:	The students • can describe and explain the performance and motivation of employees and their reactions to operational requirements, • recognize the requirements for the design of the workplace and working environment in order to take human concerns into account and bring economic aspects into line with them and are able to apply them. These especially include climate, lighting, noise and vibration, dust, gases and vapors as well as paints, • can determine modern forms of work organization and their effects on employees and relevant areas of labor law [in accordance with taxonomy level 5].
Module contents:	The contents of this module is based on the REFA basic training UNI 2.0. This includes the following topics in particular: Analysis and design of processes, especially • the REFA working system • work data management • process structures and process representation • task and process - structure and design • expiration and time data Determination and application of process data, in particular • REFA time study incl. assessment of performance level • determination of plan time modules • multi-moment snapshot • distribution time notification • comparing and estimating Practical method training in the Lean Factory • process description • time study in practice, multi-moment recording • calculation of costs • first optimization approaches • presentation of the results
Teaching and learning methods:	on-site teaching (lecture), learning in small groups (exercises/practical training), technical discussion (deepening of the subject areas)
Assessment methods:	written examination (90 minutes, 100%)
Workload	150 h

(30 h ≙ 1 ECTS credit) :	
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	participation in all teaching units and successful completion of the REFA basic certificate including practical method training in the Lean Factory
Recommended literature:	• REFA documentation on the basic REFA license • Further literature will be communicated during the course.
Use of the module in other programs:	…
Particularities:	…
Latest update:	02/2020

6.3 Automation

Module number:	1228
Module title in German:	Automatisierung
Type of module:	required elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	5th semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. Hasan Smajic
Lecturer(s):	Prof. Dr.-Ing. Hasan Smajic
Learning outcome:	The students acquire • operational knowledge of fundamentals of industrial communication, drive technology, programmable logic controllers, human-machine interaction, with a focus on advanced methods of the "Internet of Things" (IoT) approach through • a combination of lectures, exercises and practical training • and testing their knowledge by evaluating each other's automation projects in order to later • be able to design, implement and evaluate complex control solutions [in accordance with taxonomy level 5].
Module contents:	• measurement and process data acquisition (sensor technology) • innovative drive technology (positioning and speed control) • processing of the process data by means of a PLC and safe PLC • operation and monitoring of processes (control technology) • use of fieldbus systems and Industrial Ethernet • procedures for planning, describing and solving automation tasks • machinery guidelines, norming, standardization, committees and associations • marketing and sales of automation components • project planning of field buses, operation and monitoring of processes, energy efficiency
Teaching and learning methods:	on-site teaching (lectures and exercises), practical training in the laboratory for automation technology, independent work in small groups
Assessment methods:	written examination (90 minutes, 100%) Successful participation in the practical training in the laboratory and active participation in the exercises are prerequisites for the examination.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	80 h
Individual preparation and follow up:	70 h
Recommended prerequisites:	passed examination of the module Control Technology
Recommended literature:	Script and exercise materials are available for download. Further literature will be communicated during the course.

Use of the module in other programs:	…
Particularities:	…
Latest update:	09/2020

6.4 Bachelor's Thesis + Final Oral Examination (“Kolloquium”)

Module number:	0950
Module title in German:	Bachelorarbeit + Kolloquium
Type of module:	obligatory module
ECTS credits:	15
Language:	German
Duration of the module:	13 weeks
Recommended semester:	7th semester
Frequency:	winter and summer semester
Module responsible:	Prof. Dr.-Ing. Hasan Smajic
Lecturer(s):	all lecturers of the Institute of Production
Learning outcome:	The students can • within a defined period, independently solve a limited but complex scientific problem by applying scientific methods and rules, selecting suitable solution procedures and methods, and applying them appropriately by • interpreting and evaluating the solutions developed, independently acquiring missing detailed knowledge, e.g. by consulting scientific literature, as well as adequately documenting the results achieved in written form and presenting and explaining them in a scientifically correct manner in order to later • be able to develop technology-based solution strategies to the problems posed by technical requirements that are changing at an ever-faster pace, with independent expansion of knowledge, and to design, evaluate and communicate these regarding their effects, taking into account social, ecological and cultural requirements. [in accordance with taxonomy level 6].
Module contents:	The Bachelor's Thesis is usually an independent investigation with a constructive, experimental, technical, organizational or economic task from production engineering, logistics or industrial engineering and management with an adequate description and explanation of its solution. In technically appropriate cases it can also be a written term paper with technical literary content.
Teaching and learning methods:	Independent execution of the task with minimal instruction by the lecturer.
Assessment methods:	written documentation of the results in the Bachelor's thesis and presentation with defense of the results in the final oral examination (“Kolloquium”)
Workload (30 h ≙ 1 ECTS credit) :	450 h
Contact hours:	…
Individual preparation and follow up:	documentation: 390 h preparation and realization of the final oral examination (“Kolloquium”): 60 h
Recommended prerequisites:	See the examination regulations of the program.
Recommended literature:	depending on the project topic
Use of the module in other programs:	…
Particularities:	…

Latest update: 09/2020

6.5 Procurement Logistics

Module number:	3330
Module title in German:	Beschaffungslogistik
Type of module:	required elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr. rer. pol. Helmut Schulte Herbrüggen
Lecturer(s):	Prof. Dr. rer. pol. Helmut Schulte Herbrüggen
Learning outcome:	After the successful completion of the module, students can • implement demand-synchronized procurement logistics concepts (Just-In-Time and Just-In-Sequence) as well as concepts such as Vendor Managed Inventory (VMI) and Collaborative Planning Forecasting and Replenishment (CPFR) for national and international production and trading companies, by • performing relevant analytical procedures such as information and material flow analyses as well as ABC and XYZ analyses, in order to later • introduce and further develop delivery and stocking concepts suitable for parts and articles, even in complex production and trading companies based on these analyses, and to take ethical, social and ecological aspects into account. [in accordance with taxonomy level 6].
Module contents:	• make or buy decisions (in-house production or external procurement including co-operation option) • strategic and operational procurement (including purchasing to ensure the legal availability of goods) • supply early warning systems • sourcing concepts (in- and outsourcing, local and global sourcing, brine, single, dual and multiple sourcing, parts and modular sourcing as well as other sourcing concepts such as eSourcing, cooperative sourcing, parallel sourcing etc.) • international procurement market analysis • procurement policies and instruments, including social, intercultural and ethical aspects • organizational processes in procurement and purchasing, especially information and material flows between suppliers and customers up to the provision of goods for production: from the national and international search for suppliers, through supplier selection, negotiation and conclusion of contracts, to supplier assessment, controlling and auditing • aspects of social responsibility (see section Learning outcome)
Teaching and learning methods:	interactive lectures: exercises in which students work individually or in groups on procurement logistics issues, answer questions and present practical examples
Assessment methods:	written examination (90 minutes, 100%) During the examination the use of a non-programmable calculator is allowed.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h

Individual preparation and follow up:	86 h
Recommended prerequisites:	the course Fundamentals of Logistics
Recommended literature:	script of slides, exercises and • Appelfeller, W./Buchholz, W: Supplier Relationship Management. Strategie, Organisation und IT des modernen Beschaffungsmanagements, latest edition, Wiesbaden. • Heß, G.: Supply-Strategien in Einkauf Beschaffung. Systematischer Ansatz und Praxisfälle, latest edition, Wiesbaden; 1st edition from 2008 available as e-Book. • Large, R.: Strategisches Beschaffungsmanagement. Eine praxisorientierte Einführung. Mit Fallstudien, latest edition, Wiesbaden. • Meierbeck, R.: Strategisches Risikomanagement der Beschaffung. Entwicklung eines ganzheitlichen Modells am Beispiel der Automobilindustrie, latest edition, Cologne. • Schuh, G. and others: Beschaffungslogistik im Maschinen- und Anlagenbau, latest edition, Aachen.
Use of the module in other programs:	This module is also offered in the B. Sc. Logistics.
Particularities:	none
Latest update:	08/2020

6.6 Fundamentals of Fatigue Strength

Module number:	
Module title in German:	Betriebsfestigkeit - Grundlagen
Type of module:	elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	5th semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. P. Krug
Lecturer(s):	Prof. Dr.-Ing. P. Krug
Learning outcome:	The students • know the material science processes at different component loads and the relevant test methods for characterizing the relevant material behavior, • can describe and apply the experimental methods for the determination of fatigue properties and compare different damage accumulation models, • know adequate methods for service life extension, in order to later • establish appropriate test procedures, • to be able to calculate the service life of cyclically loaded, simple components, • to be able to specifically identify the appropriate process, taking into account the material and the load spectrum [in accordance with taxonomy level 5].
Module contents:	deformation behavior of different material groups under static, cyclic and dynamic load, fatigue behavior of metallic materials, experimental fundamentals of fatigue strength, operational fatigue strength verification, fundamentals of wear, fundamentals of corrosion, fundamentals of creep loading, fundamentals of special loads
Teaching and learning methods:	• on-site teaching • practical training project • guest speakers • technical discussion (individual) • exercises in English • presentations in English
Assessment methods:	oral examination
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	50 h
Individual preparation and follow up:	100 h
Recommended prerequisites:	All obligatory modules of the scientific fundamentals of engineering and mathematics.
Recommended literature:	• E. Haibach, „Betriebsfestigkeit“, Springer Verlag • D. Radaj; M. Vormwald, „Ermüdungsfestigkeit“ Springer Verlag • H. Gudehus, H. Zenner, „Leitfaden für eine Betriebsfestigkeitsrechnung“ Stahleisen Verlag in English: • J. A. Bannantine, J.L. Handrock, J. J. Comer; „Fundamentals of Metal Fatigue Analysis

	• D. Radaj, C. M. Sonsino, W. Fricke, “Fatigue Assessment of Welded Joints by Local Approaches”, Woodhead Publishing (sophisticated and demanding)
Use of the module in other programs:	This module is also offered in the program B. Eng. Automotive Engineering.
Particularities:	passed examination in Materials Science I as admission requirement
Latest update:	09/2020

6.7 Business Theory

Module number:	2070
Module title in German:	Betriebsorganisation
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	3rd semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. Christoph S. Zoller
Lecturer(s):	Prof. Dr.-Ing. Christoph S. Zoller
Learning outcome:	The students can • critically evaluate self-developed structural and operative organizational improvements for problems in the direct and indirect business area by • internalizing selected lean methods from the areas of production, administration and development and reviewing them in a quiz in order to later • be able to successfully initiate or accompany change processes within the operational organization in their everyday professional life. [in accordance with taxonomy level 5].
Module contents:	• fundamental concepts of business organization • presentation of the vision of a Lean company • problem solving techniques and strategies • effects of Lean Management methods • overview of the central Lean principles and application possibilities • selected Lean Management methods for the areas of production, administration and development to design information flows and communication • planning, control and communication of successful change processes
Teaching and learning methods:	lecture, exercise, voluntary practical training
Assessment methods:	The grade of the module consists of 5 equally weighted tests with, among others, multiple or single choice questions.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	regarding content: none
Recommended literature:	Slide script is handed out during the lecture. • Bergmann, R./Garrecht, M.: Organisation und Projektmanagement, Heidelberg, 2008. • Womack, J. P. /Jones, D. T.: Lean Thinking. Ballast abwerfen, Unternehmensgewinn steigern, Francfort, 2013. • Saheb, K.: Lean Administration, Aachen, 2014.

	Further literature recommendations will be communicated during the course.
Use of the module in other programs:	This module is also offered in the B. Sc. Logistics.
Particularities:	…
Latest update:	09/2020

6.8 Distribution Logistics

Module number:	3310
Module title in German:	Distributionslogistik
Type of module:	required elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	5th semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr. rer. pol. Stephan Freichel
Lecturer(s):	Prof. Dr. rer. pol. Stephan Freichel
Learning outcome:	The students • can define common terms of distribution logistics and describe logistic chains, • deal with the strategic importance as well as current trends of distribution logistics, • can systematically integrate distribution logistics into the concepts of marketing and sales, • are able to elaborate the special features of distribution logistics for manufacturing companies as well as for trading companies and spare parts logistics, • are able to describe and analyze vertical and horizontal dimensions of distribution channels and networks and apply them to practical examples, • can independently apply the functions of logistics to distribution logistics, • can discuss specific aspects of the organization and management of distribution logistics by • analyzing and applying them, • conducting supplementary research in current technical literature and specialized media, • comparing commonalities and conflicting goals, • analyzing key statements from technical literature, • in this regard comparing essential properties and interrelationships, • preparing and delivering presentations in the context of a reverse classroom, • analyzing the fundamentals learned in the context of case studies, in order to later • be able to select different characteristics when designing (distribution) logistics systems, • be able to make strategic decisions based on sound information, • be able to quickly identify the interrelationships and mutual influence of both corporate functional areas, • be able to act successfully based on knowledge of the customs of the branches, • to investigate and improve distribution structures in practice, • to be able to transfer specific technical facts from the relevant fields of activity and to develop them further through research-based learning, • understand and question potential job profiles and be able to shape them sustainably in the professional environment as a team member and/or as a manager in the company [in accordance with taxonomy level 5].
Module contents:	• terms, development and goals of distribution logistics • classification of distribution logistics in the supply chain • importance, trends and strategies of distribution logistics

	• special features of international distribution logistics
	• classification of distribution into the concepts of marketing and sales
	• importance of distribution logistics for manufacturing companies and trading firms in B2B and B2C
	• special features of the distribution of spare parts
	• analysis and design of distribution channels and networks
	• functions of distribution logistics:
	  • order processing and supply chain event management
	  • inventory management and category management
	  • distribution centers and logistics properties
	  • packaging design
	  • shipping, transport management and international container traffic
	  • logistics service providers and parcel services in distribution logistics
	• organization and management of distribution logistics

Teaching and learning methods:	exercise: case studies on, among other things, the use of technology in distribution logistics, distribution logistics in B2C and B2B trade, industry-related distribution logistics (pharmaceuticals, new vehicles, consumer goods), implications of Industry 4.0/digital networking, air freight and world trade on-site teaching, reverse classroom lectures, seminar-based teaching in the form of case study presentations by students, guest lectures/excursions if necessary
Assessment methods:	• 15-20-pages, individual and handwritten teaching/learning portfolio is a prerequisite for the examination (is graded as passed/failed) • written examination of 60 minutes, (100%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	Fundamental knowledge from the lecture Fundamentals of Logistics.
Recommended literature:	• Pfohl, H.-Chr. (2018): Logistiksysteme. Betriebswirtschaftliche Grundlagen. 9th edition, Springer Gabler, 2018. • Helmold, M. (2010): Distributionslogistik. Kundenzufriedenheit und Ausschöpfung von Wettbewerbsvorteilen durch die stetige und nachhaltige Optimierung der Distributionslogistik. Shaker, Düren 2010. • Tripp, Chr. (2021): Distributions- und Handelslogistik. Netzwerke und Strategien der Omnichannel-Distribution im Handel. 2nd edition, Springer Gabler, Wiesbaden 2021. • Koether, R. (2018): Distributionslogistik. Effiziente Absicherung der Lieferfähigkeit. 3rd edition, Gabler, Wiesbaden 2018. • Selzer, G. (2010): Distributionslogistik. Die Steuerung von weltweit vernetzten Warenströmen. Shaker, Düren 2010. • Pfohl, H.-Chr. (2021): Logistikmanagement. Konzeption und Funktionen. 4th edition, Springer, Berlin et al. 2021.
Use of the module in other programs:	This module is also offered in the B. Sc. Logistics.
Particularities:	…
Latest update:	03/2022

6.9 English for Production Engineering and Logistics

Module number:	1340
Module title in German:	English for Production Engineering and Logistics
Type of module:	obligatory module
ECTS credits:	5
Language:	English
Duration of the module:	one semester
Recommended semester:	1st or 2nd semester
Frequency:	in the winter and summer semester
Module responsible:	Anke Vollmer, M.A.
Lecturer(s):	Anke Vollmer, M.A.
Learning outcome:	The students • can express themselves in English on basic personal and professional topics, • have basic knowledge of production and logistical structures and processes, • can independently prepare and present short presentations on technical, logistical or economic topics, and answer questions on these topics, • gain knowledge of potential pitfalls in intercultural communication, • can describe trends and developments by • discussing and debating various issues in group work, • analyzing and explaining technical texts, • 1) examining and evaluating presentations by others and 2) creating and giving presentations, • adopting roles and ways of thinking in an international context, • examining diagrams and correctly using the necessary linguistic devices in order to later • gain general confidence in oral expression concerning life and work as well as important social and societal aspects, and articulate views and approaches in a coherent and convincing manner, • later draft (productive) and understand (receptive) English texts with appropriate organizational and technical content, and weigh the advantages and disadvantages of technical content, • consolidate and expand presentation and feedback techniques, to be able to later meet others sensitively, tolerantly in a linguistically adequate manner, • be able to describe and interpret changes in economy/society/companies/projects etc. in English [in accordance with taxonomy level 5].
Module contents:	reading and discussing texts and videos with organizational and technical content on production and logistics issues; answering questions on text content, definitions and discussions; special exercises on grammar fields often perceived as problematic; intercultural communication; short presentations (language level B1+ according to the Common European Framework of Reference for Languages CEFR)
Teaching and learning methods:	practical exercises/interactive seminar in small groups (compulsory attendance) in different social forms
Assessment methods:	• oral performance and presentation 50% • Portfolio 50% In order to pass the course, both the presentation and the portfolio must be passed with at least 50%. The presentation is a preliminary requirement for the examination. Examinations are only evaluated if the attendance requirement is fulfilled.
Workload	150 h

(30 h ≙ 1 ECTS credit) :	
Contact hours:	48 h
Individual preparation and follow up:	102 h
Recommended prerequisites:	basic knowledge of the English language in accordance with the “Fachhochschulreife”, a German entrance qualification for a university of applied sciences (level B1 according to CEFR)
Recommended literature:	www.macmillandictionary.com; oald8.com. Further literature references will be communicated during the course.
Use of the module in other programs:	…
Particularities:	Attendance is compulsory.
Latest update:	03/2022

6.10 Waste Management Logistics

Module number:	4090
Module title in German:	Entsorgungslogistik
Type of module:	required elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr. rer. nat. Kathrin Hesse
Lecturer(s):	Prof. Dr. rer. nat. Kathrin Hesse
Learning outcome:	The students can • differentiate different waste management logistics processes depending on the different types of waste and allocate them to the treatment processes or plants based on certain criteria (waste law, costs, hazard potential) by • establishing the waste legal bases on the different levels (EU and national) in the context of waste management, distinguishing and examining the particularities of waste types, calculating the efficiency and costs of selected processes, in order to later • be able to make and evaluate an optimal selection for the treatment of further present and future waste materials regarding recycling and resource efficiency [in accordance with taxonomy level 5].
Module contents:	In addition to the basics of scientific work and presentations, the course content conveys aspects for social commitment and includes the following topics: • introduction to the disposal logistics processes, • waste types and volumes, • disposal logistics processes (collection, transport, handling, treatment), • fundamentals of waste legislation of the EU and Germany down to the individual municipalities, including waste prevention strategies, • recycling process of selected valuable materials, • waste management and climate change.
Teaching and learning methods:	lectures, exercises, presentations, excursions
Assessment methods:	remote/digital examination (70%) and oral presentation (30%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	…
Recommended literature:	script and the included bibliography, as well as the following literature: • Bilitewski, B./Härdtle, G: Abfallwirtschaft. Handbuch für Praxis und Lehre, 4th edition, Wiesbaden, Springer Vieweg Verlag, 2013. • Kranert, Martin (Ed.): Einführung in die Kreislaufwirtschaft, Planung – Recht – Verfahren. Fachbuch für Lehre und Praxis, 5th edition, Wiesbaden, Springer Fachmedien Wiesbaden GmbH, 2017 • Martens, H./Goldman, D.: Recyclingtechnik. Fachbuch für Lehre und Praxis, 2nd edition, Wiesbaden, Springer Fachmedien Wiesbaden GmbH, 2016.

	• Piehl, T./Süselbeck, G.: Abfall-Entsorgungs-Trainer. Grundlagen für die Schulung, 10th edition, Hamburg, Storck Verlag, 2013. Further literature recommendations will be communicated during the course.
Use of the module in other programs:	This module is also offered in the B. Sc. Logistics.
Particularities:	…
Latest update:	03/2022

6.11 Waste Management Technology

Module number:	4092
Module title in German:	Entsorgungstechnik
Type of module:	elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	5th semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr. rer. nat. Kathrin Hesse
Lecturer(s):	Prof. Dr. rer. nat. Kathrin Hesse
Learning outcome:	The students can • relate ecological systems to economic systems, • assess existing recycling techniques and processes, • evaluate environmental and competitive contexts in a resource-efficient manner, by • comparing and evaluating the essential basics of waste management technology, waste prevention and recycling concepts as well as closed-loop approaches in waste management including end-of-life product recycling and reuse regarding strengths and weaknesses depending on the different waste materials in order to later • think in terms of material cycles and formulate holistic, systemic approaches to sustainable development in a global context [in accordance with taxonomy level 5].
Module contents:	• mission statements and strategies, sustainability, ecological and technical principles • environmental management systems/life-cycle analysis • national and international environmental problems • waste, sewage, drinking water, extinction of species, soil and contaminated sites, air pollution, noise, climate and energy • recycling techniques and processes • raw material utilization strategies • recycling management processes • material flow management in the circular economy • hazardous materials management • internal and external waste management systems • resource efficiency in production
Teaching and learning methods:	lectures, exercises, presentations, excursions
Assessment methods:	remote/digital examination (70%) and oral presentation (30%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	…
Recommended literature:	script and the included bibliography

Use of the module in other programs:	…
Particularities:	…
Latest update:	03/2022

6.12 First Semester Project Week

Module number:	1082
Module title in German:	Erstsemesterprojektwoche
Type of module:	obligatory module
ECTS credits:	1
Language:	German
Duration of the module:	usually one week
Recommended semester:	1st semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr. rer. nat. Kathrin Hesse
Lecturer:	Lecturers of the Institute for Production
Learning outcome:	The students can • apply project management methods, • independently carry out project work in a team, • document and present their own work results in a professional manner [in accordance with taxonomy level 3].
Module contents:	Development and implementation of a product concept for the packaging of a freely selectable packaged good under consideration of defined quality criteria, which the packaging should fulfill in an industrial context. These include: • processing of a predefined problem from the industry, • definition of the specialist roles in the team, • carrying out the idea generation process and develop a product idea, • definition of the requirements from the product properties, • creation of a catalog of criteria, • development of two packaging designs, • production of a prototype, • determination of test procedures and testing of the developed prototype, • description of the production process and definition of the production machines, • presentation of the product concept and the finished prototype, • reflection on the progression of the project and the team process.
Teaching and learning methods:	project-based learning in group work, teaching talks (continuous supervision by lecturers and support by tutors), plenary discussion, presentations from representatives of the industry
Assessment methods:	attendance is obligatory during the project week, project documentation (fully completed portfolio and prototype), presentation
Workload (30 h ≙ 1 ECTS credit) :	30 h
Contact hours:	30 h
Individual preparation and follow up:	…
Recommended prerequisites:	…
Recommended literature:	• Kummer, S./Jammernegg, W./Green, O.: Grundzüge der Beschaffung, Produktion und Logistik. 3rd edition, Pearson Studium, 2013 • Jakoby, W.: Projektmanagement für Ingenieure: Ein praxisnahes Lehrbuch für den systematischen Projekterfolg. 3rd edition, Springer Vieweg, 2015 • Bea, F. X./Scheurer, S./Hesselmann, S.: Projektmanagement. 2nd edition, UTB, 2011

	• Seifert, J. W.: Visualisieren – Präsentieren – Moderieren. 34th edition, Gabal, 2014 • Ravens, T.: Wissenschaftlich mit PowerPoint arbeiten, Pearson Studium, 2004 • Klenke, K.: Studieren kann man Lernen. Mit wenig Mühe zu mehr Erfolg. Springer Gabler, 2013 Further literature will be communicated during the course.
Use of the module in other programs:	…
Particularities:	only credit points, no grading If students are not able to complete the first semester project week in the first semester, they can recover the missed credit point in the following winter semester as a tutor in the first semester project week if they provide sufficient justification. In order to be appointed as a tutor, students must complete the qualification as a project tutor.
Latest update:	02/2020

6.13 Factory Planning

Module number:	2530
Module title in German:	Fabrikplanung
Type of module:	elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr. rer. pol. Therese Mahr-Lethen
Lecturer(s):	Prof. Dr. rer. pol. Therese Mahr-Lethen
Learning outcome:	The students • can use the acquired knowledge to redesign a factory, • can analyze and categorize existing approaches, • are able to plan factory plants with the help of computer-aided models [in accordance with taxonomy level 6].
Module contents:	• planning object factory • planning stages • planning activities • production program • investments • location planning • general development plan • operating data • area planning • planning models • computer-aided factory planning
Teaching and learning methods:	lecture, exercises.
Assessment methods:	written examination (90 minutes, 100%) [examination type in accordance with PO §§ 19, 20]
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	fundamental knowledge from the lecture Industrial Business Administration
Recommended literature:	• Wiendahl/Reichardt/Nyhuis: Handbuch Fabrikplanung, 2009. Pawellek: Ganzheitliche Fabrikplanung, 2008. • Wirth/Schenk: Fabrikplanung und Fabrikbetrieb, 2004. Schmigalla: Fabrikplanung. Begriffe und Zusammenhänge, 1995.
Use of the module in other programs:	…
Particularities:	…
Latest update:	02/2020

6.14 Manufacturing Measurement Technology

Module number:	1212
Module title in German:	Fertigungsmesstechnik
Type of module:	required elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	5th semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. Hasan Smajic
Lecturer(s):	Prof. Dr.-Ing. Jörn Riedel
Learning outcome:	The students can • determine the essential measurement principles, methods and procedures as well as important system components in measurement systems on the basis of metrological fundamentals and terms, • analyze and interpret influencing variables and measurement uncertainties of measurement processes and • assess the integration of measurement technology into production in order to later • select and set up suitable measuring methods for the measuring dimension, shape, position and surface roughness as well as to evaluate and analyze acquired data and assess the measuring process [in accordance with taxonomy level 5].
Module contents:	The content of the course Manufacturing Measurement Technology comprises the basics and applications of modern production metrology. This includes not only the measuring principles and the setup of metrological equipment, but also the integration into production structures as well as the evaluation and analysis of the measured data. The courses enable students to select, set up and evaluate suitable measurement methods for a given task. Practical training: planning, realization and evaluation of measurements of geometric quantities (dimension, shape, position, surface roughness) with simple and complex measuring equipment and documentation of the results
Teaching and learning methods:	on-site teaching, seminar-based lecture, practical training in small groups
Assessment methods:	written examination (90 minutes, 100%) The successful participation in the practical training is a prerequisite for taking the examination.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	70 h
Individual preparation and follow up:	80 h
Recommended prerequisites:	basic knowledge from the modules Mathematics, Statistics, Design Theory I and Manufacturing Equipment
Recommended literature:	• Pfeifer, Tilo; Schmitt, Robert (2010): Fertigungsmesstechnik. 3rd edition, Munich: Oldenbourg.

	• Keferstein, Claus P.; Marxer, Michael (2015): Fertigungsmesstechnik. 8th. edition, Wiesbaden: Springer Vieweg. • DIN 1319, sheets 1-3: Grundlagen der Messtechnik. (current version), Beuth Verlag. Berlin • Linß, Gerhard (2011): Qualitätsmanagement für Ingenieure. 3rd edition, Munich: Fachbuchverl. Leipzig im Carl-Hanser-Verlag Further literature will be communicated during the course.
Use of the module in other programs:	…
Particularities:	…
Latest update:	09/2020

6.15 Manufacturing Equipment

Module number:	1330
Module title in German:	Fertigungsmittel
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	5th semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. Ralf Breede
Lecturer(s):	Prof. Dr.-Ing. Ralf Breede
Learning outcome:	The students • understand the designs and components of machine tools and robots for industrial production, their performance characteristics, areas of application and control parameters by • applying the criteria, formulas and correlations learned in the course as well as in self-study to a given manufacturing task, taking into account the technical requirements in order to later • make a suitable selection of production equipment and design it in an application-related manner, as well as to derive, analyze and evaluate solutions for the design and programming of industrial robot applications based on the imparted knowledge in the context of the final examination and a practical exercise [in accordance with taxonomy level 5].
Module contents:	The content of the module includes imparting knowledge on essential, industrially used production equipment. For this purpose, the types and design features, components and parameters for machine tools and robots are considered based on basic manufacturing processes, with a focus on forming and separating processing as well as the industrial use of robots.
Teaching and learning methods:	on-site teaching, working in small groups, practice-oriented work
Assessment methods:	remote/digital examination (60 minutes, 100%) The successful completion of the practical exercises is a prerequisite for the examination.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	80 h
Individual preparation and follow up:	70 h
Recommended prerequisites:	knowledge from the courses Materials Science, Technical Mechanics, Design Theory, Manufacturing Processes, Control Engineering
Recommended literature:	• Weck, M.; Brecher, Ch.: Werkzeugmaschinen – Maschinenarten und Anwendungsbereiche. Reihe Werkzeugmaschinen Fertigungssysteme vol. 1, Springer-Verlag • Weck, M.; Brecher, Ch.: Werkzeugmaschinen – Konstruktion und Berechnung. Reihe Werkzeugmaschinen Fertigungssysteme vol. 2, Springer-Verlag • Hesse, S.; Seitz, G.: Robotik. Vieweg-Verlag • Weber, W.: Industrieroboter. Hanser-Verlag Further literature will be communicated during the course.

Use of the module in other programs:	…
Particularities:	…
Latest update:	02/2022

6.16 Manufacturing Systems

Module number:	1222
Module title in German:	Fertigungssysteme
Type of module:	required elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr.-Ing. Ralf Breede
Lecturer(s):	Prof. Dr.-Ing. Ralf Breede
Learning outcome:	The students • are able to present and evaluate the different types of manufacturing systems as well as their specific characteristics and areas of application, and to design and optimize them for a production task, • have knowledge of the possibilities for monitoring and controlling automated machining processes and can evaluate and design monitoring concepts on this basis, • can design, analyze and optimize production volumes at different levels of manufacturing systems with the aid of industrial 3D planning software modules [in accordance with taxonomy level 5].
Module contents:	The content of the module includes imparting of knowledge about the industrially common manufacturing systems in automated production environments. This includes the areas of application, the system-specific features, the material flow linkage and the possibilities of process monitoring as well as the design, evaluation, optimization and operation of the different types of systems.
Teaching and learning methods:	on-site teaching, working in small groups, practice-oriented work
Assessment methods:	remote/digital examination (60 minutes, 100%) The successful completion of the practical exercises is a prerequisite for the examination.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	80 h
Individual preparation and follow up:	70 h
Recommended prerequisites:	knowledge from the modules Manufacturing Processes, Manufacturing Equipment, Control Engineering, Information Technology
Recommended literature:	• Weck, M./Brecher, Ch.: Werkzeugmaschinen – Mechatronische Systeme, Vorschubantriebe, Prozeßdiagnose. Reihe Werkzeugmaschinen Fertigungssysteme, vol. 3, Springer-Verlag. • Weck, M./Brecher, Ch.: Werkzeugmaschinen – Automatisierung von Maschinen und Anlagen. Reihe Werkzeugmaschinen Fertigungssysteme, vol. 4, Springer-Verlag. • Kief, H. B./Roschiwal, H. A.: NC/CNC Handbuch 2007/2008. Hanser-Verlag. Further literature will be communicated during the course.
Use of the module in other programs:	…

Particularities:	
Latest update:	02/2022

6.17 Manufacturing Processes

Module number:	1080
Module title in German:	Fertigungsverfahren
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	3rd semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. Christoph Hartl
Lecturer(s):	Prof. Dr.-Ing. Christoph Hartl
Learning outcome:	The students can • make a suitable process selection for a manufacturing task from industrial production by • applying the knowledge imparted on the technical process options and the relationships between production processes and the factors of cost, time and quality in order to later • be able to decide on economically feasible manufacturing processes in areas of employment such as product development, production or production planning [in accordance with taxonomy level 4].
Module contents:	application-relevant basics of industrially used manufacturing processes for the production and processing of components made of metallic materials, plastics, ceramics and glass: primary forming, shaping, separating, coating, generative manufacturing.
Teaching and learning methods:	on-site teaching (lecture), learning in small groups (calculation exercises); on-site teaching (lecture) with digital provision of learning material via intranet-based learning platform; guided solution of tasks for practical case studies.
Assessment methods:	written examination (120 minutes, 100%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	48 h
Individual preparation and follow up:	102 h
Recommended prerequisites:	basic knowledge from the modules Materials Science, Technical Mechanics, Physics, Mathematics
Recommended literature:	• Fritz, A. H. and others: Fertigungstechnik, Springer Vieweg, 2018. • Westkämper, E.; Warnecke, H.-J.: Einführung in die Fertigungstechnik, Vieweg+Teubner Verlag, 2010. Further literature will be communicated during the course.
Use of the module in other programs:	This module is also offered in the program B. Eng. Automotive Engineering.
Particularities:	…
Latest update:	02/2022

6.18 Fundamentals of Cost and Investment Accounting

Module number:	1310
Module title in German:	Grundlagen Kosten- und Investitionsrechnung
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	1st or 2nd semester
Frequency:	winter and summer semester
Module responsible:	Prof. Dr. rer. oec. Markus Pütz
Lecturer(s):	Prof. Dr. rer. oec. Markus Pütz
Learning outcome:	The students can • describe the purposes and subsystems of managerial accounting and the associated parameters, distinguish between essential cost concepts and typical cost trends, and illustrate the sub-areas of cost and activity accounting, • successfully complete typical tasks in cost element, cost center, cost object unit and cost object time accounting, • differentiate cost accounting systems according to time and material reference and successfully process typical tasks of contribution margin accounting as well as decision-oriented cost accounting, • present basic forms of corporate financing and successfully complete typical tasks in static investment appraisal by • understanding the relevant technical terms, principles, methods and instruments and applying them in an exercise-based manner appropriate to the task at hand, in order to later • be able to successfully complete basic cost and activity accounting and static investment accounting tasks and projects [in accordance with taxonomy level 3].
Module contents:	• principles of cost accounting • cost-type accounting • cost center accounting • cost unit accounting • cost unit time accounting • traditional cost accounting systems and contribution margin accounting • basic forms of corporate financing and static procedures of investment calculation (cost, profit, profitability comparison and amortization calculation)
Teaching and learning methods:	on-site teaching (lecture), seminar-based teaching, working in small groups for exercises, technical discussions (individual)
Assessment methods:	written examination (90 minutes, 100%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	

Recommended literature:	• Coenenberg, Adolf Gerhard/Fischer, Thomas M./Günther, Thomas: Kostenrechnung und Kostenanalyse, 9th revised edition, Stuttgart: Schäffer-Poeschel, 2016. • Deimel, Klaus/Isemann, Rainer/Müller, Stefan: Kosten- und Erlösrechnung, 1st edition, reprint, Pearson Studium, 2006. • Friedl, Gunther/Hofmann, Christian/Pedell, Burkhard: Kostenrechnung, 3rd edition, Munich: Vahlen, 2017. • Däumler, Klaus-Dieter/Grabe, Jürgen/Meinzer, Christoph R.: Investitionsrechnung verstehen: Grundlagen und praktische Anwendung mit Online-Training, 14th updated and extended edition, Herne: NWB Verlag, 2019. Further literature will be communicated during the course.
Use of the module in other programs:	…
Particularities:	…
Latest update:	09/2020

6.19 Fundamentals of Logistics

Module number:	1122
Module title in German:	Grundlagen Logistik
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	2nd semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr. rer. pol. Stephan Freichel
Lecturer(s):	Prof. Dr. rer. pol. Stephan Freichel
Learning outcome:	The students can • describe the essential terms, objectives, characteristics and significance of logistics, • explain functions, phases and institutions of logistics systems, • select suitable instruments for the analysis, planning and design of logistics systems, • explain, analyze and comment on macroeconomic and international aspects as well as current and special aspects of logistics and supply chain management in general terms (e.g. on topics such as globalization, sustainability, outsourcing, lean logistics), • independently describe, test and compare logistical problems on the basis of case studies by • selecting and examining them from suggested literature as well as analyzing them in terms of their characteristics, • developing and applying them within the framework of the courses, • systematically reviewing recommended literature regarding specific topics of interest, • regularly analyzing case studies in order to later • include corresponding features in the design of logistics systems, • identify mechanisms of action and select options for decision-making, • be able to examine and design logistics systems in a targeted manner, • be able to act on a case-by-case basis in a wide range of logistics areas, • be able to structure and select approaches for solutions or measures for optimization and implementation [in accordance with taxonomy level 4].
Module contents:	• terms, characterization and meaning of the logistics concept • function-related logistics systems (order processing, transport, warehousing, packaging/loading unit formation, warehousing/stock management) • phase-related logistics systems (distribution, production, procurement, disposal, spare parts logistics) • institutional aspects of logistics systems (intra- and interorganizational design of logistics or supply chain networks, logistics services, institutions of freight transport) • macroeconomic and international aspects of logistics systems • current and special aspects of logistics management (industry logistics as well as logistics strategy, planning and controlling)
Teaching and learning methods:	• interactive lectures (knowledge transfer with the support of presentation graphics and notes on the board), whereby the understanding of the students is tested through questions provided by the lecturer

	• exercises, in which selected lecture content is deepened and practical examples/case studies on current topics are independently worked on in groups, and then presented and discussed in the plenum • company visits and/or guest lectures (where appropriate)
Assessment methods:	• 15-20 pages, individual and handwritten teaching/learning portfolio is a prerequisite for the examination (is graded as passed/failed) • written examination of 60 minutes (100%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	For the active participation in the course, previous knowledge according to the recommended course of studies as well as interest in logistical issues are helpful. Regular preparation and follow-up based on the textbook and your own notes is necessary.
Recommended literature:	textbook / guide of the course and examination and the following literature: • Pfohl, H.-Chr.: Logistiksysteme. Betriebswirtschaftliche Grundlagen. 9th newly edited and updated edition, Springer Verlag, Berlin and others, 2018. Supplementary: • Schulte, Chr.: Logistik. Wege zur Optimierung der Supply Chain. 7th revised and expanded edition, Vahlen Verlag, Munich, 2017. • Large, R.: Logistikfunktionen. Betriebswirtschaftliche Logistik, vol. 1, Oldenbourg Verlag, Stuttgart, 2012. • Gleissner, H. / Femerling, C.: Logistik. Grundlagen, Übungen, Fallbeispiele, 2nd edition, Gabler Verlag, Wiesbaden, 2012. • Eßig, M. / Hofmann, E. / Stölzle, W.: Supply Chain Management, 2nd edition, Vahlen Verlag, Munich, 2022. • Freichel, S: Organisation von Logistikservice-Netzwerken. Berlin 1993.
Use of the module in other programs:	…
Particularities:	…
Latest update:	02/2022

6.20 Fundamentals of Production Planning and Controlling

Module number:	2030
Module title in German:	Grundlagen Produktionsplanung und- steuerung
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	3rd semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. Helmut Abels
Lecturer(s):	Prof. Dr.-Ing. Helmut Abels Prof. Dr. Franz Josef Weiper
Learning outcome:	The students • can implement the basic objectives of production planning and control (PPC) as well as the basic procedure for order processing in production companies, • recognize the core tasks of PPC and are able to apply the methods used for it, • have first experiences in handling the basic functions of a PPC system of a well-known PPC provider [in accordance with taxonomy level 3].
Module contents:	• challenges and goals of the PPC • core tasks of PPC at a glance • individual tasks of data management in the PPC • individual tasks of production program planning, production requirements planning and in-house production planning and control Practical training: • introduction to the navigation of a PPC system • managing material master and bill of material • managing work plan • planning of production and procurement quantities • processing a sales order • processing a production order
Teaching and learning methods:	on-site teaching (lecture), learning in small groups (exercises), independent practical work in small groups with preparation of an examination report, technical discussion (individual), blended learning
Assessment methods:	written examination (90 minutes, 100%) Successful participation in the practical training is a prerequisite for the examination.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	80 h
Individual preparation and follow up:	70 h
Recommended prerequisites:	fundamental knowledge from the lectures Mathematics and Industrial Business Administration
Recommended literature:	• Wiendahl: Betriebsorganisation für Ingenieure, 2015. • Schuh, G./Stich, V.: Produktionsplanung und -steuerung, Grundlagen der PPS, 1st edition, 2016. • REFA (ed.): Methodenlehre der Betriebsorganisation. Planung und Steuerung Teil 1-3. Günther/Tempelmeier: Produktion und Logistik, 2016. Further literature will be communicated during the course.

Use of the module in other programs:	This module is also offered in the B. Sc. Logistics.
Particularities:	…
Latest update:	02/2020

6.21 Human Resources

Module number:	3026
Module title in German:	Human Resources (Personalmanagement)
Type of module:	elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr. rer. pol. Therese Mahr-Lethen
Lecturer(s):	Prof. Dr. rer. pol. Therese Mahr-Lethen
Learning outcome:	The students • recognize the importance of PMS for the automotive engineering and supplier industry (practical examples and practical presentations), • can apply the learned and trained elements of the PMS in a modified way to specific problems, • apply the classical modules of the PMS to the transfer of work 4.0. • prepare a presentation in group work teams and present it as part of the exercise, [in accordance with taxonomy level 6].
Module contents:	• basics of Human Resources (PMS) • staff activation, recruitment, development and promotion • remuneration models and systems • management strategies, principles and systems • motivation models; qualification profiles • work 4.0 • guidelines
Teaching and learning methods:	• on-site teaching: lecture, exercise, teamwork, presentation(s) • theory: learning in small groups ("whisper conferences") • practical application(s)
Assessment methods:	• presentation of seminar paper • written examination (60 minutes)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	78 h
Individual preparation and follow up:	72 h
Recommended prerequisites:	basic knowledge of Industrial Business Administration, Information Technology and Business Management
Recommended literature:	online platform ILIAS, script, further literature will be announced and published during the course, Federal Ministry of Labour and Social Affairs: work 4.0
Use of the module in other programs:	…
Particularities:	…
Latest update:	02/2020

6.22 Industrial Business Administration

Module number:	2010
Module title in German:	Industriebetriebswirtschaftslehre
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	1st semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr. rer. pol. Therese Mahr-Lethen
Lecturer(s):	Prof. Dr. rer. pol. Therese Mahr-Lethen
Learning outcome:	The students • can analyze and evaluate industrial companies, • can work together in teams, • can increase their professional, methodological and social skills [in accordance with taxonomy level 5].
Module contents:	• corporate governance • mission statement • human resources management • material management/logistics • financial management • production management • procurement management • quality management • sales management • environmental management • scientific/academic work • case study processing
Teaching and learning methods:	on-site teaching (lecture), case study processing, group work
Assessment methods:	• written examination (90 minutes, 50% of the grade) • case study in groups (50% of the grade)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	48 h
Individual preparation and follow up:	102 h
Recommended prerequisites:	
Recommended literature:	• Nolden, R.-G./Körner, P./Bizer, E.: Industriebetriebslehre. Management betrieblicher Prozesse, 14th edition, Bildungsverlag Eins, 2012. Further literature will be communicated during the course.
Use of the module in other programs:	…
Particularities:	…
Latest update:	02/2020

6.23 Information Technology

Module number:	2510
Module title in German:	Informationstechnologie (IT)
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	1st semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. T. Tiltmann
Lecturer(s):	Prof. T. Tiltmann / Dipl.-Ing. C. Pack
Learning outcome:	The students • become familiar with syntax elements of a programming language for the representation of sequences, branching, repetition, modularization, learn to present requirements (flow descriptions, data concepts) with the help of • the C++ programming language and a microcontroller, of UML activity diagrams, as well as simple and complex data types in order to later • learn algorithmic thinking to be able to understand processes in production, analyze and design processes in production engineering [in accordance with taxonomy level 5].
Module contents:	Information technology is comprehensively included in all production business processes and its scope and influence on production continues to increase significantly. Therefore, it is important for future industrial engineers to master the basics of information technology, especially algorithmic thinking. Content: data types, variables, syntax programming language C++ (without OOP and other higher concepts); basic functions Arduino controller, AD converter, PWM, use of inputs and outputs with sensors and actuators, modeling and creating complex data types, operators, sequences, loops, branches, functions
Teaching and learning methods:	• on-site teaching • exercise • individual project
Assessment methods:	Project: The successful participation in the project is a prerequisite for the examination. Examination: 90 minutes (in the part on "programming technique" of the examination, at least 50% of the points must be achieved to pass)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	knowledge from middle school physics and intrinsic motivation
Recommended literature:	• Helmut Erlenkötter: Programmieren von Anfang an • Erik Bartmann: Die elektronische Welt mit Arduino entdecken • Maik Schmidt: Arduino - Ein schneller Einstieg in die Microcontroller-Entwicklung • Simon Monk: Programming Arduino Getting Started with Sketches

	• and any standard C/C++ literature... Further literature: • Simon Monk: Programming Arduino Next Steps: Going Further with Sketches • Günter Spanner: Arduino - Schaltungsprojekte für Profis • Helmut Balzert: Lehrbuch der Software-Technik • Stefan Zörner: Software-Architekturen dokumentieren und kommunizieren • Chris Rupp: Requirements-Engineering und -Management
Use of the module in other programs:	…
Particularities:	…
Latest update:	09/2020

6.24 Mathematics for Engineers I

Module number:	1010
Module title in German:	Mathematics for Engineers I
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	1st semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr. rer. nat. Margot Ruschitzka
Lecturer(s):	Fabian Richter M. Sc.
Learning outcome:	The students • have the basic knowledge of mathematics required for their further education and their future work as engineers, • master traditional contents of business and engineering mathematics (also regarding other courses), • can independently develop and use mathematical methods from given literature, • recognize mathematics as the basis for rational, scientific and technical thinking by means of abstract conceptualization and logical deductions, • are able to work on vectorgebraic tasks, • can distinguish and solve different types of equations, • can form derivatives and integrals by • knowing and applying the relevant relationships and formulas, • carrying out the relevant forming steps, • recognizing and applying the appropriate procedures in order to later • comprehend and solve geometrical and physical tasks of the engineering profession, • work on equations in the relevant fundamental courses, • master elementary craft in all engineering disciplines [in accordance with taxonomy level 4].
Module contents:	• propositional logic, number systems, elementary arithmetic, combinatorics • geometric vector calculation, linear systems of equations • convergence and continuity, elementary functions • differentiability • integrals and integration techniques • applications of differential and integral calculus
Teaching and learning methods:	on-site teaching, learning in small groups
Assessment methods:	written examination (60 minutes, 100%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	80 h
Individual preparation and follow up:	70 h
Recommended prerequisites:	…

Recommended literature:	• Papula, L.: Mathematik für Ingenieure, Vieweg Verlag. Stingl, P.: Mathematik für Fachhochschulen, Hanser Verlag. • Nollau, V.: Mathematik für Wirtschaftswissenschaftler, Teubner Verlag. Meyberg, K./Vachenauer, P.: Höhere Mathematik 1 und 2, Springer.
Use of the module in other programs:	This module is also offered in the program B. Eng. Automotive Engineering.
Particularities:	…
Latest update:	09/2020

6.25 Mathematics for Engineers II

Module number:	1020
Module title in German:	Ingenieurmathematik II
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	2nd semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr. rer. nat. Margot Ruschitzka
Lecturer(s):	Fabian Richter, M. Sc.
Learning outcome:	The students • have the basic knowledge of mathematics required for their further education and their future work as engineers, • master traditional contents of business and engineering mathematics (also regarding other courses), • can independently develop and use mathematical methods from given literature, • recognize mathematics as the basis for rational, scientific and technical thinking by means of abstract conceptualization and logical deductions, • can handle complex numbers with confidence, • can develop sequences into series and check their convergence properties, as well as develop advanced models of Taylor and Fourier series from them, • can work on tasks of linear algebra by • knowing and applying the basic modes of representation and arithmetic operations, • knowing and understanding the relevant criteria and derivations, • knowing the relevant terms and operations in order to later • have necessary basic knowledge for other relevant engineering courses, • be able to model different system behaviors, • have a firm command of elementary basic knowledge in other engineering areas [in accordance with taxonomy level 4].
‚Module contents:	• infinite series, convergence and divergence • power series • Taylor series, Maclaurin series • Fourier series • complex numbers, representation of oscillations, frequency response • linear algebra, determinants, Cramer's rule, Laplace's development theorem, linear systems of equations, eigenvalue problems <u>Practical training:</u> • syntax and command set of computer algebra program (MAPLE) • simple programming tasks (procedures, loops and branches) in the computer algebra program
Teaching and learning methods:	on-site teaching, learning in small groups, individual independent project work, technical discussion about the practical training
Assessment methods:	written examination (60 minutes, 100%) Successful participation in the practical training is a prerequisite for the examination.
Workload (30 h ≙ 1 ECTS credit) :	150 h

Contact hours:	80 h
Individual preparation and follow up:	70 h
Recommended prerequisites:	Basic knowledge of the lecture Mathematics I.
Recommended literature:	• Papula, L.: Mathematik für Ingenieure, Vieweg Verlag. Stingl, P.: Mathematik für Fachhochschulen, Hanser Verlag. • Meyberg, K./Vachenauer, P.: Höhere Mathematik 1 und 2, Springer.
Use of the module in other programs:	This module is also offered in the program B. Eng. Automotive Engineering.
Particularities:	…
Latest update:	09/2020

6.26 Mathematics for Engineers III

Module number:	1214
Module title in German:	Ingenieurmathematik III
Type of module:	elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	5th semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr. rer. nat. Margot Ruschitzka
Lecturer(s):	Prof. Dr. rer. Nat. Margot Ruschitzka
Learning outcome:	The students • reproduce and apply the basic mathematical methods and procedures generally used in the engineering sciences, • recognize the application relevance of the presented methods and procedures with examples, • independently develop mathematical methods from given literature, • formulate mathematical models with the help of higher mathematics, • derive and integrate multivariable functions; solve differential equations, • transform systems by • safely distinguishing and converting between different coordinate systems, • distinguishing type, cases and procedures, • mastering the relevant integral transformations and their properties and specific methods in order to later • calculate complex bodies and their physical and mechanical properties, • solve systems of DGLs, • digitally model and simulate complex systems [in accordance with taxonomy level 6].
Module contents:	• multiple integrals without substitution • ordinary differential equations • time invariant differential equations of 1st and 2nd order • DGL systems • integral transformation according to Fourier • integral transformation according to Laplace
Teaching and learning methods:	on-site teaching (embedded exercises), learning in small groups
Assessment methods:	written examination (60 minutes, 100%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	Basic knowledge of the lectures Mathematics I and II.
Recommended literature:	• Stingl, P.: Mathematik für Fachhochschulen, Hanser Verlag. Meyberg, K./Vachenauer, P.: Höhere Mathematik 1 und 2, Springer. • L. Papula: Mathematik für Ingenieure, vol.2, Vieweg.

	• Th. Rießinger: Mathematik für Ingenieure, Springer.
Use of the module in other programs:	…
Particularities:	…
Latest update:	09/2020

6.27 Interdisciplinary Project Week

Module number:	2582
Module title in German:	Interdisziplinäre Projektwoche
Type of module:	obligatory module
ECTS credits:	1
Language:	German
Duration of the module:	usually one week
Recommended semester:	5th semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr. rer. nat. Kathrin Hesse
Lecturer(s):	Lecturers of the participating faculties of TH Köln.
Learning outcome:	The students • can reflect on their independently organized, interdisciplinary collaboration and develop cross-disciplinary project ideas and concepts by • determining requirements and basic rules for successful interdisciplinary cooperation, • reflecting on the requirements and challenges arising in the work process in daily discussions with the tutor*in preparation for the project conclusion, • finally presenting and discussing their group work and learning process based on a self-chosen form of presentation using given guiding questions in order to later • be able to act and make decisions in heterogeneous teams in future professional contexts, to use their understanding of the technical language, methods and ways of thinking of other disciplines and to communicate constructively beyond the boundaries of their own discipline and to work together [in accordance with taxonomy level 6].
Module contents:	• independent development of a project concept in an interdisciplinary team • processing of a predefined problem • go through the idea generation process • interdisciplinary consensus building • development of a product idea • preparation of a project proposal • presentation of the project concept • reflection on the progression of the project and the team process The problem definition is formulated jointly by the lecturers involved across faculties. This is based on the theme of the current Science Year. The module can also be conducted in English.
Teaching and learning methods:	project-based learning in group work, teaching talks (continuous supervision by lecturers and support by tutors), plenary discussion, presentations from representatives of the industry
Assessment methods:	opening and closing lecture for which attendance is compulsory, reflection conversation, project documentation (project application)
Workload (30 h ≙ 1 ECTS credit) :	30 h
Contact hours:	30 h
Individual preparation and follow up:	…
Recommended prerequisites:	…

Recommended literature:	• Kummer, S./Jammernegg, W./Green, O.: Grundzüge der Beschaffung, Produktion und Logistik. 3rd edition, Pearson Studium, 2013 • Werner, H.: Supply Chain Management: Grundlagen, Strategien, Instrumente und Controlling. 5th edition, Springer Gabler, 2013 • Jakoby, W.: Projektmanagement für Ingenieure: Ein praxisnahes Lehrbuch für den systematischen Projekterfolg. 3rd edition, Springer Vieweg, 2015 • Kerzner, H.: Project Management: A Systems Approach to Planning, Scheduling, and Controlling. 11th edition, John Wiley & Sons, 2013 • Blanchard, K./Randolph, A./Grazier, P.: Go Team!: Teamarbeit auf höchstem Niveau. Gabal, 2010 Further literature will be communicated during the course.
Use of the module in other programs:	…
Particularities:	only credit points, no grading
Latest update:	02/2020

6.28 Design Theory I

Module number:	1050
Module title in German:	Konstruktionslehre I
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	1st semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. Alexander Stekolschik
Lecturer(s):	Prof. Dr.-Ing. Alexander Stekolschik
Learning outcome:	The students can • apply methods of design theory, • apply a 3D-CAD system, • prepare the implementation of the design suitable for production by being able to • analyzing and explaining the development of technical products, • creating, interpreting and analyzing a technical drawing, • identifying requirements, • determining technical functions and relate the functions, • designing the 3D CAD model structure and model 3D assemblies, • being able to analyze and evaluate inaccuracies (tolerances) of a design and calculate them in order to later • be able to learn methods of production and logistics, • implement simple designs in the CAD system, • enable the production [in accordance with taxonomy level 5].
Module contents:	Students acquire the basic knowledge of design theory, standardization, technical drawing (manual and CAD) and tolerance theory required for their further education and future work as engineers. Special attention is paid to the teaching of function-oriented design theory to enable the analysis of more complex tasks in production. The basics of the over-arching technical product life cycle are taught and serve as a basis for other topics.
Teaching and learning methods:	lecture, exercise, CAD practical course, project, online teaching units
Assessment methods:	written examination, partly multiple or single choice questions (90 minutes, 100%) CAD training and project as prerequisites for examination
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	75 h
Individual preparation and follow up:	75 h
Recommended prerequisites:	…
Recommended literature:	• Labisch, S./Weber, C.: Technisches Zeichnen, Vieweg. • Hoischen, H.: Technisches Zeichnen, Cornelsen.
Use of the module in other programs:	…

Particularities:	…
Latest update:	09/2020

6.29 Design Theory II

Module number:	1226
Module title in German:	Konstruktionslehre II
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr.-Ing. Alexander Stekolschik
Lecturer(s):	Prof. Dr.-Ing. Alexander Stekolschik
Learning outcome:	The students • carry out product design in line with production and cost requirements by being able to • learning the fundamentals of design methodology, • identifying and analyzing product requirements, • determining and evaluating product functions, • estimating, determining and optimizing product costs in order to later • plan new developments, execute and optimize them and evaluate constructions independently [in accordance with taxonomy level 6].
Module contents:	Function and project-oriented design theory: • basics of the construction methodology • cost recognition and optimization in the construction • construction with constructive system modules • quality assurance in construction • lightweight construction and bionics methods for carrying out construction projects, scientific research
Teaching and learning methods:	project teaching, group work
Assessment methods:	project report (50%) and presentation (50%) Successful participation in the project as admission requirement for the examination.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	60 h
Individual preparation and follow up:	90 h
Recommended prerequisites:	passed examination in Design Theory I (compulsory)
Recommended literature:	Further literature will be announced depending on the project topic.
Use of the module in other programs:	…
Particularities:	…
Latest update:	09/2020

6.30 Logistics IT and ERP Systems

Module number:	3210
Module title in German:	Logistik IT und ERP Systeme
Type of module:	required elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr. Franz Josef Weiper
Lecturer(s):	Prof. Dr. Franz Josef Weiper
Learning outcome:	The students • analyze, describe and develop requirements and processes of modern logistics IT systems (warehouse, production, procurement, distribution, transport, etc.) by • learning the basic concepts of IT (development, data management, modeling, data exchange, architecture, portals) and logistics IT systems such as ERP, WMS, TMS, SCM), as well as practically applying selected processes (such as master data, CRM, order management, procurement, production, warehousing) in order to later • incorporate and design new logistics IT processes [in accordance with taxonomy level 6].
Module contents:	• IT basics (development, data management, data exchange, architecture, portals) • IT requirements due to different tasks from different logistics areas (distributed, networked, mobile, transparent, integrated ...) • basics of logistics IT systems (ERP, WMS, TMS, SCM) • selected logistics IT processes (such as route planning, optimization problems, key figure systems) Practical training: • various tutorials/seminars (e.g. HTML, SQL, BPMN) • practical exercises on modern logistics IT systems (ERP, WMS, TMS, SCM)
Teaching and learning methods:	on-site and seminar teaching and practical exercises
Assessment methods:	The module is evaluated based on two partial performances: • documentation of learning progress in the form of a portfolio of exercises (50%) • elaboration and presentation of an application-oriented group project, including questions (50%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	Basic knowledge of the lecture Information Technology.
Recommended literature:	• A lecture script will be made available successively after the individual courses. • Abts D./Mülder, W.: Grundkurs Wirtschaftsinformatik. Eine kompakte und praxis-orientierte Einführung, 8th edition, Springer Vieweg, 2013.

	• Ten Hompel, M.: IT in der Logistik 2013/2014. Marktübersicht & Funktionsumfang, Fraunhofer Verlag, 2013. • Weilkiens, T. and others: Basiswissen Geschäftsprozessmanagement, 2nd edition, dpunkt.verlag, 2015. • Hausladen, I.: IT-gestützte Logistik. Systeme - Prozesse - Anwendungen, 2nd edition, Gabler Verlag, 2014. Further literature recommendations will be communicated during the course.
Use of the module in other programs:	This module is also offered in the B. Sc. Logistics.
Particularities:	…
Latest update:	09/2020

6.31 Moderation and Negotiation Skills

Module number:	2620
Module title in German:	Moderation und Verhandlungsführung (provided by “Kompetenzwerkstatt” (competence workshop))
Type of module:	obligatory module Soft Skills
ECTS credits:	3
Language:	German
Duration of the module:	…
Recommended semester:	7th semester
Frequency:	…
Module responsible:	Prof. Dr.-Ing. Christoph S. Zoller
Lecturer(s):	....
Learning outcome:	The students • know the basics of general communication psychology, • know convincing argumentation structures and can apply them, • know essential principles for negotiations and can take them into account, • can prepare negotiations methodically, • know phases of a negotiation and can evaluate and select options for steering the conversation, • can argue and negotiate convincingly [in accordance with taxonomy level 5].
Module contents:	basics of general communication psychology, Harvard concept of negotiation, fair and unfair means of negotiation, argumentation structures (five-sentence structural model, etc.), methodical preparation and conversation skills
Teaching and learning methods:	seminar with exercises and role plays, individual and group work, reflection and feedback
Assessment methods:	40% oral participation, including the role plays performed 60% seminar paper (or test)
Workload (30 h ≙ 1 ECTS credit) :	90 h
Contact hours:	32 h
Individual preparation and follow up:	58 h
Recommended prerequisites:	…
Recommended literature:	• Fisher, R./Ury, W./Patton, B.: Das Harvard-Konzept, Campus Verlag 2009. • Birkenbihl, V.: Rhetorik. Redetraining für jeden Anlass. Besser reden, verhandeln, diskutieren, Ariston, 2010. • Schulz von Thun, F.: Miteinander Reden, Rowohlt, 2010. • Watzlawik, P./Beavin, J./Jackson, D.: Menschliche Kommunikation, Verlag Hans Huber, 2011.
Use of the module in other programs:	…
Particularities:	only credit points, no grading, module is offered by the competence workshop
Latest update:	02/2020

6.32 Optimization and Mathematical Modeling

Module number:	3014
Module title in German:	Optimierung und mathematische Modellbildung (OMM)
Type of module:	elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr. rer. nat. habil. Rainer Lenz
Lecturer(s):	Prof. Dr. rer. nat. habil. Rainer Lenz
Learning outcome:	The students • solve specialized problems in the field of optimization (also in a team) by • adapting suitable mathematical optimization models to a specific problem and selecting efficient solution methods in order to later • be able to solve complex real-world problems (especially in the industry) in a reasonable amount of time [in accordance with taxonomy level 4].
Module contents:	• repetition of basic mathematical knowledge (especially basic transformations in linear spaces, vector analysis) • embedding the optimization problem in the decision theory • formulation and solution of extreme value tasks with and without constraints • nonlinear compensation calculation • convex polyhedron and simplex algorithm, linear optimization • selected combinatorial optimization models relevant for production and logistics • usage of the programming environment R
Teaching and learning methods:	on-site teaching (lecture), learning in small groups (exercises), successful participation in the project is a prerequisite for taking the examination
Assessment methods:	written examination of 90 minutes (75%), presentation during the exercises classes (25%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	knowledge of the contents of the modules Engineering Mathematics I, II and Statistics
Recommended literature:	• Papadimitriou, C.H., Steiglitz, K.: Combinatorial Optimization: Algorithms and Complexity, Dover Books on Computer Science, 2000 • Sachs, M: Wahrscheinlichkeitsrechnung und Statistik, Fachbuch. Leipzig, 2013 • Nickel, S., Stein, o., Waldmann, K-H.: Operations Research, Springer, 2014 • Zimmermann, Hans-Jürgen: Operations Research, Vieweg-Verlag, 2007
Use of the module in other programs:	…
Particularities:	…
Latest update:	09/2020

6.33 Physics I

Module number:	1030
Module title in German:	Physik I
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	2nd semester
Frequency:	once a year in the summer semester
Module responsible:	Dr. Mohamed Ait Tahar
Lecturer(s):	Dr. Mohamed Ait Tahar
Learning outcome:	The students • have in-depth physical knowledge, • can apply scientific methodology and the most important physical principles of technology, • are thus able to apply their theoretical knowledge to practical problems by solving exercises [in accordance with taxonomy level 3].
Module contents:	• physical quantities and units • vector calculus • kinematics of linear motion (application examples: free fall, vertical throwing) • undisturbed superposition of movements (the superposition principle, the horizontal, oblique throw) • kinematics of circular motion • dynamics of linear motion (Newtonian axioms, mechanical forces, inertial forces, D'Alembert's principle) • work, energy and power (mechanical work forms, energy conservation law, power and efficiency) • impact processes (impulse, force impact, conservation of momentum, impact laws) • dynamics of rigid bodies (torque, moment of inertia, Steiner theorem, angular momentum, conservation of angular momentum)
Teaching and learning methods:	on-site teaching (lecture, seminar-based teaching), demonstration experiments, preparation of the exercises as homework
Assessment methods:	written examination (90 minutes, 100%), certificate of attendance for written preparation and active participation in the exercises is a prerequisite for taking the examination
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	48 h
Individual preparation and follow up:	102 h
Recommended prerequisites:	…
Recommended literature:	• Kruisz, C./Hitzenberger, R.: Physik verstehen, UTB • Nanzi, G.: Vorkurs Physik für Ingenieure, UTB • Dobrinski, P./Krakau, G./Vogel, A.: Physik für Ingenieure, Teubner Verlag. Tipler, Paul A.: Physik, Spektrum Akademischer Verlag, Heidelberg. • Lindner, H.: Physik für Ingenieure, Fachbuchverlag Leipzig. Further literature will be communicated during the course.

Use of the module in other programs:	…
Particularities:	…
Latest update:	02/2020

6.34 Physics II

Module number:	1216
Module title in German:	Physik II
Type of module:	elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	5th semester
Frequency:	once a year in the winter semester
Module responsible:	Dr. Mohamed Ait Tahar
Lecturer(s):	Dr. Mohamed Ait Tahar
Learning outcome:	The students • have in-depth physical knowledge, • are able to apply scientific methodology and the most important physical principles of technology, • are thus able to apply their theoretical knowledge to practical problems by solving exercises, • master the basics of physical measurement and are able to carry out, document and evaluate experiments in the physics laboratory, • within the framework of project-oriented practical training, students are also able to document the results of the project experiments in writing and present them in a lecture [in accordance with taxonomy level 4].
Module contents:	• introduction to the calculation of errors • application to the "mathematical pendulum" experiment • gravity • dormant liquids and gases • flowing liquids and gases • selected chapters from thermodynamics • four experiments from the fields of mechanics and thermodynamics with the presentation of results
Teaching and learning methods:	on-site teaching (lecture, seminar-based teaching), demonstration of experiments, preparation of the exercises as homework, conducting own experiments, project-oriented practical training
Assessment methods:	written examination (90 minutes, 100%) Passing the physical practical training is a prerequisite for the written examination.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	fundamental knowledge from the lecture Mechanics
Recommended literature:	• Dobrinski, P./Krakau, G./Vogel, A.: Physik für Ingenieure, Teubner Verlag. Tipler, Paul A.: Physik, Spektrum Akademischer Verlag, Heidelberg. • Lindner, H.: Physik für Ingenieure, Fachbuchverlag Leipzig. • Freund, J.: Spezielle Relativitätstheorie für Studienanfänger, UTB • Walser,H.: Statistik für Naturwissenschaftler, UTB Further literature will be communicated during the lecture.

Use of the module in other programs:	…
Particularities:	…
Latest update:	02/2020

6.35 Internship Semester

Module number:	0942
Module title in German:	Praxissemester
Type of module:	obligatory
ECTS credits:	30
Language:	German
Duration of the module:	…
Recommended semester:	4th semester
Frequency:	…
Module responsible:	Prof. Dr. rer. nat. habil. Rainer Lenz
Lecturer(s):	supervision by all lecturers of the Institute for Production
Learning outcome:	The students • apply the technical knowledge acquired during their studies to concrete tasks in a problem-oriented manner and find solutions by being able to • classifying, (critically) evaluating and processing practical engineering-related and/or commercial/organizational topics in a team in order to later • be able to solve complex tasks in a problem-oriented manner and to document and justify the results in a comprehensible way later in their professional lives [in accordance with taxonomy level 6].
Module contents:	• engineering and commercial organizational activities • content is determined by the respective employer
Teaching and learning methods:	internship in a company
Assessment methods:	20-page internship semester report, moderated workshop before the internship semester
Workload (30 h ≙ 1 ECTS credit) :	900 h
Contact hours:	…
Individual preparation and follow up:	…
Recommended prerequisites:	according to the examination regulations for the Bachelor of Production and Logistics
Recommended literature:	depending on topic
Use of the module in other programs:	…
Particularities:	only credit points, no grading
Latest update:	09/2020

6.36 Production Controlling

Module number:	1124
Module title in German:	Produktionscontrolling
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	3rd semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr. rer. oec. Markus Pütz
Lecturer(s):	Prof. Dr. rer. oec. Markus Pütz
Learning outcome:	The students can • reflect the conceptual understanding of production controlling, • successfully handle typical support tasks of production controlling in the area of cost management, • successfully handle typical support tasks of production controlling for management in the areas of production-related planning, control, coordination and information supply, • describe typical support tasks of production controlling in the areas of Supply Chain Management and Industry 4.0 by • understanding the relevant technical terms, methods and instruments and applying them in an exercise-based manner appropriate to the task at hand and in selected case studies in order to later • be able to successfully fulfill basic tasks and projects of production controlling in company practice [in accordance with taxonomy level 3].
Module contents:	• conceptual basics of production controlling (basic understanding, terms, levels, goals and tasks, organization) • basics of cost accounting and cost management for production controlling • planning and planning instruments (quantitative planning procedures, qualitative planning procedures, simulation) • coordination and coordination instruments (transfer pricing, budgeting, incentive systems) • control and control instruments (benchmarking, deviation analyses) • information supply and information instruments (key figures and key figure systems, reporting • production controlling in the context of supply chain management and industry 4.0.
Teaching and learning methods:	on-site teaching (lecture), seminar-based teaching, working in small groups for exercises and case studies, technical discussions (individual)
Assessment methods:	examination (90 minutes, 100%), a choice of two alternative options with current references to the course is provided within the amount of 30 credit points
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	80 h
Individual preparation and follow up:	70 h

Recommended prerequisites:	knowledge from the module "Fundamentals of Cost and Investment Calculation”
Recommended literature:	• Steven, Marion: Produktionscontrolling. Stuttgart: Kohlhammer 2016. • Coenenberg, Adolf Georg/Fischer, Thomas M./Günther, Thomas: Kostenrechnung und Kostenanalyse, 9th revised edition, Stuttgart: Schäffer-Poeschel 2016. • Friedl, Gunther/Hofmann, Christian/Pedell, Burkhard: Kostenrechnung, 3rd edition, Munich: Vahlen, 2017. • Troßmann, Ernst/Baumeister, Alexander: Internes Rechnungswesen: Kostenrechnung als Standardinstrument im Controlling. Munich: Vahlen 2015. • Corsten, Hans/Friedl, Birgit: Einführung in das Produktionscontrolling, Munich: Vahlen 1999. • Gottmann, Juliane: Produktionscontrolling: Wertströme und Kosten optimieren, Wiesbaden: Springer Gabler 2016. • Hoitsch, Hans-Jörg: Produktionswirtschaft: Grundlagen einer industriellen Betriebswirtschaftslehre, 2nd edition, Munich: Vahlen 1993. • Horváth, Péter/Gleich, Ronald/ Seiter, Mischa: Controlling, 14th edition, Munich: Vahlen 2020. • Kaplan, Robert S. Norton, David P: Balanced Scorecard. Strategien erfolgreich umsetzen, Stuttgart: Schäffer Poeschel 1997. • Küpper, Hans-Ulrich; Friedl, Gunther; Hofmann, Christian; Hofmann, Yvette; Pedell, Burkhard: Controlling: Konzeption, Aufgaben, Instrumente. 6th edition, Stuttgart: Schäffer Poeschel 2013. • Reichmann, Thomas/Kißler, Martin/Baumöl, Ulrike: Controlling mit Kennzahlen: Die systemgestützte Controlling-Konzeption, 9th edition, Munich: Vahlen 2017. • Weber, Jürgen/Wallenburg, Carl Marcus: Logistik- und Supply Chain Controlling. 6th edition, Stuttgart: Schäffer Poeschel 2010. • Werner, Hartmut: Kompaktedition: Supply Chain Controlling: Grundlagen, Performance-Messung und Handlungsempfehlungen. Wiesbaden: Springer Gabler 2014. • Wildemann, Horst: Produktionscontrolling, 4th edition, Munich: TCW 2002. • Zäpfel, Günter/Piekarz, Bartosz: Supply Chain Controlling: Interaktive und dynamische Regelung der Material- und Warenflüsse. Wien: Ueberreuter 1996. Further literature will be communicated during the course.
Use of the module in other programs:	…
Particularities:	…
Latest update:	08/2021

6.37 Production Logistics

Module number:	3320
Module title in German:	Produktionslogistik
Type of module:	required elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	5th semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. Christoph S. Zoller
Lecturer(s):	Prof. Dr.-Ing. Christoph S. Zoller
Learning outcome:	The students • analyze, design and optimize technical information and material flow systems in production by • applying selected methods from lean production as well as current IT-supported material flow simulation in order to later • be able to successfully initiate or accompany optimization measures of storage, transport and handling processes within production logistics in their future professional daily routine [in accordance with taxonomy level 5].
Module contents:	• basic elements of information and material flow systems • technical material flow models • lean management methods within production logistics • procedures for planning, management and control of internal transport, handling and storage processes • development, evaluation and optimization of simulation models for the illustration of logistic processes within production, using event-oriented standard simulation software
Teaching and learning methods:	lecture, exercise, voluntary practical training
Assessment methods:	The grade of the module consists of 5 equally weighted tests with, among others, multiple or single choice questions.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	as regards content: none
Recommended literature:	A slide script is handed out during the lecture. • Günthner, W.A./Boppert, J: Lean Logistics, Berlin/Heidelberg, Springer-Verlag, 2013. • Eley, M.: Simulation in der Logistik, Berlin/Heidelberg, Springer-Verlag, 2012. • Günthner, W. A./et.al.: Schlanke Logistikprozesse, Berlin/Heidelberg, Springer-Verlag, 2013. • Erlach, K.: Wertstromdesign. Der Weg zur schlanken Fabrik, Berlin/Heidelberg, Springer-Verlag, 2010.

	• Arnold, D./Furmans K.: Materialfluss in Logistiksystemen, 6th edition, Berlin/Heidelberg, Springer-Verlag, 2009. Further literature recommendations will be communicated during the course.
Use of the module in other programs:	This module is also offered in the B. Sc. Logistics.
Particularities:	…
Latest update:	09/2020Further

6.38 Production Planning and Controlling

Module number:	1232
Module title in German:	Production Planning and Controlling
Type of module:	required elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr.-Ing. Helmut Abels
Lecturer(s):	Prof. Dr.-Ing. Helmut Abels
Learning outcome:	The students • recognize the potential for optimization in production planning and control (PPC) as well as in the PPC environment, • understand the cross-sectional tasks of PPC and can apply selected methods that are used for this purpose, • can formulate basic tasks and methods of PPC in production networks [in accordance with taxonomy level 5].
Module contents:	• production requirements planning (time management) • in-house production planning and control • alternative strategies for production control (Kanban, BOA, FZ, production leveling, etc.) • design fields in the PPC environment (Kaizen process, introduction of lean management, production systems, etc.) • recognizing optimization potentials of PPC (lean production & Kaizen, value stream design, optional business game) • new tasks and methods of PPS in production networks (CSUP, CPFR, VMI, etc.)
Teaching and learning methods:	on-site teaching (lecture), learning in small groups (exercises, business game), technical discussion (individual), blended learning
Assessment methods:	written examination (90 minutes, 100%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	80 h
Individual preparation and follow up:	70 h
Recommended prerequisites:	successfully completed module examination in the course Fundamentals of Production Planning
Recommended literature:	• Wiendahl: Betriebsorganisation für Ingenieure, 2015. • Schuh, G./Stich, V.: Produktionsplanung und -steuerung, Grundlagen der PPS, 4th edition, 2016. • Günther/Tempelmeier: Produktion und Logistik, 2016. • Womack/Jones: Lean Thinking. Ballast abwerfen, Unternehmensgewinn steigern, Francfort, 2004. Rother/Shook: Sehen lernen, 2004.
Use of the module in other programs:	…
Particularities:	…

Latest update: 02/2020

6.39 Project I (Interdisciplinary Project)

Module number:	0941
Module title in German:	Projekt I (Interdisziplinäres Projekt)
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	7th semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. Hasan Smajic
Lecturer:	all lecturers of the Institute of Production
Learning outcome:	The students • are able to apply the knowledge acquired during their studies in a problem-oriented manner, • find adequate solutions to new problems and can assess them accordingly, • can work in a team with independent task distribution, time management and their own communication structures, • can act in a targeted and cost-conscious manner, • increase their willingness to take responsibility [in accordance with taxonomy level 6].
Module contents:	selection, processing, documentation and presentation of a project in an industrial context
Teaching and learning methods:	supervision of the work by two supervising lecturers
Assessment methods:	project documentation and presentation
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	…
Individual preparation and follow up:	…
Recommended prerequisites:	fundamental knowledge from the lecture Project Management
Recommended literature:	depending on the project topic • Clamp, H.: Projekte zum Erfolg führen. Projektmanagement systematisch und kompakt, Deutscher Taschenbuchverlag, 2010. • Patzak, G./Rattay, G.: Projektmanagement. Leitfaden zum Management von Projekten, Projektportfolios und projektorientierten Unternehmen, Linde Verlag, 2008. • Litke, H. - D.: Projektmanagement - Methoden, Techniken, Verhaltensweisen, Carl Hanser Verlag, 2007. • A Guide to Project Management Body of Knowledge, 3rd edition, Project Management Institute, 2005. • Fiddler, R.: Controlling von Projekten. Projektplanung, Projektsteuerung und Projektkontrolle, 2nd edition, Brunswick/Wiesbaden 2003. • Preißner: Projekte budgetieren und planen, Berlin/Heidelberg 2003.
Use of the module in other programs:	…
Particularities:	…

Latest update: 02/2020

6.40 Project II (Individual Project)

Module number:	0943
Module title in German:	Projekt II (Individuelles Projekt)
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	7th semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. Hasan Smajic
Lecturer:	all lecturers of the Institute of Production
Learning outcome:	The students • are able to apply the knowledge acquired during their studies in a problem-oriented manner, • find adequate solutions to new problems and can assess them accordingly, • can work in a team with independent task distribution, time management and their own communication structures, • can act in a targeted and cost-conscious manner, • are willing to take responsibility [in accordance with taxonomy level 6].
Module contents:	selection, processing, documentation and presentation of a project in an industrial context
Teaching and learning methods:	supervision of the work by two supervising lecturers
Assessment methods:	project documentation and presentation
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	…
Individual preparation and follow up:	…
Recommended prerequisites:	fundamental knowledge from the lecture Project Management
Recommended literature:	depending on the project topic • Clamp, H.: Projekte zum Erfolg führen. Projektmanagement systematisch und kompakt, Deutscher Taschenbuchverlag, 2010. • Patzak, G./Rattay, G.: Projektmanagement. Leitfaden zum Management von Projekten, Projektportfolios und projektorientierten Unternehmen, Linde Verlag, 2008. • Litke, H. - D.: Projektmanagement - Methoden, Techniken, Verhaltensweisen, Carl Hanser Verlag, 2007. • A Guide to Project Management Body of Knowledge, 3rd edition, Project Management Institute, 2005. • Fiddler, R.: Controlling von Projekten. Projektplanung, Projektsteuerung und Projektkontrolle, 2nd edition, Brunswick/Wiesbaden 2003. • Preißner: Projekte budgetieren und planen, Berlin/Heidelberg 2003.
Use of the module in other programs:	…
Particularities:	…

Latest update: 02/2020

6.41 Project Management I

Module number:	2520
Module title in German:	Projektmanagement I
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	2nd semester
Frequency:	summer semester
Module responsible:	Prof. Dr.-Ing. Christoph S. Zoller
Lecturer(s):	Dr. Alexandra Schreiner
Learning outcome:	The students • know and understand the essential structural features, objectives, activities and functions of agile, classic and hybrid project management at system level through • the conscious and interconnected application of relevant concepts, models and techniques of project management for the planning, implementation, control, monitoring and acceptance of projects for • the systematic processing of real, global problems [in accordance with taxonomy level 3].
Module contents:	• basic concepts, models and techniques of project management • project setup and process organization (dynamics and structure of a project) • agile, hybrid and classic process models • socio-dynamics and leadership in project teams • success factors and risk management in a project • technical-ethical problems in engineering
Teaching and learning methods:	project-based lectures with technical inputs, exercises, case studies, simulations, individual technical discussions and independent project work
Assessment methods:	60% oral examination performance (presentation, individual, 40% written examination performance (project outline, collective) All partial examinations must be passed individually.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	60 h
Individual preparation and follow up:	90 h
Recommended prerequisites:	First Semester Project Week (1082)
Recommended literature:	• Kuster, J.; Bachmann, C. Huber, E.; Hubmann, M.; Lippmann, R.; Schneider, E.; Schneider, P.; Witschi, U.; Wüst, R. (2019): Handbuch Projektmanagement: Agil – Klassisch – Hybrid. Wiesbaden: Springer Gabler, 4th edition. • Timinger, H. (2017): Modernes Projektmanagement. Weinheim: Wiley-VCH. • Stöhler, C. (2016): Projektmanagement im Studium: Vom Projektauftrag bis zur Abschlusspräsentation. Wiesbaden: Springer Gabler, 2nd edition. Further literature will be communicated during the course.
Use of the module in other programs:	...

Particularities:	For capacity reasons, module 2520 can only be taken by students of B. Eng. Production and Logistics.
Latest update:	03/2022

6.42 Project Management II

Module number:	3028
Module title in German:	Projektmanagement II
Type of module:	elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr. rer. nat. Kathrin Hesse
Lecturer(s):	Prof. Dr. rer. nat. Kathrin Hesse
Learning outcome:	The students • successfully develop, prioritize and derive project ideas for research projects by • applying the methods and tools of project management in a research project, • developing control options and checklists for different project phases and using them in a targeted manner, • forming and taking on roles in teams, • planning and conducting the moderation of team meetings in order to later • document and present project results in the form of reports as well as posters, presentations and web conferences [in accordance with taxonomy level 6].
Module contents:	• deepening of the basics of project management • design of research projects • preparation of a project diary • application of creativity techniques • human resources and conflict management • project processing in a team • project presentation
Teaching and learning methods:	on-site teaching: seminar-based teaching (lecture, exercises, seminar with independent presentation), learning in small groups with a self-chosen case study
Assessment methods:	project documentation diary and presentation
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	successful participation in the module Project Management I
Recommended literature:	• Bauer, W.; Bleck-Neuhaus, J.; Dombois, R.; Wehrtmann, I.S.; Forschungsprojekte entwickeln: Von der Idee bis zur Publikation. 2nd edition, Nomos, Taschenbuch, März 2018. • Olfert, K.: Kompakt-Training Projektmanagement, 10th edition, Herne, 2016. • DIN 69901 Projektmanagement, Teil 1 bis 5, 2009, Berlin • Kerzner, H.: Projekt Management, 2nd edition, Heidelberg, 2008. • Jacoby, W.: Projektmanagement f. Ingenieure, 3nd edition, Wiesbaden, 2015. • Jacoby, W.: Intensivtraining Projektmanagement, Wiesbaden, 2015. • Michels, B.: Projektmanagement Handbuch, Selbstverlag, 2015.

Use of the module in other programs:	…
Particularities:	…
Latest update:	02/2020

6.43 Quality Management

Module number:	2060
Module title in German:	Qualitätsmanagement
Type of module:	obligatory module
ECTS credits:	5
Language:	German/English
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the summer semester
Module responsible:	TBD
Lecturer(s):	TBD
Learning outcome:	The students can • implement standard requirements for a quality management system in a familiar working environment, • identify, eliminate and avoid the causes of errors by • identifying requirements, formulating objectives and describing processes on the basis of the defined terms and principles of quality management, • selecting and applying the appropriate data collection, data analysis, and root cause identification methods for the systematic application purpose in order to later • be able to participate in the development of QM systems, • reactively and preventively solve quality problems [in accordance with taxonomy level 5].

Module contents:	• definitions and basic terms of quality management
	• requirements of the quality management standards
	• application of the so-called PDCA (plan-do-check-act) cycle on the levels of
	  ○ businesses in general
	  ○ business processes (e.g. product development, procurement)
	  ○ products
	• methods to support the PDCA cycle
	• advanced quality planning

Teaching and learning methods:	on-site teaching: seminar-based teaching (lecture, exercises, seminar with independent presentation), learning in small groups, company excursion, guest speakers
Assessment methods:	written examination (90 minutes, 100%) In the exercise class extra points can be earned to improve the examination grade.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	basic knowledge from the modules Mathematics, Statistics, Business Organization, Design Theory I and Manufacturing Equipment
Recommended literature:	• Linß: Qualitätsmanagement für Ingenieure, Carl Hanser Verlag, 2011 • DIN Taschenbuch 226: Qualitätsmanagement – QM-Systeme und –Verfahren, Beuth Verlag, 10th edition, 2019 • Theden/Colsman; Qualitätstechniken – Werkzeuge zur Problemlösung und ständigen Verbesserung, 5th edition, Carl Hanser Verlag, 2013

	• VDA/AIAG: FMEA-Handbuch, 1st edition 2019
Use of the module in other programs:	This module is also offered in the B. Sc. Logistics and B. Eng. Automotive Engineering.
Particularities:	…
Latest update:	09/2020

6.44 Statistics

Module number:	1320
Module title in German:	Statistik (STAT)
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	3rd semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr. rer. nat. habil. Rainer Lenz
Lecturer(s):	Prof. Dr. rer. nat. habil. Rainer Lenz
Learning outcome:	The students • can address specific questions using statistical data analysis and perform quantitative analyses with multiple characteristics by • intensively exploring the basic concepts of probability and descriptive statistics and weighing suitable methods against each other in order to later • explain real-life relationships and present them in a way that is both mathematical and understandable to a non-expert [in accordance with taxonomy level 4].
Module contents:	Statistical methodology including the elementary probability theory: • observations, data types, classification of data • histograms, empirical distribution function • measurement series, position and scattering parameters, correlation • various probability terms • discrete and continuous probability distributions • point and interval estimates, test procedures • usage of the programming environment R
Teaching and learning methods:	on-site teaching (lecture), learning in small groups (exercises)
Assessment methods:	written examination (90 minutes, 100%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	successfully completed module examination in Mathematics I (compulsory). In addition, knowledge of the course Mathematics II as well as elementary school knowledge of stochastics is required.
Recommended literature:	• Sachs, M.: Wahrscheinlichkeitsrechnung und Statistik für Ingenieurstudenten an Fachhochschulen, Fachbuchverlag Leipzig, 2013 • Kastner, M.: Statistik, Kiehl Verlag, 2016 • Krengel, U.: Einführung in die Wahrscheinlichkeitstheorie und Statistik, Vieweg, 2007 • Lehn, J., Wegmann, H.: Einführung in die Statistik, 3rd edition, Stuttgart/Leipzig, Teubner-Verlag, 2000.

	• Bronstein, I. N., Semendjajew, K. A.: Taschenbuch der Mathematik, Francfort a. M., Verlag Harri Deutsch, 2016
Use of the module in other programs:	…
Particularities:	
Latest update:	09/2020

6.45 Control Engineering

Module number:	1060
Module title in German:	Steuerungstechnik
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	2nd semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr.-Ing. Hasan Smajic
Lecturer(s):	Prof. Dr.-Ing. Hasan Smajic
Learning outcome:	The students can • model and simulate the control behavior of a machine or system, • create and read the circuit diagram, pneumatic diagram and functional diagram, and explain the characteristics and applications of PLCs and drives. The students can acquire • knowledge of how to build heterogeneous control systems by analyzing the requirements and characteristics of machines and systems and applying the learned functions and function blocks (AND, OR, SR, TP, TON, Move, etc.) to a complete overall solution, • knowledge of means to rationalize industrial production facilities and can use and classify them [in accordance with taxonomy level 3].
Module contents:	• control types and their classification • comparison of control and regulation • mechanical controls • fluidic control systems • electrical contact controls • programmable logic controllers (functional principle and hardware structure, programming according to IEC61131-3) • industrial communication (basics of field buses) • numerical and robot controls • examples of realized control applications
Teaching and learning methods:	mix of methods including lectures and exercises with a high degree of practical relevance, independent work in small groups, technical discussion (individual) and blended learning
Assessment methods:	written examination (90 minutes, 100%) Successful participation in the practical training in the laboratory and active participation in the exercises are prerequisites for the examination.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	80 h
Individual preparation and follow up:	70 h
Recommended prerequisites:	Mathematics I
Recommended literature:	• Pritschow, G.: Einführung in die Steuerungstechnik, Hanser Verlag, 2005. • Schmid, D. and others: Steuern und Regeln für Maschinenbau und Mechatronik, most recent edition, Haan-Gruiten, Europa-Lehrmittel. Further literature will be communicated during the course.

Use of the module in other programs:	…
Particularities:	…
Latest update:	09/2020

6.46 Technical Mechanics I

Module number:	1040
Module title in German:	Technische Mechanik I
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	1st semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. Jochen Blaurock
Lecturer(s):	Prof. Dr.-Ing. Jochen Blaurock
Learning outcome:	The students will be able to calculate static stresses by • calculating with stress vectors and • thus analyze the effect of forces and moments in statically determined force systems, in order to later dimension individual parts, assemblies and entire systems.
Module contents:	• fundamentals • vectors in mechanics • force systems • foci • equilibria • trusses • internal forces • adhesion • virtual work
Teaching and learning methods:	• on-site lecture • learning in small groups • student tutorials
Assessment methods:	written examination (90 minutes, 100%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	75 h
Individual preparation and follow up:	75 h
Recommended prerequisites:	• mathematical knowledge according to the “Fachhochschulreife” (advanced technical college entrance qualification) • three-dimensional imagination
Recommended literature:	Blaurock, Faßbender: Interaktiver Grundkurs Technische Mechanik: Band 1, Carl Hanser Verlag Blaurock, Faßbender: Interaktive Aufgaben Technische Mechanik: Band 1, Carl Hanser Verlag Spura: Technische Mechanik 1 Stereostatik, Springer Verlag Mahnken: Lehrbuch der Technischen Mechanik – Band 1: Starrkörperstatik, Springer-Verlag
Use of the module in other programs:	This module is also offered in the program B. Eng. Vehicle Development.
Particularities:	…

Latest update: 02/2022

6.47 Technical Mechanics II

Module number:	1224
Module title in German:	Technische Mechanik II
Type of module:	elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr.-Ing. Jochen Blaurock
Lecturer(s):	Prof. Dr.-Ing. Jochen Blaurock
Learning outcome:	The students will be able to calculate static stresses by • calculating with stress vectors and • thus analyze the effect of forces and moments in statically determined force systems, in order to later dimension individual parts, assemblies and entire systems.
Module contents:	• principle of cutting, stresses, deformations, law of elasticity (Hooke) • normal force, thrust and torsional stress • beam bending, buckling • form changes, differential equation of the bending line • permissible loads and safety
Teaching and learning methods:	• on-site lecture • exercises in small groups
Assessment methods:	written examination (90 minutes, 100%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	48 h
Individual preparation and follow up:	102 h
Recommended prerequisites:	Basic knowledge from the lecture Technical Mechanics I (Statics).
Recommended literature:	• Spura: Technische Mechanik 2 Elastostatik, Springer Verlag • Mahnken: Lehrbuch der Technischen Mechanik – Band 2: Elastostatik, Springer-Verlag
Use of the module in other programs:	no
Particularities:	none
Latest update:	02/2022

6.48 Forming Technology

Module number:	1230
Module title in German:	Umformtechnik
Type of module:	required elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr.-Ing. Christoph Hartl
Lecturer(s):	Prof. Dr.-Ing. Christoph Hartl
Learning outcome:	The students • select a suitable process for a forming manufacturing task from industrial production, design the process and determine manufacturing sequences taking into account the factors of cost, time and quality by • deriving the imparted knowledge on the technical process possibilities and the calculation and simulation possibilities based on the fundamentals of plastomechanics in order to later • be able to decide on economically viable forming processes in areas of employment such as product development, production or production planning, to design these together with upstream and downstream manufacturing steps, and to specify required machine systems for process execution [in accordance with taxonomy level 5].
Module contents:	application-relevant fundamentals of forming technology for metallic materials: process overview and characteristics, process, tool and machine design Practical training: • forming limit analysis on the practical part • simulation of forming processes with the FEM
Teaching and learning methods:	on-site teaching (lecture) with digital provision of learning material via intranet-based learning platform; guided approach to solving problems for practical calculation examples
Assessment methods:	written examination (120 minutes, 100%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	96 h
Individual preparation and follow up:	54 h
Recommended prerequisites:	basic knowledge from the modules Materials Science, Technical Mechanics, Physics, Mathematics and Manufacturing Processes
Recommended literature:	• Fritz, A. H.; Schulze, G.: Fertigungstechnik, Springer Vieweg Verlag, 2018. • Hoffmann, H.: Neugebauer, R.; Spur, G.: Handbuch Umformen. Carl Hanser Verlag, München, 2012. • Doege, E.; Behrens, B.-A.: Handbuch Umformtechnik, Springer Verlag, Berlin, Heidelberg, 2010. Further literature will be communicated in the lectures according to the subject matter.

Use of the module in other programs:	…
Particularities:	…
Latest update:	02/2022

6.49 Corporate Governance

Module number:	2040
Module title in German:	Unternehmensführung
Type of module:	elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the summer semester
Module responsible:	Prof. Dr. rer. oec. Markus Pütz
Lecturer(s):	Prof. Dr. rer. oec. Markus Pütz
Learning outcome:	The students can • identify the relevant reference groups of companies and analyze their importance for the management of a reference company, • carry out strategic environmental and corporate analyses for the purpose of determining and shaping strategy, • analyze basic forms of organizations and corporate cultures, • analyze elementary leadership techniques and staff management tasks, • in typical application examples, • analyze essential components of strategic controlling in the context of selected examples of corporate management by • understanding the relevant technical terms, principles, concepts, procedures and instruments and applying them appropriately and in a solution-oriented manner to exercises and selected case studies, as well as successfully analyzing typical business management tasks in order to later • be able to analyze fundamental tasks and projects of corporate management in business practice in a manner appropriate to the company's objectives and to successfully fulfill them or at least to effectively support the fulfillment of these objectives [in accordance with taxonomy level 4].
Module contents:	• fundamentals of corporate management (concept and purpose of corporate management, theories of corporate management, reference groups of companies, corporate constitution and corporate governance, business ethics) • strategic planning and control (basics of corporate strategy, strategic analysis, strategy definition, strategy implementation and strategic control) • organization, organizational design and organizational dynamics (concept and dimensions of organization, organizational differentiation, organizational integration, influencing variables of organizational design, corporate culture, organizational development) • personnel and leadership (behavior of individuals and groups, leadership theories, leadership style concepts and leadership techniques, basic aspects of personnel management) • basic aspects of strategic controlling (concept, classification, goal-setting and tasks of strategic controlling and related techniques at a glance)
Teaching and learning methods:	on-site teaching (lecture), seminar-based teaching, working in small groups for exercises and case studies, technical discussions (individual) The small groups will be formed after announcement in the first on-site lecture by “lottery” in the first two exercises.

Assessment methods:	examination (90 minutes, 100%), a choice of two alternative options with current references to the course is given within the amount of 30 credit points A successful participation in work carried out in small groups of students (presentation, recording and/or discussion contributions) in the exercises will count as extra points in the overall result of the examination with a maximum of 10% of the total number of points.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	64 h
Individual preparation and follow up:	86 h
Recommended prerequisites:	knowledge from the modules Business Organization, Controlling and Industrial Business Administration
Recommended literature:	• Bergmann, Rainer/Bungert, Michael: Strategische Unternehmensführung: Perspektiven, Konzepte, Strategien, 2nd edition, Berlin – Heidelberg: Springer Gabler 2012. • Hungenberg, Harald: Strategisches Management in Unternehmen: Ziele – Prozesse – Verfahren, 8th edition, Wiesbaden: Springer Gabler 2014. • Hungenberg, Harald/Wulf, Torsten: Einführung für Bachelorstudierende, 5th edition, Berlin – Heidelberg: Springer Gabler 2015. • Macharzina, Klaus/Wolf, Joachim: Unternehmensführung: Das internationale Managementwissen Konzepte – Methoden – Praxis, 10th edition, Wiesbaden: Springer Gabler 2018. • Schreyögg, Georg/Steinmann, Horst: Management. Grundlagen der Unternehmensführung Konzepte – Funktionen – Fallstudien, 8th edition, Wiesbaden: Springer Gabler 2020. • Stähle, Wolfgang H.: Management, 8th edition, Munich: Vahlen 1999. Further literature will be communicated during the course.
Use of the module in other programs:	…
Particularities:	A successful participation in the work carried out in small groups of students (presentation, recording and/or discussion contributions) in the exercises will count as extra points in the overall result of the examination with a maximum of 10% of the total number of points.
Latest update:	08/2021

6.50 Materials Science I

Module number:	1210
Module title in German:	Werkstoffkunde I
Type of module:	obligatory module
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	3rd semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. Peter Krug
Lecturer(s):	Prof. Dr.-Ing. Peter Krug
Learning outcome:	The students • can describe the structure of metals and the essential mechanisms and properties in crystal lattices and explain how conditions and processes at the atomic level determine the macroscopic properties of materials in order to select a suitable material and material state from a limited number of materials for a given design. • can interpret state diagrams and explain the microstructural processes during forming and heat treatment in order to identify the most suitable process from a selection of heat treatment processes for a given application. • know the most important technological material testing methods, can apply them and interpret the test results appropriately in order to quantify significant parameters for a given constructive design. (corresponds to taxonomy level 5)
Module contents:	fundamentals of atomic structure and materials science, bonding types and crystal structure, material transport (diffusion), elastic behavior, plasticity, hardening mechanisms, phase diagrams, material groups, heat treatment, material testing methods, manufacturing processes
Teaching and learning methods:	on-site teaching (lecture), exercises and tutorials for independent application of the lecture material, experimental practical courses, demonstration tests, individual technical discussions
Assessment methods:	written exam online or on-site (admission requirement for the written exam is that both intermediate tests offered are passed (with at least 30%) and that at least 50% of the points are achieved on average over both intermediate tests.
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	45 h
Individual preparation and follow up:	105 h
Recommended prerequisites:	good knowledge in chemistry, physics; mathematics, spatial imagination
Recommended literature:	• Läpple; „Wärmebehandlung des Stahls“; Europa-Lehrmittel • E. Macherauch / H.-W. Zoch: „Praktikum in Werkstoffkunde“, Vieweg Teubner Verlag • M. F. Ashby; D. R. H. Jones; „Werkstoffe 1“; Spektrum Akademischer Verlag • M. F. Ashby; D. R. H. Jones; „Werkstoffe 2“, Spektrum Akademischer Verlag in English: • M. F. Ashby; D. R. H. Jones; „Engineering Materials 1“, Butterworth-Heinemann • M. F. Ashby; D. R. H. Jones; „Engineering Materials 2“,Butterworth-Heinemann

Use of the module in other programs:	This module is also offered in the program B. Eng. Automotive Engineering.
Particularities:	…
Latest update:	11/2020

6.51 Materials Testing (Materials Science II)

Module number:	3020
Module title in German:	Werkstoffprüfung (Werkstoffkunde II)
Type of module:	elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	6th semester
Frequency:	once a year in the winter semester
Module responsible:	Prof. Dr.-Ing. Peter Krug
Lecturer(s):	Prof. Dr.-Ing. Peter Krug
Learning outcome:	The students • know the most important physical and technological material testing methods, can apply them, and interpret the test results appropriately in order to quantify significant parameters for a given constructive design, • know the common methods of destructive (nzfP) and non-destructive (zfP) and can apply these methods, interpret the results and select the most suitable methods for a given application and justify this selection, • can identify the appropriate test methods for a given, complex problem and compile the sequence of different tests in order to create test concepts for development, production or in the area of quality assurance, • can apply statistical methods, analyze and evaluate the recorded measured values with regard to their trustworthiness and informative value in order to compare, classify and evaluate results of larger test series or from different sources- • know the significance of relevant, international as well as national standards and can implement standard specifications in the field of materials testing in order to guarantee comparability of test results, • know standardized procedures for damage analysis in order to apply them to new problems [in accordance with taxonomy level 5].
Module contents:	relationship between material structure and measurement possibilities or measured quantities, common methods of destructive and non-destructive materials testing in the automotive industry and its suppliers, assessment of test results, standardization and QA methods in materials testing, systematic assessment of damage cases
Teaching and learning methods:	• on-site teaching • experiments during practical training • presentations (also in English) • exercises in English • technical discussion (individual) • guest speakers
Assessment methods:	oral examination
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	60 h
Individual preparation and follow up:	90 h
Recommended prerequisites:	All obligatory modules of the scientific fundamentals of engineering and mathematics.

Recommended literature:	• B. Heine; „Werkstoffprüfung – Ermittlung der Eigenschaften metallischer Werkstoffe“, Carl Hanser Verlag. • H.-J. Hunger; „Ausgewählte Untersuchungsverfahren in der Metallkunde“, Springer-Verlag • E. Macherauch / H.-W. Zoch: „Praktikum in Werkstoffkunde“, Vieweg Teubner Verlag in English: • Horst Czichos; “Springer Handbook of Materials Measurement Methods” (Springer Handbooks)
Use of the module in other programs:	This elective is offered for the Bachelor's program of Automotive Engineering as well as for the program of Production and Logistics - here, however, the module is listed under Materials Science II (WSK II).
Particularities:	…
Latest update:	09/2020

6.52 Business Law

Module number:	2080
Module title in German:	Wirtschaftsrecht
Type of module:	elective
ECTS credits:	5
Language:	German
Duration of the module:	one semester
Recommended semester:	5th semester
Frequency:	once a year in the winter semester
Module responsible:	Jur. Manfred Beden
Lecturer(s):	Jur. Manfred Beden
Learning outcome:	The students • can explain the basics of commercial law, with civil law focusing on product liability law and commercial law, • can apply the principles of labor law to the management of employees, • are aware of their legal responsibility arising from the most important legal provisions affecting a company, • can classify the most important legal provisions affecting a company and are able to judge when to consult a lawyer or the legal department [in accordance with taxonomy level 5].
Module contents:	• fundamentals of civil law • warranty • fundamentals of commercial law • fundamentals of company law (legal forms of companies) • fundamentals of labor law • fundamentals of the product liability law
Teaching and learning methods:	on-site teaching (lecture), learning in small groups (exercises), technical discussion (individual)
Assessment methods:	written examination (60 minutes, 100%)
Workload (30 h ≙ 1 ECTS credit) :	150 h
Contact hours:	48 h
Individual preparation and follow up:	102 h
Recommended prerequisites:	…
Recommended literature:	• Jaschinski, C. U.: Wirtschaftsrecht, 5th edition, Hannover 2009. • Klunzinger, E.: Grundzüge des Gesellschaftsrechts, 10th edition, Munich 2004. • Steckler, B.: Wirtschaftsrecht, 6th edited and updated edition, Ludwigshafen 2003. • Wörlen, R.: Schuldrecht Allgemeiner Teil, 5th edition, Köln 2002.
Use of the module in other programs:	…
Particularities:	…
Latest update:	09/2020

7 Module Matrix

Explanations of the module matrix:

Fields of activity:
Fields of activity describe concrete activities that are carried out by the graduates in their later profession.

LP: Logistics processes
Apply competences in this field of activity (logistics processes).

PP: Production processes
Apply competences in this field of activity (production processes).

TAL ("Teamarbeit/ -leitung"): Teamwork/ team leadership - participation in teams and team leadership
Leading and working in heterogeneous, interdisciplinary teams in industry and research.

FG ("Fachliches Grundwissen"): Basic technical knowledge - the basis for understanding and assessing
e.g. operating procedures, processes, machines, mechanical procedures, optimization requirements

Competences:
The skills (competences) that a graduate should master after graduation are described in the graduate profile. They are needed in order to be able to implement the actions related to the professional field. Several competences are often required in one or more fields of activity.

IGV ("Ingenieurwissenschaftliche Grundlagen verstehen"): Understanding engineering fundamentals
Understanding the engineering fundamentals needed as a basis for further competencies.

BGV ("Betriebswirtschaftliche Grundlagen verstehen"): Understanding business fundamentals
Understanding the business fundamentals that are needed as a basis for further skills.

MMA: Apply models and/or methods of systemic management, process management and/or information technology
The specific application of models and methods of systemic management and process management and information technology is fundamental for the integration of the various sub-disciplines.

BA ("Betriebsabläufe"): Planning, evaluating, controlling and/or developing operating procedures
Graduates will be able to plan, evaluate, control and/or develop operating procedures for socio-technological systems in accordance with efficiency, effectiveness, sustainability and ethics premises.

PIL (“Probleme identifizieren und/oder lösen”): Identifying and/or solving problems
Through the relevant and broad understanding of the technical and business management aspects of all phases of the product life cycle, graduates will be able to identify, work on and solve technically and economically relevant questions in science and business.

SET (“Systematische Entscheidungen treffen”): Making systematic decisions
The networked acquisition of relevant mathematical, scientific, technical and humanities fundamentals enables graduates to make systematic decisions in both technological and economic contexts.

Table 5: Module matrix B. Eng. Production and Logistics (Industrial Engineering and Management)

Module Matrix	Degree Program: B. Eng. Production and Logistics			Faculty: 08 Automotive Systems and Production															
Modules / courses				Fields of activity / number of credit points				Competences of the graduate profile						Criteria of the degree program				Examinations	
Semester	Module	Lecturer	CP	38,6 LP	68,6 PP	65 TAL	130 FG	KV	BGV	MMA	BA	PIL	SET	Internationalization	Interdisciplinarity	Digitization	Transfer	Amount	79
1	English for Production Engineering and Logistics	A. Vollmer	5	1	2	2					x	x		x		x	x	2	
	Industrial Business Administration	T. Mahr-Lethen	5			2	3		x	x	x				x		x	2	
	Information Technology	T. Tiltmann/C. Pack	5		1	1	3	x		x		x	x			x		1	
	Mathematics for Engineers I	F. Richter	5				5	x				x	x			x		1	
	Design Theory I	A. Stekolschik	5		0,5	0,5	4	x	x	x		x		x	x	x		1	
	Technical Mechanics I	J. Blaurock	5				5	x				x	x				x	1	
	First Semester Project Week	Lecturers of the Institute for Production	1	0,25	0,25	0,25	0,25	x	x	x		x	x		x		x	2	
2	Fundamentals of Cost and Investment Accounting	M. Plötz	5	0,5	1,5		3	x	x	x	x	x	x	x	x	x	x	1	
	Fundamentals of Logistics	S. Freichel	5	2		1	2		x	x	x			x		x	x	2	
	Mathematics for Engineers II	F. Richter	5				5	x				x	x			x		1	
	Physics I	M. Ait Tahar	5				5	x		x		x	x				x	1	
	Control Engineering	H. Smajic	5		1,5	1,5	2	x		x	x	x			x	x	x	1	
	Project Management I	A. Schreiner	5			2,5	2,5		x		x	x	x					2	
3	Business Theory	C. S. Zoller	5	1	1	1	2	x	x	x	x	x			x	x	x	5	
	Manufacturing Processes	C. Hart	5		3		2	x				x	x		x	x		1	
	Fundamentals of Production Planning and Controlling	H. Abels	5		1,5	1,5	2	x	x	x	x				x	x	x	1	
	Production Controlling	M. Plötz	5	0,5	2	0,5	2	x	x	x	x	x	x	x	x	x	x	1	
	Materials Science I	P. Krug	5		2		3	x		x	x	x		x	x		x	1	
	Statistics	R. Lenz	5	1	1		3	x	x	x		x			x	x		1	
4	Internship Semester	R. Lenz	30	5	5	15	5			x	x	x	x	x	x	x	x	1	
5	Work Science	H. Abels	5	1,5	1,5	1	1	x	x	x	x				x		x	1	
	Automation	H. Smajic	5		1,5	1,5	2	x		x	x	x	x		x	x	x	1	
	Fundamentals of Fatigue Strength	P. Krug	5		2		3	x		x	x	x		x	x		x	1	
	Distributions Logistics	S. Freichel	5	2		1	2		x	x	x	x	x	x		x	x	2	
	Waste Management Technology	K. Hesse	5	0,5	1	1	2,5	x		x	x	x		x	x		x	1	
	Manufacturing Measurement Technology	R. Pusch	5		2,5		2,5	x			x	x	x			x	x	2	
	Manufacturing Equipment	R. Breede	5		2,5		2,5	x		x		x	x		x	x	x	1	
	Mathematics for Engineers III	M. Ruschitzka	5				5	x		x		x	x			x		1	
	Physics II	M. Ait Tahar	5				5	x		x		x	x				x	1	
	Production Logistics	C. S. Zoller	5	1,5	1,5	1	1	x	x	x	x	x			x	x		5	
	Business Law	M. Beden	5			1	4			x		x	x		x		x	1	
	Interdisciplinary Project Week	Lecturers of the participating faculties	1			0,5	0,5	x	x	x	x	x	x	x	x		x	3	
6	3D-CAD	A. Stekolschik	5	0,5	1	2	1,5	x		x		x		x	x	x	x	2	
	Procurement Logistics	H. Schulte Herbrüggen	5	3	0,5	1	0,5		x	x	x	x	x	x	x	x	x	1	
	Waste Management Logistics	K. Hesse	5	2,5		1	1,5	x		x	x	x	x	x	x		x	2	
	Factory Planning	T. Mahr-Lethen	5	1	2		2	x	x	x	x				x	x		1	
	Manufacturing Systems	R. Breede	5	1	1,5	1	1,5	x	x	x	x	x	x		x	x	x	1	
	Human Resources	T. Mahr-Lethen	5			1	4		x	x					x		x	2	
	Design Theory II	A. Stekolschik	5		1,5	2	1,5	x	x			x	x		x		x	2	
	Logistics IT and ERP Systems	F. J. Welper	5	2	1	1	1	x		x		x		x	x	x	x	2	
	Optimization and Mathematical Modeling	R. Lenz	5	1	1	1	2			x		x	x		x	x		2	
	Production Planning and Controlling	H. Abels	5		1,5	1,5	2	x	x	x	x	x	x		x	x	x	1	
	Project Management II	K. Hesse/R. Pusch	5	1	1	3				x	x	x	x		x		x	2	
	Quality Management	R. Pusch	5	1,5	1,5	1	1			x	x	x	x	x	x		x	1	
	Technical Mechanics II	J. Blaurock	5				5	x				x	x				x	1	
	Forming Technology	C. Hart	5		3		2	x				x	x		x	x	x	1	
	Materials Testing (Materials Science II)	P. Krug	5		2		3	x		x	x	x	x	x	x		x	1	
	Corporate Governance	M. Plötz	5	0,5	0,5	1,5	2,5		x	x	x	x	x	x	x	x	x	1	
7	Project I (interdisciplinary project)	All lecturers of the institute	5	1,25	1,25	1,25	1,25	x	x	x	x	x	x		x		x	2	
	Project II (individual project)	All lecturers of the institute	5	1,5	1,5		2	x	x	x	x	x	x		x		x	2	
	Moderation/Negotiation	Competence workshop	3			1	2			x		x	x	x	x		x	1	
	Bachelor's Thesis	All lecturers of the institute	12	1,5	1,5		2	x	x	x	x	x	x	x	x	x	x	1	
	Final Oral Examination ("Kolloquium")	All lecturers of the institute	3	1,5	1,5		2	x	x	x	x	x	x	x	x	x	x	1	

*For examination types see module catalog

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