MODULE HANDBOOK

ENGINEERING AND MANAGEMENT/ INNOVATION AND DESIGN

HS PF Engineering

Study program directort:
Prof. Dr. Viola Galler

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Start of studies from WS 2024/2025

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This is an automated translation of an original document written in German. The original document is the binding version.

TABLE OF CONTENTS

The courses are designed for the following group sizes:
Lecture: 70-80 students
Seminar-based teaching: 35 students
Language courses: 25-30 students
Laboratory: according to the respective laboratory capacity

Note on the modules:
The duration of the modules is usually one semester. The section "Semester of study" shows the respective semester. If a module extends over two consecutive semesters, the two semesters in question are shown in this section. As a rule, all modules of the study program are offered every semester; elective and specialization courses may be an exception. These may be cancelled if the legally stipulated minimum number of registered participants has not been reached. Examinations are generally graded on a scale from 1 ("very good") to 5 ("fail"). The exception to this is the courses marked "ungraded examination performance" (UPL) in the special section of the study and examination regulations - and in this module handbook. These are graded as "pass" and "fail", see § 24 (1, 2) SPO.

Note on the scope of written work:
The length of a Bachelor's thesis is typically 50-80 pages. Project theses typically comprise 40-60 pages, although other artifacts can also be defined in advance as the expected project result. Term papers typically comprise 20-40 pages

LIST OF ABBREVIATIONS

CP	Credit Point according to ECTS (1 CP corresponds to 25-30 working hours. In This document contains the workload calculations with the maximum possible scope of work. You can also decide to do correspondingly fewer hours.)
ECTS	European Credit Transfer and Accumulation System
PLH	Examination performance Term paper
PLK	Examination performance Written exam
PLM	Examination performance Oral examination
PLP	Exam performance Project work
PLR	Examination performance Presentation
PLS	Examination performance Coursework
PLT	Examination performance Thesis
PVL	Examination prerequisite
PVL-BVP	Preliminary examination for the Bachelor's preliminary examination
PVL-BP	Preliminary examination for the Bachelor's examination
PVL-MP	Examination prerequisite for the Master's examination
PVL-PLT	Preliminary work for the thesis
STA1	First Stage of study
STA2	Second Stage of study
SWS	Semester hour (S) per week
UPL	Ungraded Examination performance

I. Compulsory module / First stage of studies

1. Basics of Construction

"Grundlagen der Konstruktion" / "Fundamentals of Mechanical Engineering"	
Code number	BWI10001
Semester of study	1st semester
Level	Preliminary level
Credits	5
SWS	4
Associated courses	BWI10002 Technical Mechanics BWI10003 Introduction to Design Theory
Recommended prerequisites	Mathematics skills at upper school level
Type(s) of examination, duration (only for PLK/PLM)	PLK (90 minutes) Module examination
Teaching language	German
Person responsible for the module	Prof. Dr. Oßwald
Teachers	Technical Mechanics: Dr. Frank Introduction to Design Theory: Prof. Dr.-Ing. Weber
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 1st semester
Teaching forms of the courses of the module	Lectures with practical work
Goals	Students acquire knowledge of the fundamentals of these disciplines. They are able to apply this knowledge correctly when developing and optimizing products and when creating and optimizing production facilities. **Technical Mechanics:** Students have a good understanding of the basic concepts and methods of engineering mechanics and are famlliar with the applications of statics and strength of materials as well as their specific methods. **Introduction to Design Theory:** Participants are able to find design solutions based on simple tasks. They are also able to read complex technical drawings. Participants will be able to apply the design principles of material-to-material component connections.
Interdisciplinary qualification goals	The module contributes to: • Social skills ○ Communication skills in a technical context • Self-reflection • Ability to work in a team
Contents	**Technical Mechanics:** • Introduction • Physical principles of mechanics • Statics: force systems, trusses, line loads • Introduction to strength of materials **Introduction to Design Theory:** • Basics of technical drawing, standards, technical drawings as information carriers • Component tolerances and fits

	• Materially bonded component connections • Methods for finding creative solutions
Literature	**Technical Mechanics:** Gabbert, U., Raecke, I. (2021): *Technical Mechanics for Industrial Engineers.* Hanser: Munich. **Introduction to Design Theory:** • Hoischen, H. (2022): *Technical drawing.* Cornelsen: Berlin. • VDI Guideline 2222: *Design methodology* (1997). Beuth: Berlin. • Wittel, H., Muhs, D. (2013): *Roloff/Matek machine elements: Standardization, calculation, design.* Springer Vieweg: Wiesbaden.
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, practical work, preparation for and completion of the exam: 90 hours.
Media forms	Slides, blackboard, projector, simulations, audience response techniques, teaching videos, university e-learning platform (Moodle)

2. Fundamentals of Technology

"Grundlagen der Technik" / "Fundamentals of Engineering"	
Code number	BWI10004
Semester of study	1st semester
Level	Preliminary level
Credits	5
SWS	4
Associated courses	BWI10005 Materials Science BWI10006 Introduction to Physics
Type(s) of examination, duration (only for PLK/PLM)	Materials Science: PLK (45 minutes) Introduction to Physics: UPL
Recommended prerequisites	Good school knowledge in mathematics
Teaching language	German
Person responsible for the module	Prof. Dr. Oßwald
Teachers	Materials Science: Prof. Dr.-Ing. Jost Introduction to Physics: Dr. Frank
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 1st semester
Teaching forms of the courses of the module	Materials Science: Lecture with practical work Introduction to Physics: Seminar
Goals	**Materials Science:** Students are familiar with the concepts, methods and technical possibilities of modern materials technology as a key discipline in the global engineering environment. Basic skills for the understanding and practical handling of materials are taught. Students will be able to competently deal with simple materials science issues, such as the structure of materials, materials testing, material designations, heat treatment and their effects on the material structure and its properties. **Introduction to Physics:** Students recognize and understand basic physical relationships and are able to analyze and mathematically solve simple electrical engineering problems.
Interdisciplinary qualification goals	The module contributes to: • Teamwork skills: solving tasks in groups • Social skills: Presenting and explaining solutions • Self-reflection: Reflection of the feedback on the presentation
Contents	**Materials Science** Introduction to materials science, lecture (introduction - atom - structure - microstructure - component) **Introduction to Physics** Quantities and units, technical arithmetic, forces, electrical components, simple physical systems, electrical engineering networks and their modeling
Literature	**Materials Science:** • Bargel, H., Schulze, G. (2012): *Materials science* (VDI book). 9th ed., Springer: Dordrecht. • Hornbogen, E., Jost, N. (2005): *Questions, answers, terms on materials.* 5th ed., Springer: Dordrecht.

	Introduction to Physics: • Hagmann, G. (2017): *Fundamentals of electrical engineering.* Aula: Wiebelsheim • Hering, Ekbert; Martin, Rolf; Stohrer, Martin. *Physics for engineers*. Springer-Verlag, 12th edition, 2016.
Workload	Workload: 5 ECTS x 30 hours = 150 hours. Attendance time: 4 SWS x 15 weeks = 60 hrs. Preparation/follow-up, practical work, preparation for and completion of the exam: 90 hours.
Media forms	Blackboard, data projector, simulations, experiments, peer instruction, audience response techniques

3. Mathematics

"Mathematik" / Mathematics	
Code number	BWI10007
Semester of study	1st semester
Level	Preliminary level
Credits	5
SWS	4
Associated courses	BWI10008 Mathematics 1
Type(s) of examination, duration (only for PLK/PLM)	PLK (90 minutes) Module examination
Recommended prerequisites	Good school knowledge in mathematics
Teaching language	German
Person responsible for the module	Prof. Dr. Galler
Teachers	Mathematics 1: Prof. Dr. Galler, Dr. Heinemeyer
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 1st semester
Teaching forms of the courses of the module	Lecture with practical exercises
Goals	**Contribution to the qualification objectives of the degree program:** Students are familiar with the basics of mathematics that are uniformly required in economics, engineering and all natural science disciplines, i.e. linear algebra and differential and integral calculus for one variable. They can apply the relevant methods and therefore possess the prerequisites for further studies **Learning objectives:** The students • are proficient in vector and matrix arithmetic, • can differentiate functions from a variable and thus solve extreme value problems, • can calculate limits of functions, • know important mathematical functions, • are proficient in integral calculus and know its most important applications.
Interdisciplinary qualification goals	Students learn to interpret subject-related problems, to solve them mathematically and to reflect on and discuss the solutions together.
Contents	• Vector calculus, matrix and determinant calculus • Differential calculus and integral calculus of functions with one variable
Literature	• Papula, L (2018): *Mathematics for Engineers and Scientists Volume 1,* 15th ed., Springer Vieweg Wiesbaden • Papula, L (2012): *Mathematics for Engineers and Scientists Volume 2,* 13th ed., Springer Vieweg Wiesbaden • Gohout, W. (2011): *Mathematics for business and technology*. 2nd ed., Oldenbourg: Munich.
Workload	Workload: 5 ECTS x 30 hours = 150 hours. Attendance time: 4 SWS x 15 weeks = 60 hrs. Preparation/follow-up, exercises, preparation for and completion of the exam: 90 hours.
Media forms	Slides, blackboard work, e-learning platform, tutorials

4. Computer Science

"Informatik" / "Computer Science"	
Code number	BWI10009
Semester of study	1st semester
Level	Introduction
Credits	5
SWS	4
Associated courses	BWI10010 Introduction to Computer Science BWI10011 Computer Science Laboratory
Recommended prerequisites	Mathematics at the upper secondary school level or Mathematics bridge courses
Type(s) of examination, duration (only for PLK/PLM)	Introduction to Computer Science: PLK (90 minutes) Module examination Computer Science Laboratory: UPL
Teaching language	German
Person responsible for the module	Prof. Dr. Volz
Teachers	Prof. Dr. Volz
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 1st semester
Teaching forms of the courses of the module	Lecture with discussion, laboratory
Goals	The students • can play an active and responsible role in shaping the information society, • can handle information, • understand the basic structural characteristics of data, • understand the structural characteristics of software systems, • work with modern hardware and software systems, • understand the principles of presenting, processing and interpreting information, • have knowledge and skills in computer modeling.
Interdisciplinary qualification goals	The module contributes to: • Personal initiative • Analytical skills • Self-reflection
Contents	**Introduction to Computer Science:** • Example spreadsheet as a programmable application • Data types • Functions • Propositional logic • Objects and states • Algorithms and programs • State modeling • Classes and generalization • (Recursive) data structures (lists, trees, graphs) • Formal languages and finite automata • How a computer works • Limits of predictability **Computer Science Lab:** • Basic tools of software engineering • Description languages (HTML and CSS)

	• Programming languages (JavaScript and TypeScript) • Use of software libraries • Simple distributed applications
Literature	• Volz, R. (2019): Lecture notes for the lecture - *Introduction to Computer Science*, eLearning at Pforzheim University of Applied Sciences • Hubwieser, P. et al. (2007): *Computer science 2, textbook for grammar schools.* Ernst Klett: Stuttgart • Hubwieser, P. et al. (2008): *Computer science 3, textbook for grammar schools.* Ernst Klett: Stuttgart • Hubwieser, P. et al. (2009): *Computer science 4, textbook for grammar schools.* Ernst Klett: Stuttgart • Hubwieser, P. et al. (2010): *Computer science 5, textbook for grammar schools.* Ernst Klett: Stuttgart
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, practical exercises, independent practice in the laboratory, preparation for and completion of the examination: 90 hours.
Media forms	Lecture with slides (PowerPoint with projector), computer-aided programming in the PC laboratory, e-learning units and videos for laboratory preparation, computer-aided learning outcome assessments in the laboratory, accompanying material is made available on the university's own e-learning platform (Moodle)

5. Business Administration I

"Betriebswirtschaftslehre I" / "Business Administration I"	
Code number	BWI10012
Semester of study	1st semester
Level	Preliminary level
Credits	5
SWS	4
Associated courses	BWI10013 Fundamentals of Business Administration
Recommended prerequisites	None
Type(s) of examination, duration (only for PLK/PLM)	PLK (60 minutes) Module examination
Teaching language	German
Person responsible for the module	Prof. Dr. Martin
Teachers	Prof. Dr. Martin / Prof. Schnell
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 1st semester
Teaching forms of the courses of the module	Lecture, seminar-style teaching
Goals	The Business Administration I module teaches students the classic basics of business management thinking and acting. Students first receive a general overview of the importance, objectives, tasks and procedures of external and internal accounting. They will be able to present examples of the typical issues in these areas and apply the methods of cost and performance accounting and bookkeeping and accounting. They can explain the structure and content of a balance sheet and income statement and know how to analyze them and use them for management decisions. They are familiar with the terms, systems and methods of cost and revenue accounting (e.g. full cost accounting, partial cost accounting, cost variance analysis). They can now carry out calculations independently and systematically analyze costs in the company.
Interdisciplinary qualification goals	The module contributes to the students' analytical skills.
Contents	• Cost element accounting • Cost center accounting • Cost object unit (costing) and cost object time accounting (profitability analysis) • Balance sheet and income statement • Analysis of annual financial statements with key figures • Introduction to the valuation of companies using key figures • Fundamentals of double-entry bookkeeping • Postings for current business transactions and the annual financial statements
Literature	• Joosé, G. (2018): *Basic knowledge of cost accounting.* 7th edition, Beck im DTV: Munich. • Britzelmaier, B. (2020): *Accounting*. 2nd edition, Kiehl: Herne. • Weber, M., Paa, K. U. (2020): *Bilanzen*, 5th ed., Haufe: Freiburg.
Workload	Workload: 5 ECTS x 30 hours = 150 hours.

	Attendance time: 4 SWS x 15 weeks = 60 hrs. Preparation/follow-up, exercises, preparation for and completion of the exam: 90 hours.
Media forms	Slides, blackboard work, papers, case studies and practical exercises

6. English

"Englisch" / "English"	
Code number	BWI10014
Semester of study	1st/2nd semester
Level	Preliminary level
Credits	5
SWS	4
Associated courses	BWI10015 Business English BWI10016 English for Engineers
Recommended prerequisites	B2 English (CEFR) - no prior knowledge of content required
Type(s) of examination, duration of examination (only for PLK/PLM)	Business English: PLH/PLK/PLP/PLR (60 minutes) English for Engineers: PLH/PLK/PLP/PLR (60 minutes)
Teaching language	English
Person responsible for the module	Prof. Dr. Kilian-Yasin
Teachers	Business English: Mr. Correa, N.N. English for Engineers: Mr. Correa, N.N.
Assignment to the curriculum	WI/MT, WI/ID - compulsory subject 1st/2nd semester
Teaching forms of the courses of the module	Lecture, seminar-based teaching
Goals	**Business English:** This course aims to facilitate both oral and written communication in a business context. Students practise comprehensively all four language skills - listening, reading, speaking and writing. They deal with the intercultural challenges of working with business partners from different international backgrounds and business sectors. **English for Engineers:** Students consolidate the skills learned in Business English 1 and expand their knowledge of topics related to engineering and design processes. In addition, they learn how to give a presentation in English on innovations in engineering and how to lead a discussion in plenary. In addition, they learn the skills to research and write texts on various engineering and design-related topics.
Interdisciplinary qualification goals	The courses contribute to the development of students' social and teamwork skills by working in groups to prepare and deliver presentations and written assignments. Self-reflection skills are encouraged through role play and feedback practice.
Contents	**Business English:** • Corporate structures • Types of business organizations and entrepreneurshipCorporate culture • CSR • Management strategies • Corporate strategies • Marketing • Advertising • Outsourcing • Company case study **English for Engineers**: • Data analysis and description

	• Product development • Innovations in technology and design • Materials engineering • Production and manufacturing processes • Sustainable energy construction • Technical vocabulary
Literature	**Business English:** • MacKenzie, I. (2010): *English for Business Studies.* Cambridge University Press. • The Times 100 Case Studies. www.business-casestudies.co.uk • Hofstede, G., Hofstede, G. J. (2005): *Cultures and Organizations - Software of the Mind*, 2nd Edition, McGraw-Hill: New York **English for Engineers:** • Brieger, N., Pohl, A. (2008): *Technical English - Vocabulary and Grammar.* Langenscheidt: Munich. • Ibbotson, M. (2008): *Cambridge English For Engineering.* Cambridge University Press. • Bonamy, D. (2011): *Technical English 4th* Pearson Longman
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 90 hours.
Media forms	Slides, blackboard work, practical exercises and videos

7. Economics

"Volkswirtschaftslehre" / "Economics"	
Code number	ECO1400
Semester of study	1st/2nd semester
Level	Preliminary level
Credits	5
SWS	4
Associated courses	ECO1303 Economics 1 ECO1401 Economics 2
Recommended prerequisites	Only prior knowledge of mathematics is required for Economics 1. The contents of Economics 1 are a prerequisite for Economics 2.
Type(s) of examination, duration of examination (only for PLK/PLM)	Economics 1: PLK (60 minutes) Economics 2: PLK (60 minutes)
Teaching language	German
Person responsible for the module	Prof. Dr. Sascha Wolf
Teachers	Economics 1: Prof. Dr. Sascha Wolf Economics 2: Prof. Dr. Sascha Wolf
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 1st/2nd semester
Teaching forms of the courses of the module	Lecture with discussion
Goals	Industrial engineers are at the interface between technology and economics. By analyzing markets, the effects of government intervention and operational processes, they make a significant contribution to improving product and innovation management and optimizing processes within companies. The aim of the course is to optimally prepare students for this interdisciplinary field of work. The students... • ...are able to think abstractly and structure complex problems - this is what thinking in models is for. • ...understand the functioning of markets in an economy based on the division of labor and recognize the importance of the state regulatory framework. • ...are able to assess and critically scrutinize the operational consequences of government intervention. • ...know the consequences of market failure and the special features of network and platform industries, e.g. in the IT or transportation sector. • ...understand macroeconomic relationships and phenomena such as inflation, unemployment and growth and can evaluate economic policy options for correcting macroeconomic imbalances and their consequences for business decisions.
Interdisciplinary qualification goals	Students learn about the importance of social behavior and solidarity in a market economy and the consequences of free-riding behavior and misguided incentives. By discussing different macroeconomic concepts and the impact of economic activity on the environment, students strengthen their ability to analyze and think critically.

Contents	• Aspects, basic concepts and methods of economics • Different economic systems • Demand and supply on goods markets, elasticities; consumer and producer surplus • Pricing: perfect and imperfect competition, monopolistic pricing, oligopoly markets • State intervention in market pricing: Maximum prices, minimum prices, taxes, internalization of external effects • Network externalities, platform economics and special good characteristics • Competition policy • Macroeconomic targets: Inflation, unemployment, growth, economic fluctuations • Macroeconomic policy: Keynesianism versus supply policy • Monetary theory and monetary policy
Literature	**Economics 1:** • Beck, H. (2012): *Economics*. Oldenbourg: Munich. • Mankiw, N. and Taylor, M. (2021): *Grundzüge der Volkswirtschaftslehre*. 8th ed., Schäffer-Poeschel: Stuttgart. • Pindyck, R. and Rubinfeld, D. (2018): *Microeconomics*, 9th ed, Pearson: Munich. **Economics 2:** • Beck, H. (2012): *Economics*. Oldenbourg: Munich. • Blanchard, O., Illing, G. (2021): *Macroeconomics*. 8th ed., Pearson: Munich. • Mankiw, N. and Taylor, M. (2021): *Grundzüge der Volkswirtschaftslehre*. 8th ed., Schäffer-Poeschel: Stuttgart.
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 90 hours.
Media forms	Blackboard, slides, projector, audience response techniques/interactive app, university e-learning platform (Moodle), teaching videos, alfaview (if required)

8. Production Engineering I

"Fertigungstechnik I" / "Manufacturing Technology I"	
Code number	BWI10020
Semester of study	2nd semester
Level	Preliminary level
Credits	5
SWS	4
Associated courses	BWI10021 Production Engineering 1 BWI10022 Production Engineering 1 Laboratory
Recommended prerequisites	Mathematics skills at upper school level Materials Science Introduction to Design Theory Electrical engineering and physics at high school level
Type(s) of examination, duration (only for PLK/PLM)	Production Engineering 1: PLK (60 minutes) Production Engineering 1 Laboratory: UPL
Teaching language	German
Person responsible for the module	Prof. Dr. Oßwald
Teachers	Production Engineering 1: Prof. Dr. Oßwald Production Engineering 1 Laboratory: Prof. Dr. Oßwald
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 2nd semester
Teaching forms of the courses of the module	Lectures with practical exercises Laboratory
Goals	The students • are familiar with the technological properties and processes of common manufacturing methods for metals in the fields of cutting, joining, coating • understand the implementation options and limits of these manufacturing processes, • can determine the manufacturing processes for functional products at optimum cost, • are familiar with the structure and technology of production machines and devices.

Interdisciplinary qualification goals	• Social skills
	  ○ Technical language skills in an engineering context
	• Self-reflection
	• Ability to work in a team
	  ○ Working in interdisciplinary teams

Contents	Content: Manufacturing technology of metals: Functionality, performance characteristics, areas of application of the following manufacturing processes: • Cutting • Joining • Coating
Literature	• Schulze, G. (2018): *Manufacturing technology*. 12th edition, VDI: Düsseldorf. • Schmid, D. et al (2019): *Industrial manufacturing*. Europa-Lehrmittel: Haan. • Awiszus, B. (2020): *Grundlagen der Fertigungstechnik*, 7th edition, Hanser: Freiburg.
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours

	Preparation/follow-up, exercises, preparation for and completion of the exam: 90 hrs.
Media forms	Slides, blackboard, projector, simulations, audience response techniques, teaching videos, university e-learning platform (Moodle) Practical laboratory exercises

9. Physics

"Physik" / "Physics"	
Code number	BWI10023
Semester of study	2nd semester
Level	Preliminary level
Credits	5
SWS	4
Associated courses	BWI10024 Physics
Recommended prerequisites	Mathematics skills at university entrance qualification level
Type(s) of examination, duration (only for PLK/PLM)	PLK (60 minutes) Module examination
Teaching language	German
Person responsible for the module	Prof. Dr. Volz
Teachers	Dr. Frank, N. N.
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 2nd semester
Teaching forms of the courses of the module	Lecture / inverted classroom with exercises and tutorials
Goals	The students • recognize and understand basic physical relationships, • can analyze and mathematically solve simple physical problems.
Interdisciplinary qualification goals	The module contributes to: • Social skills: Peer instruction • Self-reflection: checking your own level of knowledge using audience response techniques • Teamwork skills: solving tasks in teams
Contents	Fundamentals of translational and rotational dynamics, oscillations, energy, power, momentum, angular momentum, electrodynamics, selected topics in modern physics
Literature	• Rybach, J. (2013): *Physics for Bachelors*. Hanser: Munich. • Hering, E., Martin, R., Stohrer, M. (2017): *Physics for engineers.* Springer: Berlin • University of Colorado (Boulder): *Interactive Simulations - PhET* (Physics Education Technology). http://phet.colorado.edu/de/
Workload	Workload: 5 ECTS x 30 hours = 150 hours. Attendance time: 4 SWS x 15 weeks = 60 hrs. Preparation/follow-up, exercises, preparation for and completion of the exam: 90 hours.
Media forms	Blackboard, data projector, simulations, videos, peer instruction, audience response techniques, problem-based learning

10. Quantitative Methods I

"Quantitative Methods I" / "Quantitative Methods I"	
Code number	BWI10025
Semester of study	2nd semester
Level	Preliminary level
Credits	5
SWS	4
Associated courses	BWI10026 Statistics 1 BWI10027 Mathematics 2
Recommended prerequisites	Mathematical knowledge at university entrance qualification level; Mathematics 1 lecture
Type(s) of examination, duration (only for PLK/PLM)	PLK (90 minutes) Module examination
Teaching language	German
Person responsible for the module	Prof. Dr. Bulander
Teachers	Statistics 1: Prof. Dr. Bulander Mathematics 2: Prof. Dr. Galler, Dr. Heinemeyer
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 2nd semester
Teaching forms of the courses of the module	Lecture with practical exercises
Goals	**Contribution to the qualification objectives of the study program:** Students are familiar with the fundamentals of mathematics that are required across the board in economics, engineering and all natural science disciplines, i.e. differential and integral calculus for several variables. They can apply the corresponding methods and are thus mathematically able to successfully complete their studies Students also become proficient in descriptive statistical concepts and methods. They can confidently apply the relevant concepts and procedures and are therefore able to meet the quantitative requirements of their further studies. **Learning objectives:** The students • can differentiate functions of several variables and thus solve extreme value problems, • can calculate sequences and series, • are familiar with complex numbers and their arithmetic operations, • have mastered the integral calculus of functions with several variables and understand its most important applications, • can recognize and apply descriptive statistical concepts and methods.
Interdisciplinary qualification goals	Students learn to interpret subject-related problems, to solve them mathematically and to reflect on and discuss the solutions together.
Contents	**Statistics 1:** • Introduction to statistics • Teaching the basics of descriptive statistics

	• Basics of the evaluation of univariate data sets: Position, scatter and kurtosis parameters • Evaluation of bivariate data sets: Correlation and regression analysis **Mathematics 2:** • Differential and integral calculus of functions of several variables • Fundamentals of complex numbers • Sequences and series
Literature	**Statistics 1:** Specht, K., Bulander, R., Gohout, W. (2014): *Statistics for Technology and Economics.* 2nd updated and expanded edition, De Gruyter Oldenbourg: Munich. **Mathematics 2:** • Papula, L (2018): *Mathematics for Engineers and Scientists Volume 1,* 15th ed., Springer Vieweg Wiesbaden • Papula, L (2012): *Mathematics for Engineers and Scientists Volume 2,* 13th ed., Springer Vieweg Wiesbaden • Gohout, W. (2011): *Mathematics for Business and Technology*. 2nd ed., expanded edition, De Gruyter Oldenbourg: Munich.
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 90 hours.
Media forms	Slides, blackboard work, e-learning platform, tutorials

11. Design and Innovation Management

"Design und Innovationsmanagement" / "Design and Innovation Management"	
Code number	BWI10100
Semester of study	2nd semester
Level	Preliminary level
Credits	5
SWS	4
Associated courses	BWI10101 Design Basics BWI10030 Innovation Management
Recommended prerequisites	none
Type(s) of examination, duration of examination (only for PLK/PLM)	Design Basics: PLP Innovation Management: PLH/PLP
Teaching language	Design Basics: German Innovation Management: English
Person responsible for the module	Prof. Dr. Kölmel
Teachers	Design Basics: Prof. Gerlach Innovation Management: Prof. Dr. Kölmel
Assignment to the curriculum	WI/ID - compulsory subject 2nd semester
Teaching forms of the courses of the module	Lecture/seminar/laboratory/practical exercises
Goals	**Design Basics:** The students • have an overview of the most important fundamentals of design theory and methodology, • understand design thinking, • are able to visualize and develop simple ideas/drafts. **Innovation Management:** • Understanding innovation management as an entrepreneurial task and as a design mandate for a company-wide innovation system. • Ability to identify relevant management aspects to foster innovation initiatives, develop an understanding of organizational initiative design and how it influences the company's innovation portfolio. • Be able to identify relevant parameters of innovation collaboration management, develop an understanding of how collaboration can increase the relevant resource and capability base of the organization and the benefits of partner management in networks • Ability to explain the effect of increasing service intensity on innovation management. • Develop an understanding of the informal side of the corporate innovation organization and be able to recognize its effect on innovation team activities. The ability to identify and shape relevant parameters for influencing the innovation-oriented organizational culture. • Understand the opportunities that can arise from new technologies (e.g. IoT, additive manufacturing, DLT) and identify specific challenges for innovation management.
Interdisciplinary qualification goals	• The module contributes to social skills by giving students the opportunity to work together in group projects and learn various communication and collaboration techniques. Encourag-

	ing creativity also helps students to respond better to unexpected or unusual situations, which in turn strengthens their social skills. • The module contributes to self-reflection by giving students the opportunity to reflect on their creative processes and analyze their ways of thinking and working. • The module contributes to teamwork skills by giving students the opportunity to work together in group projects and learn different techniques for conflict resolution and collaboration. By encouraging creativity, students learn how to generate ideas in a team and develop them further together to find innovative solutions.
Contents	**Design Basics:** Students learn about the design process in stages using individual tasks that increase in complexity over the course of the semester. The short projects all follow a basic structure and methods. Students gain experience in presenting their own ideas/designs and in the basic approach to solving design tasks. **Innovation Management:** Competitive products form the basis for the economic success of companies. However, this can only be ensured in the long term if all product-related measures of a company, from the development of customer-oriented products to the optimal design of the product life cycle, are carried out effectively and efficiently through systematic innovation and product management. Central aspects of innovation and product management are taught on the basis of a process-oriented structure. • Fundamentals of innovation and product management • Strategic planning in innovation and new product management • Generation and evaluation of product ideas • Product conception • Product development • Market testing • Lifecycle management • Organization of innovation and product management
Literature	**Design Basics:** • Bürdek, B. E. (2015): *Design - History, theory and practice of product design.* Birkhäuser. • Heufler, G. (2012): *Design Basics - From the idea to the product.* niggli-Verlag. **Innovation Management:** • Wördenweber, B., Eggert, M., & Größer, A. (2020). *Technology and innovation management in companies*. Springer eBooks • Gaubinger, K., Werani, T., Rabl, M. (2015): *Practice-oriented innovation and product management basics and case studies from B-to-B markets*. Gabler: Wiesbaden. • Hauschildt, J., Salomo, S. (2007): *Innovation Management.* Vahlen: Munich.
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, project work, preparation for and completion of the examination: 90 hours.
Media forms	Project work, instructional videos, presentations, interactive exercises, group work and discussions, tasks for individual and

	group work, keynote speeches, group and panel discussions, individual and group presentations.

12. Business Administration II

"Betriebswirtschaftslehre II" / "Business Administration II"	
Code number	BWI10031
Semester of study	2nd semester
Level	Preliminary level
Credits	5
SWS	4
Associated courses	BWI10032 Financing and Investment BWI10033 Corporate Management
Recommended prerequisites	Attendance of the Business Administration I module
Type(s) of examination, duration (only for PLK/PLM)	PLK (60 minutes) Module examination
Teaching language	German
Person responsible for the module	Prof. Dr. Binder
Teachers	Financing and Investment: N.N. Corporate Management: Prof. Dr. Binder
Assignment to the curriculum	WI/MT, WI/ID - compulsory subject 2nd semester
Teaching forms of the courses of the module	Lecture
Goals	Students are familiar with the general way of thinking and acting in corporate management and its sub-functions (planning and control, organization, personnel management). In addition, students are familiar with all methods and procedures of corporate financing as well as methods for preparing investment decisions. They have a sound knowledge of modern methods of financing, investment and strategic management. They recognize the importance of the financing and investment process as well as the strategic orientation of a company in the market and which strategic management models can be used.
Interdisciplinary qualification goals	The students • can work on the case studies in a team, • can present team results in a target-oriented and appropriate manner, • develop social competence in the presentation of several socially relevant behavioural patterns in case study work with various organizational examples • solve case study tasks in presentation software exercises independently and develop self-reflection in the process
Contents	**Financing and Investment:** The basics of financing instruments, financial planning and capital budgeting are covered. Special forms of financing such as financial investments as well as innovations in corporate financing and start-up financing are also explained. **Corporate Management:** The strategic implications in the management areas of "products and markets" are focused on based on the derivation of a strategic objective for a company in the market . In addition, the student learns important concepts of personnel management and organization.
Literature	**Financing and Investment:**

	• Terstege, U., Ewert, J. (2018): *Operational financing - quickly grasped.* 2nd edition, Springer Gabler: Berlin, Heidelberg • Becker, H. P., Peppmeier, A. (2018): *Investment and financing: Fundamentals of corporate finance*. 8th edition, Springer Gabler: Wiesbaden. • Olfert, K. (2015): *Investments*. 13th ed., Kiehl: Ludwigshafen. • Olfert, K. (2017): *Financing.* 17th ed., Kiehl: Ludwigshafen. **Corporate Management:** • Dillerup, R., Stoi, R. (2016): *Corporate management*. 5th edition, completely revised and expanded. Vahlen: Munich. • Hungenberg, H., Wulf, T. (2015): *Fundamentals of Corporate Management - Introduction for Bachelor Students*. Springer-Gabler: Munich.
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 90 hours.
Media forms	Lecture with presentations and case studies as well as practical exercises.

II. Second stage of studies

13. Production Engineering II

"Fertigungstechnik II" / "Manufacturing Technology II"	
Code number	BWI10034
Semester of study	3rd semester
Level	Advanced level
Credits	5
SWS	4
Associated courses	BWI10035 Production Engineering 2 BWI10036 Production Engineering 2 Laboratory
Recommended prerequisites	Mathematics skills at upper school level Materials Science Design Theory Electrical engineering and physics at high school level Production Engineering I
Type(s) of examination, duration (only for PLK/PLM)	Production Engineering 2: PLK (60 minutes) Production Engineering 2 Laboratory: UPL
Teaching language	German
Person responsible for the module	Prof. Dr. Oßwald
Teachers	Production Engineering 2: Prof. Dr.-Ing. Golle Production Engineering 2 Laboratory: Prof. Dr.-Ing. Müller, Mr. Hügel
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 3rd semester
Teaching forms of the courses of the module	Lecture, laboratory, practical exercises
Goals	The students • are familiar wtih the technological properties and processes of common manufacturing methods for metals (in the areas of: primary forming, forming and changing material properties) and for plastics, • understand the implementation options and limits of these manufacturing processes, • can determine the manufacturing processes for functional products at optimum cost, • are familiar with the structure and technology of production machines and devices.

Interdisciplinary qualification goals	• Social skills
	  ○ Technical language skills in an engineering context
	• Self-reflection
	• Ability to work in a team
	  ○ Working in interdisciplinary teams

Contents	The topic of manufacturing technology of metals: Functionality, performance characteristics, areas of application of the following manufacturing processes: • Prototypes • Reshaping • Modification of material properties Manufacturing process for plastics:

	Properties of polymer materials, areas of application and potential, plastics processing technologies,- machines and tools, design for production and materials
Literature	• Schulze, G. (2018): *Manufacturing technology*. 12th edition, VDI: Düsseldorf. • Schmid, D. et al (2019): *Industrial manufacturing*. Europa-Lehrmittel: Haan. • Awiszus, B. (2020): *Grundlagen der Fertigungstechnik*, 7th edition, Hanser: Freiburg. • Hopmann, Chr.; Michaeli, W. (2015): *Introduction to plastics processing.* Hanser: Munich. • Saechtling, H. (2013): *Plastics pocket book.* Hanser: Munich.
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 90 hours.
Media forms	Slides, blackboard work, (laboratory) exercises, demonstration

14. Project Management

"Projektmanagement" / "Project Management"	
Code number	BWI10037
Semester of study	3rd semester
Level	Advanced level
Credits	5
SWS	4
Associated courses	BWI10038 Project Management BWI10039 Profile Project
Recommended prerequisites	None
Type(s) of examination, duration (only for PLK/PLM)	Project Management: PLK/PLP (60 minutes) Profile Project: PLH/PLK/PLP/PLR (60 minutes)
Teaching language	German
Person responsible for the module	Prof. Dr. Kühn
Teachers	Project Management: Prof. Dr. Kühn Profile Project: All teachers in the field
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 3rd semester (profile project adapted to each study program)
Teaching forms of the courses of the module	Lecture, seminar, project work
Goals	The students • know the basics of project management, • know the relevant standards, especially IPMA (German Association for Project Management) and PMI (Project Management Institute), • know methods and techniques that are used in project management, but also in other areas, including risk and quality management, • know methods and tools to generate creative ideas and implement them visually, • can explain the basics of these techniques and apply concepts, methods and technical implementations to practical case studies, • can familiarize themselves independently with a new subject area as part of a real project.
Interdisciplinary qualification goals	The students • can work on the project in a team, • can present team results in a target-oriented and appropriate manner, • develop social skills, • gain initial practical experience in the organization and implementation of projects.
Contents	**Project Management:** • General introduction to project management based on the project management standard of the Deutsche Gesellschaft für Projektmanagement e. V. / Project Management Institute (Pennsylvania, USA) / SCRUM, SCRUM org. V. / Project Management Institute (Pennsylvania, USA) / SCRUM, SCRUM.org • Students learn a wide range of modern project management tools that are also used in a variety of areas beyond project management.

	• Practical teaching of project management content in the context of case studies/practical exercises. **Profile Project:** • Students apply the project management content taught in the context of a fictitious or real project. • The exact task is specific to the study program and therefore the topic can vary in scope.
Literature	**Project Management:** • Competence-based project management (PM4) (2019): *Handbook for practice and further education in project management;* GPM Gesellschaft für Projektmanagement e. V.: Nuremberg • Schulz, M. (2020): *Project management: Goal-oriented. Efficient. Clear*. UVK • A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Seventh Edition and The Standard for Project Management (2021); Project Management Institute Inc., Newtown Square, Pennsylvania • Scrum-guide (2020); Scrum.org **Profile Project:** • Will be announced depending on the subject area.
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, project work, preparation and examination: 90 hours.
Media forms	Slide presentations, project work, instructional videos, presentations, interactive exercises, group work and discussions

15. Quantitative Methods II

"Quantitative Methods II" / "Quantitative Methods II"	
Code number	BWI10040
Semester of study	3rd semester
Level	Advanced level
Credits	5
SWS	4
Associated courses	BWI10041 Statistics 2 BWI10042 Operations Research
Recommended prerequisites	Mathematics 1 Mathematics 2 Quantitative Methods I
Type(s) of examination, duration (only for PLK/PLM)	PLK (90 minutes) Module examination
Teaching language	German
Person responsible for the module	Prof. Dr. Galler
Teachers	Statistics 2: Prof. Dr. Galler, Dr. Heinemeyer Operations Research: Prof. Dr. Galler, Dr. Heinemeyer
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 3rd semester
Teaching forms of the courses of the module	Lecture with practical exercises
Goals	**Contribution to the qualification objectives of the study program:** Students are proficient in probability theory, estimation theory and test theory as well as linear optimization and its applications. They can confidently apply the relevant concepts and methods and are therefore able to meet the quantitative requirements of their further studies. The students • are proficient in probability theory and important discrete and continuous distributions • can apply estimators and carry out statistical tests, • can identify and solve linear optimization problems.
Interdisciplinary qualification goals	Students learn to interpret subject-related problems, to solve them mathematically and to reflect on and discuss the solutions together.
Contents	**Statistics 2:** Probability theory, random variables and their distribution, estimation theory, test theory **Operations Research:** Basic model of linear optimization, graphical solution of an LP problem, simplex algorithm and special cases, duality, transport problems, assignment problem
Literature	**Statistics 2:** • Papula, L (2016): Mathematics for Engineers and Scientists Volume 3, 7th ed., Springer Vieweg Wiesbaden • Kuhlenkasper, T., Handl, A. (2018): Introduction to Statistics: Theory and Practice with R, Springer Spektrum • Specht, K., Bulander, R., Gohout, W. (2014): Statistics for Technology and Economics. 2nd revised edition, De Gruyter Oldenbourg: Munich.

	Operations Research: • Gohout, W. (2009): *Operations Research*. 4th revised edition, De Gruyter Oldenbourg: Munich.
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 90 hours.
Media forms	Slides, blackboard work, e-learning platform, tutorials,

16. IT Applications

"IT-Anwendungen" / "IT Applications	
Code number	BWI10043
Semester of study	3rd semester
Level	Advanced level
Credits	5
SWS	4
Associated courses	BWI10044 IT Applications BWI10045 IT Applications Laboratory
Recommended prerequisites	Previous participation in the courses Production Engineering 1 Introduction to Design Engineering Business Administration I Successful laboratory practice before taking the exam Computer Science module
Type(s) of examination, duration (only for PLK/PLM)	PLK (60 minutes) Module examination IT Applications Laboratory: UPL
Teaching language	German
Person responsible for the module	Prof. Dr. Wunderlich
Teachers	IT Applications: Prof. Dr. Wunderlich IT Applications Laboratory: Prof. Dr. Wunderlich
Assignment to the curriculum	WI/MT, WI/ID - compulsory subject 3rd semester
Teaching forms of the courses of the module	Lecture/laboratory exercises on the computer Arithmetic exercises
Goals	The students • are familiar with the different types of operational application systems, their basic functionalities and special features in the time-to-customer and time-to-market process chains, • can assign methods to the process phases, • are able to explain business application systems (ERP/PPS and CAx modules), • understand the complete order process in the company and its IT support through standard business software, • know the fundamental importance of the product creation process with CAx tools.
Interdisciplinary qualification goals	The interdisciplinary qualification objectives supplement the subject-specific knowledge of application systems and process chains and prepare students for the requirements of the job market. They promote important interdisciplinary skills that are in demand in many professional contexts and help students to work successfully in multidisciplinary teams. These include • **Teamwork skills**: Students will be able to work in teams and collaborate on tasks and projects related to the content covered. By working in groups, they can bring in different perspectives, improve their communication and conflict resolution skills and learn to work effectively in a team. • **Presentation skills**: Students develop the ability to present their ideas and findings clearly and convincingly. They should be able to explain complex concepts and contexts in an understandable way and adapt their presentations to different target groups. This will improve their communication skills and confidence when presenting to others. • **Problem-solving skills**: Students learn to analyze complex problems in connection with application systems and the time-to-customer and time-to-market process chains and to develop solutions. They should be able to identify problems,

	evaluate alternative approaches and make well-founded decisions. In doing so, they can further develop their critical thinking, analytical skills and creativity. • **Interdisciplinary thinking**: Students develop an understanding of the different subject areas that come together in the content of the course, such as business administration, computer science and engineering. They should be able to think outside the box and recognize the interdisciplinary aspects of application systems and process chains. This promotes their holistic thinking and their ability to look at complex problems from different perspectives. • **Project management skills**: Students should learn the basics of project management and be able to apply them. They should be able to plan, organize and monitor projects in connection with application systems and the time-to-customer and time-to-market process chains. This will develop their time management skills, their ability to plan resources and their understanding of how to carry out successful projects.
Contents	**IT Applications:** • Business application systems - basics, management of the digital enterprise, the role of information for the management of companies, company-wide applications • Introduction to the time to market and time to customer process with all building blocks along the process chain **IT Applications Laboratory:** • Monitoring the process flow of an order from acceptance to dispatch with the help of calculation tasks for inventory management, requirements planning and scheduling • Introduction to the basics of PPS and ERP systems • Exercises on the computer with the help of a CAD system (Solid Works)
Literature	**IT Applications:** • Wiendahl Hans -Peter, Wiendahl Hans-Hermann. (2020): Business organization for engineers.9th edition, Hanser: Göttingen • Jodlbauer, H. (2016): Production optimization - value-creating and customer-oriented planning and control. Springer: Vienna. **IT Applications Laboratory:** • Arnold, Heege, Röh, Tussing (2022): Materials management and purchasing. 14th edition, Springer: Mönchengladbach. • Schabacker, Michael (2021). Solidworks for beginners - short and sweet, 5th edition, Springer: Magdeburg
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 90 hours.
Media forms	Lecture with exercises, exercises on the CAD system E-learning units and videos for self-study, accompanying material is made available on the university's own e-learning platform (Moodle).

17. Production Management

"Produktionsmanagement" / "Production Management"	
Code number	BWI10046
Semester of study	3rd semester
Level	Advanced level
Credits	5
SWS	4
Associated courses	BWI10047 Production Management BWI10048 Production Management Exercises
Recommended prerequisites	None
Type(s) of examination, duration (only for PLK/PLM)	Production Management: PLK (60 minutes) Production Management Exercises: UPL
Teaching language	German
Person responsible for the module	Prof. Dr.-Ing. Weyer
Teachers	Production Management: Prof. Dr.-Ing. Production Management Exercises: Prof. Dr.-Ing. Weyer
Assignment to the curriculum	WI/MT, WI/ID - compulsory subject 3rd semester
Teaching forms of the courses of the module	Lecture, laboratory, practical exercises
Goals	The students • understand methods and processes of production management, • deal with the mindset and problems of production planning and production management, • can distinguish between strategic and planning/operational tasks in production planning, • can independently carry out various planning tasks within production management (e.g. line balancing, creation of a material requirement plan (MRP) or layout optimization), • can optimize a production system, • can deal with planning problems and tasks in the production environment and are able to act confidently in the production environment with specialist knowledge.
Interdisciplinary qualification goals	• Ability to work in a team Students learn how to act in a group under pressure in a team exercise and how to systematically implement a solution supported by the team. In doing so, they experience the perception of issues from different perspectives and learn tools for fact-based conflict resolution. • Self-reflection By regularly alternating between lectures and practical exercises based on their content, students have the opportunity to assess their own learning progress and skills development. • Social competence The lecture highlights many instances of how the "human factor" must be taken into account in planning and implementation. This ranges from integration into the strategy process, through the ergonomic provision of work materials, to the calculation of target working times, which must also provide for human needs, such as breaks.

Contents	Students understand the methods and processes of production management and production planning. They apply them and are able to adopt the correct approach to solve problems.
Literature	• Heizer, J., Render, B. (2014): *Operations Management*. Pearson Education: New Jersey. • Slack, N. et al. (2012): *Operations and Process Management - principles and practice for strategic impact*. Pearson: New Jersey. • Thonemann, U. (2011): *Operations Management - Concepts, Methods and Applications*. Pearson: Munich.
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 90 hours.
Media forms	Slides, blackboard work, (laboratory) exercises, demonstration

18. Law

"Recht" / "Law"	
Code number	LAW1300
Semester of study	3rd semester
Level	Advanced level
Credits	5
SWS	4
Associated courses	LAW1301 Contract Management LAW1302 Corporate Law
Recommended prerequisites	None
Type(s) of examination, duration (only for PLK/PLM)	PLK (60 minutes) Module examination
Teaching language	German
Person responsible for the module	Prof. Dr. Lorinser
Teachers	Contract Management: Prof. Dr. Lorinser Corporate Law: Prof. Dr. Lorinser
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 3rd semester
Teaching forms of the courses of the module	Lecture
Goals	Students master the legal principles of contract and liability law, including product liability and product safety and environmental law, as a prerequisite for solving business law and business management problems in the context of the professional tasks of an industrial engineer.
Interdisciplinary qualification goals	Independent development of case exercises (self-reflection), partly in group work (teamwork) and presentation of solutions (free speaking) as well as joint development of solutions.
Contents	• Civil law - closure of contracts, general terms and conditions, representation, etc., contract performance and performance disruptions, contractual and non-contractual liability • Fundamentals of product safety and environmental law
Literature	• Text editions of the German Civil Code (BGB) and the German Commercial Code (HGB), e.g. Deutscher Taschenbuch Verlag: Munich. • Gildeggen, R. et al. (current edition): *Wirtschaftsprivatrecht - Kompaktwissen für Betriebswirte.* Oldenbourg: Munich. • Eisenberg, C. et al. (current edition): Product Liability Law
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 90 hours.
Media forms	Blackboard work, worksheets, e-learning modules, interactive forms of teaching

19. Production

"Production" / "Production Engineering & Manufacturing"	
Code number	BWI10052
Semester of study	4th semester
Level	Advanced level
Credits	6
SWS	4
Associated courses	BWI10053 Production 1 BWI10054 Production 2 BWI10055 Production 1 Laboratory
Recommended prerequisites	Materials Science Physics Manufacturing Technology Technical Mechanics Production Management
Type(s) of examination, duration (only for PLK/PLM)	PLK (60 minutes) Module examination Production 1 Laboratory: UPL
Teaching language	German
Person responsible for the module	Prof. Dr.-Ing. Saile
Teachers	Production 1: Prof. Dr.-Ing. Saile Production 2: Prof. Dr.-Ing. Saile Production 1 Laboratory: Prof. Dr.-Ing.
Assignment to the curriculum	WI/MT, WI/ID - compulsory subject 4th semester
Teaching forms of the courses of the module	Lecture with discussion, laboratory
Goals	The students • are familiar with the basic design principles in product development with regard to automation-compatible assembly, • can recognize different functional groups of an automated product assembly and make the appropriate selection of automation components depending on the work task, • know modern organizational forms of production and factory operation, • understand the importance of the production system in connection with the product characteristics and the planning premises, • understand the basic functioning of control loops in both the technical and organizational context of a production plant.
Interdisciplinary qualification goals	The students • learn how to work on complex issues in a team using group exercises • reflect on their own growth in knowledge through regular entry tests and classification of their level of knowledge on the basis of a matrix of relevant terms • improve communication skills in connection with technical issues by reflecting on the results of practical laboratory exercises.
Contents	**Production 1, Production 1 Laboratory:** • Lean Production • Electropneumatics • Electrical measurement technology • Assembly technology • Thermography • Human-robot collaboration

	• Control engineering **Production 2:** • Assembly technology • Robotics • Sensors • Transfer systems • Workpiece carrier • Feeding technology
Literature	**Production 1:** Brenner, Jörg (2016) Lean Production, ISBN 978-3-446-45028-8 **Production 1 Laboratory and Production 2:** Automation technology, fundamentals, components and systems for Industry 4.0, Europa-Verlag, 2021, ISBN 9783808551653
Workload	Workload: 6 ECTS x 30 hours = 180 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 120 hours.
Media forms	Lecture with discussion, practical exercises in the laboratory on machines and experimental setups

20. Logistics and Controlling

"Logistik und Controlling" / "Logistics and Management Accounting"	
Code number	BWI10056
Semester of study	4th semester
Level	Advanced level
Credits	6
SWS	4
Associated courses	BWI10057 Logistics BWI10058 Controlling 1
Recommended prerequisites	None
Type(s) of examination, duration (only for PLK/PLM)	PLK (60 minutes) Module examination
Teaching language	German or English
Person responsible for the module	Prof. Dr. Binder
Teachers	Logistics: Prof. Dr.-Ing. Weyer / Prof. Dr. Peter Controlling 1: Prof. Dr. Binder
Assignment to the curriculum	WI/MT, WI/ID - compulsory subject 4th semester
Teaching forms of the courses of the module	Lecture with discussion
Goals	**Logistics:** Students master the important basics of logistics in the areas of micro- and macrologistics. The basics of these areas are explained and concepts, methods and technical implementations are developed using practical case studies. Furthermore, students have the skills to design processes and strategies along the entire value chain. Participants learn about the entirety of logistics business processes. **Controlling 1:** Students learn how to think and act as a management accountant. They are familiar with the methods and procedures of a controller and their use in the company and can assess the benefits and limitations of the instruments.
Interdisciplinary qualification goals	The students • can work on the case studies in a team, • can present team results systematically and appropriately. • develop social skills, • solve case study tasks in presentation software exercises independently and develop self-reflection in the process
Contents	**Logistics:** • Logistics definitions, logistical thinking, importance and perspectives of procurement logistics • International procurement logistics, process design in purchasing, sourcing strategies, supplier management, supplier selection and evaluation, supplier controlling • Interaction between procurement, production and distribution logistics • Macrologistics and transportation logistics, international significance of means of transport, trade-offs in transportation decisions

	Controlling 1: As part of the course, students first learn the basic concepts and basic instruments as well as the procedural and organizational issues of controlling. Students then learn how the achievement of a company's objectives can be measured with the help of key figures and key figure systems.
Literature	**Logistics:** • Chopra, S. (2018): *Supply Chain Management: Strategy, Planning, and Operation.* 7th Edition. Pearson: London. • Heizer, J., Render, B. (2016): *Operations Management*. Global Edition, 11th Edition, Pearson: London. • Van Weele, A. J. (2014): *Purchasing and Supply Chain Management*. 6th Edition, Cengage Learning: London. • Handfield, R. B., Monczka, R. M., Giunipero, L. C., Patterson, J. L. (2016): *Sourcing and Supply Chain Management.* 6th Edition, Cengage Learning: Florence KY. • Lecture notes of the lecturer (Participants are asked to register for the course "Logistics 1" and "Introduction to Controlling 1" in e-learning (Moodle) and to download the current lecture notes as a PDF). **Controlling 1:** • Horvath P. (2020), Controlling, 14th ed., Vahlen: Munich, 2020 • Joos-Sachse, T. (2014): *Controlling, cost accounting and cost management*. 5th ed., Gabler: Wiesbaden. • Weber, J., Schäffer, U. (2016): *Introduction to management accounting.* 15th edition, Schäffer-Poeschel: Stuttgart.
Workload	Workload: 6 ECTS x 30 hours = 180 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 120 hours.
Media forms	PowerPoint, e-learning (Moodle), lecture with numerous case studies and practical exercises incl. presentation software

21. Product Development and Design

"Produktentwicklung und Design" / "Product Development and Design"	
Code number	BWI10092
Semester of study	4th semester
Level	Advanced level
Credits	6
SWS	4
Associated courses	BWI10093 Methods of Product Development with Laboratory BWI10094 Freehand Drawing
Recommended prerequisites	none
Type(s) of examination, duration (PLK, PLM only)	Methods of Product Development with Laboratory: PLH/PLK/PLP/PLR (45 minutes) Freehand Drawing: PLP/PLH/PLR
Teaching language	Methods of Product Development with Laboratory: German or English Freehand Drawing: German
Person responsible for the module	Prof. Dr.-Ing. Woidasky
Teachers	Methods of Product Development with Laboratory: Prof. Dr.-Ing. Freehand Drawing: N.N. (Faculty of Design)
Assignment to the curriculum	WI/ID - compulsory subject 4th semester
Teaching forms of the courses of the module	Lecture with discussion, group discussions, short research and presentation units, joint development of content, practical laboratory work, drawing course
Goals	**Methods of Product Development with Laboratory:** The students are able to, • structure the product development process, assign specific activities to the individual steps and pursue design-to-X approaches, • apply methods of product development and quality assurance (including creativity methods, FMEA, QFD, modeling, cost management), • describe and evaluate products and processes from a sustainability and cost perspective. **Freehand Drawing:** Students learn conscious design, strategic drawing and visual communication in this practice-oriented and experimental drawing course. They are able to visually represent and communicate the creative process of idea generation and further development.
Interdisciplinary qualification goals	**Methods of Product Development with Laboratory:** Ability to work in a team through group discussions and, above all, by working on laboratory questions in groups, including documentation of results, organizational skills through self-organized work processes in the laboratory **Freehand Drawing:** Self-reflection through group and individual feedback and discussions as well as presentations of results; appreciative interaction and teamwork skills through group discussions
Contents	**Methods of Product Development with Laboratory:** • Methods of PD: Munich Product Concretization Model (MKM) or comparable approach, such as SPALTEN

	• Sustainable PD 3: Exemplary development of a product, preferably in cooperation with external partners. • (corporate) partners • Value-based PD: cost management in product development; life cycle costs • Energy management: System approach: Energy and Energy Management; Energy transition in Germany; Energy efficient Production and use of goods • Lightweight design as a driver of innovation: improving energy efficiency and emissions of GHG • Innovative energy efficient techniques in production, transport or storage of energy • Material efficiency and circular economy **Freehand Drawing:** The course includes a theoretical introduction to the material, approaches and techniques, light and shadow, perspective, proportion, composition, visual communication and practical exercises. Students train conscious observation as well as experimental and technical drawing, including presentation of work and joint retrospectives.
Literature	**Methods of Product Development with Laboratory:** • Ulrich, K. T., Eppinger, S. D. (2012): *Product Design and Development.* McGraw-Hill: New York. • Pahl, G., Beitz, W. et al. (2007): *Konstruktionslehre - Grundlagen erfolgreicher Produktentwicklung. Methods and applications.* Springer: Berlin, Heidelberg. • Gausemaier, J. et al. (2011): *Produktinnovation - Strategische Planung und Entwicklung der Produkte von morgen.* Hanser: Munich. • Warnecke, H. J., Bullinger, H. J. (2003): *Economic efficiency calculation for engineers.* Hanser: Munich. **Freehand Drawing:** • Viebahn, U.: *Technical freehand drawing*. Springer Vieweg Berlin, Heidelberg, 2017; https://doi.org/10.1007/978-3-662-54654-3 • Afflerbach, F.: Basics freehand drawing. Birkhäuser Publishing House, 2014
Workload	Workload: 6 ECTS x 30 hours = 180 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 120 hours.
Media forms	Slides, blackboard work, online resources for editing, (laboratory) exercises, demonstrations; group discussions, practical drawing work

22. Technical Sales

"Technischer Vertrieb" / "Technical Sales"	
Code number	BWI10062
Semester of study	4th semester
Level	Advanced level
Credits	6
SWS	4
Associated courses	BWI10062 International Technical Sales BWI10064 Customer Relationship Management
Recommended prerequisites	Business Administration I Business Administration II
Type(s) of examination, duration of examination (only for PLK/PLM)	International Technical Sales: PLK (60 minutes) Customer Relationship Management: PLH/PLP
Teaching language	German
Person responsible for the module	Prof. Dr.-Ing. Bührer
Teachers	International Technical Sales: Prof. Dr.-Ing. Bührer Customer Relationship Management: Prof. Dr. Kölmel
Assignment to the curriculum	WI/MT, WI/ID - compulsory subject 4th semester
Teaching forms of the courses of the module	Lecture with discussion
Goals	**International Technical Sales:** Students are familiar with the basic concepts and instruments as well as an understanding of marketing as a management concept for companies. They are familiar with the special features of international marketing, industrial goods marketing and technical sales. **Customer Relationship Management:** The aim of the course is to provide students with an in-depth and advanced understanding of customer relationship management. The focus is on opportunities and challenges in data-driven companies. Customer relationship management is to be understood as a strategic approach that is used for the complete planning, control and implementation of all interactive processes with customers. CRM encompasses the entire company and the entire customer life cycle and the corresponding CRM software as a management tool. Students are able to evaluate customers using various methods (Customer Lifetime Value (CLV), Recency, Frequency, Monetary Value (RFM)) and to plan and implement CRM campaigns. You will learn how to handle data available in companies (legally, methodically, strategically).
Interdisciplinary qualification goals	Students deepen their communication skills in English and strengthen their ability to work together ad hoc in teams and different constellations in group tasks. They are able to use case studies to analyze situations in the marketing of technical products and design their own solutions, particularly for the appropriate use of communication tools.
Contents	**International Technical Sales:**

	• Introduction and basics: marketing terms, marketing concepts, especially for capital goods and technology companies • Product policy • Pricing policy • Communication policy • Special features of technical sales in relation to the various business types in industrial goods marketing **Customer Relationship Management:** This course deals with aspects of the development and design of value-adding relationships between customers and companies. Conceptual and methodological principles of Customer Relationship Management (CRM/Customer Management) are presented. Furthermore, selected current topics, concepts and instruments are dealt with in depth and a case study is worked on in groups and presented before the course. Participants receive a comprehensive overview of the planning, management, implementation and controlling of customer relationships. The following topics, among others, are covered in the course: • Introduction, overview, basics and methods of CRM • CRM concepts and tools (customer experience management, journey mapping, lift, RFM, CLV, campaign management, personas, segmentation, CHAID, etc.) • Management and controlling in CRM
Literature	**International Technical Sales:** • Backhaus, K., Voeth, M. (2014): Industriegütermarketing: Grundlagen des Business-to-Business Marketing. 10th ed., Vahlen: Munich. • Backhaus, K., Voeth, M. (2010): International Marketing. 10th ed., Schäffer-Poeschel: Stuttgart. • Kotler, P. et al. (2016): Fundamentals of Marketing, Pearson: Hallbergmoos. • Nieschlag, R., Dichtl, E., Hörschgen, H. (2002): Marketing. 19th ed., Duncker & Humblot: Berlin. **Customer Relationship Management:** • Buttle, F., Maklan, S. (2015): Customer Relationship Management - Concepts and Technologies. Routledge: USA • Kumar, V., Reinartz, W. (2018): Customer Relationship Management. Springer: Berlin, Heidelberg.
Workload	Workload: 6 ECTS x 30 hours = 180 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 120 hours.
Media forms	The module consists of three teaching and learning formats (lectures; speed research; case study) and follows an interactive approach, using PowerPoint, blackboard work, video and print media as illustrative material.

23. Elective Module 1

The elective specializations available will be posted in advance. Participation can be restricted.

"Wahlvertiefung Modul 1" / "Major Elective Module 1"	
Code number	BWI10065
Semester of study	4th semester
Level	Advanced level
Credits	6
SWS	4
Associated courses	Subject to the current semester course offer
Recommended prerequisites	Content from the previous semesters; if an English-language subject is chosen, English at level B2.
Type(s) of examination, duration of examination (only for PLK/PLM)	PLH/PLK/PLP/PLR
Teaching language	German or English
Person responsible for the module	The head of the study program or the module coordinator of the chosen specialization
Teachers	Subject to the selected module
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 4th semester (adapted elective specializations determined by the study program)
Teaching forms of the courses of the module	Possible course formats are seminar-based teaching, lecture or project determined by the chosen specialization
Goals	Determined by the chosen specialization
Interdisciplinary qualification goals	Determined by the chosen specialization
Contents	Determined by the chosen specialization
Literature	The literature depends on the courses of the chosen specialization and is published in the respective syllabi of the courses before the start of the lecture period.
Workload	Workload: 6 ECTS x 30 hours = 180 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 120 hours.
Media forms	Determined by the selected courses

24. Academic Education and Methods

"Wissenschaftliche Bildung und Methoden" / "Academic Education and Methods"	
Code number	BWI10066
Semester of study	5th semester
Level	Advanced level
Credits	5
SWS	4
Associated courses	BWI10067 Academic Seminar BWI10068 Academic Work
Recommended prerequisites	None
Type(s) of examination, duration of examination (only for PLK/PLM)	General Academic Seminar: UPL Academic Work: UPL
Teaching language	Academic Seminar German and English Academic Work: German
Responsible for the module	Prof. Dr. Mahadevan
Teachers	Academic Seminar: Prof. Dr. Mahadevan Academic Work: Prof. Dr. Martin, Dr. Frank
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 5th semester
Teaching forms of the courses of the module	Workshops, e-learning, practical exercises
Goals	**Academic Seminar:** Students work independently on general academic topics and also use these to develop their individual study profile. They demonstrate both by submitting corresponding assignments. **Academic Work:** Students are familiar with the requirements and characteristics of academic work and the demands placed on academic work. They are able to approach a problem scientifically, investigate it systematically and write a scientific paper independently, taking into account the formal criteria.
Interdisciplinary qualification goals	**Academic Seminar:** • Self-reflection is trained through learning reports = central element of the subject, for all students • Social skills are trained through certain activities, e.g. holding tutorials, depending on the profile • Teamwork skills are trained through certain activities, e.g. co-organization of a specialist event or conference, depending on the profile **Academic Work:** • Includes units on self-reflection, e.g. scientific writing and reflection on research • Includes group work to train the ability to work together in scientific teams
Contents	**Academic Seminar:** • Ability to work independently • Task-oriented work • Summary and communication of general scientific content • Individual profiling **Academic Work:** • Identify and formulate the problem

	• Develop research question • Characteristics and style of academic writing • Sources: researching, evaluation, citing • Structure, outline and formal requirements of an academic paper • Tables and figures • Planning and reviewing your own work
Literature	**Academic Seminar:** Will be announced in the seminar **Academic Work:** • Theisen, M. R. (2011): *Scientific work. Technique - Methodology - Form.* 15th ed., Vahlen: Munich. • Franck, N., Stary, J. (2011): *The technique of scientific work: A practical guide.* 16th ed., UTB/Schöningh: Paderborn et al.
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, practical exercises, preparation for and completion of the exam: 90 hours.
Media forms	Presentations, e-learning, practical exercises

25. Internship

"Internship semester" / "Internship"	
Code number	BWI10068
Semester of study	5th semester
Level	Advanced level
Credits	25
SWS	At least 100 attendance days in a company
Associated courses	None
Recommended prerequisites	Courses from semesters 1-4 In particular, completion of 1st stage of studies
Type(s) of examination, duration (PLK, PLM only)	UPL
Teaching language	German or English
Person responsible for the module	The internship supervisors are responsible: Assignment according to WI homepage/internship semester
Teachers	Not applicable
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 5th semester
Teaching forms of the courses of the module	Practice/training
Goals	Students can apply and deepen the knowledge acquired in their previous semesters in an industrial and business setting. The activities and working methods of industrial engineers are experienced in everyday life and can be correlated with the theoretical subject matter. Students enhance their experience in terms of methodological and social skills, learn about technological, commercial and organizational contexts and increase their understanding of business processes. They learn how to work on specific tasks and projects in a team together with other company employees and how to integrate themselves into the company hierarchy. Students are able to reflect on what they have learned in theory and in practice and thus get a clear picture of where they want to work in the future. . The practical experience and the feedback also enable students to choose a suitable topic for their thesis and their subsequent career.. Ultimately, the internship also paves the way for a good start in their career .

Interdisciplinary qualification goals	Information on the contribution of the module or the individual courses to
	• Social skills
	  ○ Working in operational structures
	  ○ Interaction with other company levels
	  ○ Interaction in the customer/supplier relationship
	  ○ Ability to engage in dialog
	  ○ Critical thinking
	  ○ Interpersonal skills
	• Self-reflection
	  ○ Self-positioning in the WI professional spectrum
	  ○ Successful performance within company structures
	  ○ Self-assessment of specialist knowledge and skills
	• Ability to work in a team
	  ○ Teamwork in the corporate context

	○ Teamwork for external requirements
Contents	The internship should be aligned to the study program and focus on the application of the theoretical knowledge acquired during the course, as well as familiarizing students with the processes and structures of a company. . Both technical and business activities can be carried out, whereby the activities at the interface between the two areas are particularly suited to the aims of the internship. Ongoing contact with the respective supervisor in the company ensures that the students gain sufficient insight into business and/or technological operational contexts through a qualified employee. The internship is an integrated part of the study program. The university regulates the internship and determines its contents. It is intended to provide students with practical experience and knowledge to supplement the study program content. The internship comprises at least 20 weeks (100 attendance days) in a company or other professional practice institution (practical placement). The student must prepare a detailed written report on the internship, demonstrating that the required content and activities were actually completed in the company.
Literature	Subject to the topic
Workload	25 ECTS x 30 hours = 750 hours = 100 days of 7.5 hours each.
Media forms	Not applicable

26. Elective Subjects

Students must acquire 6 credits from courses taken from the compulsory electives catalog of the study program, which is posted on the notice board. The modules/subjects must be selected in consultation with the head of the study program. Participation may be limited by the study program.

"Elective subjects" / "Electives"	
Code number	BWI10070
Semester of study	6th semester
Level	Advanced level
Credits	6
SWS	4
Associated courses	Subject to the current semester course offer
Recommended prerequisites	Content from the previous semesters; if an English-language subject is chosen, English at level B2.
Type(s) of examination, duration (only for PLK/PLM)	PLH//PLK/PLP/PLR
Teaching language	German or English
Person responsible for the module	The program director
Teachers	Subject to the courses selected
Assignment to the curriculum	WI/MT, WI/ID, WI/CEE, WI/IMo - compulsory subject 6th semester
Teaching forms of the courses of the module	Determined by the courses selected, possible course formats are seminar-based teaching, lectures or projects.
Goals	Determined by the courses selected
Interdisciplinary qualification goals	Determined by the courses selected
Contents	Determined by the courses selected
Literature	The literature is determined by the selected courses and is published in the respective syllabi of the courses before the start of the lecture period.
Workload	Workload: 6 ECTS x 30 hours = 180 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 120 hours.
Media forms	Determined by the selected courses

27. Project Methods and Creativity

"Project Methods and Creativity" / "Project in Methods and Creativity"	
Code number	BWI10071
Semester of study	6th semester
Level	Professionally qualifying academic level
Credits	6
SWS	4
Recommended prerequisites	First study stage completed
Type(s) of examination, duration (PLK, PLM only)	PLH/PLP/PLR
Teaching language	German
Person responsible for the module	Prof. Dr. Kölmel
Teachers	Prof. Dittmann, Dr. Heinemeyer, Prof. Dr. Bulander, Prof. Dr. Kölmel
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 6th semester
Teaching forms of the courses of the module	Seminar-based teaching
Goals	• Development of skills for planning, implementing and monitoring projects: Students should be able to define projects, set goals, create schedules and milestones and allocate resources. They should become familiar with various project methods and learn how to apply them according to the respective requirements. • Promoting creativity: Students should learn to use their creativity to find innovative solutions to complex problems. They should become familiar with various creativity techniques and learn how to apply them in projects. • Development of teamwork skills: Students should learn to work effectively in teams and achieve goals together. In doing so, they should learn how to communicate effectively, delegate tasks and resolve conflicts. • Improving self-reflection: Students should learn to reflect critically on their own skills and methods and to optimize their working methods. In doing so, they should reflect on and evaluate their decision-making processes and creative methods. • Presentation skills: Students should learn to communicate the results of their work in the form of presentations. In doing so, they should learn how to present information effectively and attractively and obtain feedback from others. • Development of problem-solving skills: Students should learn how to identify, analyze and solve problems. They should become familiar with various problem-solving methods and learn how to apply these to complex problems. • Promoting entrepreneurial thinking: Students should learn how to transform innovative ideas into marketable products or services. In doing so, they should understand the importance of market and customer orientation and learn how to create business models.
Interdisciplinary qualification goals	The course Project Methods and Creativity makes an important contribution to the development of social skills, self-reflection and the ability to work in a team.

	• Social skills: The course involves group work, discussions and team projects that help participants improve their collaboration, conflict management and communication skills. They learn how to work effectively in teams, deal with different personalities and communicate effectively. • Self-reflection: The course includes exercises for self-reflection, e.g. through feedback from other participants or by critically examining their own mistakes. Participants learn how to reflect on and improve their own behavior and thought processes. • Teamwork skills: In this course, participants will work in teams to plan, implement and present projects. In doing so, they will learn how to work effectively with others and how to contribute their strengths and weaknesses to a team. They will also learn how to utilize the different skills and perspectives of team members to develop creative and innovative solutions.
Contents	Guided project in which a complex task is worked on in defined milestones (research/analysis, concept, prototype, implementation). The objectives are • Technical project management: definition of technical projects, project phases, project management methods and techniques in the technical field, project planning and monitoring, risk management. • Creativity in the technical field: definition of creativity in the technical field, creativity factors in technical projects, creativity techniques in the technical field, application of creativity techniques in technical project work. • Teamwork: basics of teamwork, team dynamics, team building, team meetings, conflict management in the technical field, cooperation and communication • Technical problem solving techniques: Analysis of technical problems, problem solving techniques such as troubleshooting, design thinking in the technical field, technical brainstorming and mind mapping. • Technical decision making: Definition of decisions, decision-making methods, decision-making processes, decision-making strategies and techniques. • Technical entrepreneurship: basics of entrepreneurship, development of technical business ideas, creation of business models in the technical field.
Literature	• Ries, E., Böhme, E., et al. (2018): The Startup Way: The toolkit for the 21st century that every business can use to succeed. Vahlen: Munich. • Eppler, M. J., Hoffmann, F., & Pfister, R. A. (2017). Creability: Creative together - innovative methods for idea development in teams. Schäffer-Poeschel. • Fox, D., Püttmann, T. et al. (2018): Build, experience, understand: fischertechnik models for makers. dpunkt: Heidelberg. • Lewrick, M., Link, P., & Leifer, L. (2017). The Design Thinking Playbook: With traditional, current and future success factors. Vahlen. • Becker, J., Schwaderlapp, W., & Seidel, S. (2012). Management of creativity-intensive processes: Theories, methods, software and their application. Springer-Verlag.
Workload	Workload: 6 ECTS x 30 hours = 180 hours Attendance time: 4 SWS x 15 weeks = 60 hours

	Preparation/follow-up, exercises, project work, preparation and examination: 120 hours.
Media forms	Project work, assessed milestone presentations and project meetings

28. Management Focus Module

The respective Management[1]focus modules are announced via list/notices. Participation can be limited by the study program.

"Management Focus Module" / "Management Elective"	
Code number	BWI10073
Semester of study	6th semester
Level	Advanced level
Credits	6
SWS	4
Associated courses	Determined by the current semester course offer
Recommended prerequisites	Content from the previous semesters; if an English-language subject is chosen, English at level B2.
Type(s) of examination, duration (only for PLK/PLM)	PLH/PLK/PLP/PLR (60 minutes) Module examination
Teaching language	German or English
Person responsible for the module	Head of study program or the module coordinator of the selected specialization module
Teachers	Determined by the choice of module
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - Compulsory subject 6th semester (Adapted focus modules for each study program)
Teaching forms of the courses of the module	Determined by the courses chosen, seminar-based teaching, lecture or project
Goals	Students acquire in-depth knowledge within the framework of self-selected specialization subjects from the field of management. Courses in this module contribute to the fulfillment of the Qualifications Framework for Industrial Engineering and Management - Management component.
Interdisciplinary qualification goals	Determined by the selected courses
Contents	The contents are determined by the courses selected from the "Management Focus Modules" elective list and are published in the syllabi of the courses before the start of the lecture period.
Literature	The literature is determined by the selected courses of the elective list "Focus Modules Management" and will be published in the syllabi of the courses before the start of the lecture period.
Workload	Workload: 6 ECTS x 30 hours = 180 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 120 hours.
Media forms	Determined by the selected courses

[1] *A list of the possible focus modules in the Management study program will be published in a list/attachment. It can also be viewed at the study program management assistant's office. One focus module (4 SWS, 6 credits) from the "Management Focus Modules" elective list must be taken.*

29. Advanced Module Innovation and Design

Innovation and Design is a compulsory module. Participation in the specialization module can be limited by the study program.

"Innovation und Design" / "Innovation and Design"	
Code number	BWI10095
Semester of study	6th/7th semester
Level	Professionally qualifying academic level
Credits	12
SWS	8
Associated courses	BWI10096 Sustainable Product Development BWI10097 Product Design BWI10098 Innovation Project
Participation requirements according to SPO	First study stage completed
Recommended prerequisites	None
Type(s) of examination, duration (only for PLK/PLM)	PLH/PLK/PLP/PLR (60 minutes) per course
Planned group size	Max. 25 students
Teaching language	Sustainable Product Development: German or English Product Design: German Innovation Project: German or English
Person responsible for the module	Prof. Dr. Kölmel
Lecturers	Sustainable Product Development: Prof. Dr.-Ing. Woidasky Product Design: Prof. Gerlach / N. N. (Faculty of Design) Innovation Project: Prof. Dr. Kölmel, Prof. Dr. Kühn, Prof. Dr.-Ing. Hinderer, N.N. (two lecturers per semester)
Assignment to the curriculum	WI/ID - compulsory subject 6th/7th semester
Teaching forms of the courses of the module	Seminar-based teaching
Goals	**Sustainable Product Development:** Students know the basic procedure for developing products. They are familiar with the concept of sustainability and can apply it to industrial issues relating to products and processes. They can assess products and processes in terms of their environmental and sustainability impact. They are able to independently create a test protocol. **Product Design**: Students recognize the connections between form, function, usability and meaning. They understand different formal systems and are able to recognize the principles behind these systems and put them into practice in their own work. They are able to implement their personal ideas of form and appearance, taking into account the findings of perception theory. They are able to establish and critically reflect on criteria for their design. **Innovation Project:** Students are able **to** develop and evaluate innovative ideas and formulate them as concepts. They understand that the selection of an idea depends on its chances of success on the market. Concepts are implemented as visual, functional or interactive

	prototypes. Ideas and concepts are reflected on in the group in order to adopt mutual perspectives, recognize problems in dialogue with others and redefine approaches to solutions
Interdisciplinary qualification goals	The specialization contributes to various interdisciplinary qualification goals, including the development of social skills, self-reflection and the ability to work in a team. The specialization contributes to the development of social skills by giving students the opportunity to work together in group projects and learn various communication and collaboration techniques. In particular, the focus on sustainable product development means that students learn how to incorporate social and environmental factors into product development and thus gain a better understanding of the needs and requirements of different interest groups. The specialization contributes to the development of self-reflection by giving students the opportunity to evaluate their own contributions to group projects and receive feedback from other group members. Students also use creative methods to reflect on and evaluate their own decision-making processes. The specialization contributes to the development of teamwork skills by giving students the opportunity to work together in group projects and learn different techniques for conflict resolution and collaboration. The integration of sustainable aspects into product development requires a team-based approach, as different areas of expertise and perspectives are needed to find innovative, sustainable solutions. Therefore, students learn how to work effectively in interdisciplinary teams and improve their teamwork skills.
Contents	**Sustainable Product Development:** Fundamentals and history of sustainability, sustainability concept, fundamentals of product development, development methodologies such as Stage-Gate, VDI 2221; legal requirements for product development, definition of "quality", functions, functional models, quality function deployment, FMEA, Design for X, etc. Design for recycling, lightweight construction; securing raw materials, recycling rates, selected examples of recycling cycles; production and recycling of important materials (e.g. glass, PET, steel); life cycle analysis, environmental impact categories, simplified life cycle analysis, eco labels, environmental protection approaches; reliability and service life: basics, concepts, obsolescence; introduction to standardization activities, development of standards **Product Design:** Development of a design project in selected work steps from the following catalog: • Research and creation of the criteria • Team building and decision-making processes • Ideation and use of creativity and design techniques • Idea sketch phase until selection of preferred variant • Design to selection Keysketch • Detailed design • Preparation of the final presentation describing the design • Brief presentation and next steps **Innovation Project:**

	The students develop an innovation project between technology and business. Materials are created in the accompanying process steps, and the social, economic and ecological relevance is addressed. Students also make an initial assessment of the marketability of the innovation. The project prepares students for an interdisciplinary working environment in which it is no longer just a question of specialist expertise, but also of what happens with this knowledge, which problems are taken into consideration and what solutions they contribute to.
Literature	**Sustainable Product Development:** • Scholz, U., Pastoors, S., Becker, J., Hofmann, D., & Van Dun, R. (2018). Practical handbook on sustainable product development. Springer eBooks • Engeln, W. (2011): Methods of product development. Oldenbourg Industrieverlag: Munich. • Ophey, L. (2005): Development management - Methods in product development. Springer eBooks. • Ponn, J. and Lindemann, U. (2011): Concept development and design of technical products. Springer: Berlin. • Ehrlenspiel, K. (2009): Integrated product development. Hanser: Munich **Product Design:** • Bernhard E. Bürdek (2015): Design: History, theory and practice of product design, Birkhäuser, 2015 • Gerhard Heufler (2012) Design Basics, From the idea to the product, Niggli • Oerkermann, G. (2015). Sustainable product design. Springer eBooks **Innovation Project:** • Kröll, M. (2020). Designing innovation projects and organizational change professionally: Theory of reflection and reflective competence. Springer-Verlag. • Michael Lewrick & Patrick Link & Larry Leifer: The Design Thinking Playbook; Wiley (2018) • Großklaus, Rainer H. G.: From the product idea to market success. - 2nd ed. 2014. - Wiesbaden : Gabler Verlag, (2014). http://dx.doi.org/10.1007/978-3-8349-4594-5
Workload	Specification for Sustainable Product Development and Product Design per course: Workload: 3 ECTS x 30 hours = 90 hours Attendance time: 2 SWS x 15 weeks = 30 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 60 hours. Estimate for Innovation Project: Workload: 6 ECTS x 30 hours = 180 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 120 hours.
Media forms	Project work, instructional videos, presentations, interactive exercises, group work and discussions, tasks for individual and group work, keynote speeches, group and panel discussions, individual and group presentations. Slides, graphic and digital drafts and descriptions, tasks for individual and group work, keynote speeches, group and plenary discussions, concrete prototypes

30. Elective Module 2

Elective Module 2 (12 credits) is to be chosen from Modules A and B (see Section III Specialization) and a list that is published for each semester on the election registration date. Elective Module 1 can be a prerequisite for Elective Module 2.

"Wahlvertiefung Modul 2" / "Major Elective Module 2"	
Code number	BWI10099
Semester of study	6th/7th semester
Level	Advanced level
Credits	12
SWS	8
Associated courses	Determined by the current semester course offer
Recommended prerequisites	Content from the previous semesters; if an English-language subject is chosen, English at level B2.
Type(s) of examination, duration (only for PLK/PLM)	PLH/PLK/PLP/PLR
Teaching language	German or English
Person responsible for the module	The head of the study program or the module coordinator of the chosen specialization
Teachers	Determined by the selected module
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 6th/7th semester (adapted elective specializations depending on the study program)
Teaching forms of the courses of the module	Determined by the chosen specialization, possible course formats are seminar-based teaching, lecture or project
Goals	Determined by the chosen specialization
Interdisciplinary qualification goals	Determined by the chosen specialization
Contents	Determined by the chosen specialization
Literature	The literature is determined by the courses of the chosen specialization and is published in the respective syllabi of the courses before the start of the lecture period.
Workload	Workload: 12 ECTS x 30 hours = 360 hours Attendance time: 8 SWS x 15 weeks = 120 hours Preparation/follow-up, exercises, preparation for and completion of the exam: 240 hours.
Media forms	Determined by the selected courses

31. Interdisciplinary Project Work

"Interdisziplinäre Projektarbeit" / "Interdisciplinary Project"	
Code number	BWI10076
Semester of study	7th semester
Level	Professionally qualifying academic level
Credits	4
SWS	4
Associated courses	Interdisciplinary project work
Recommended prerequisites	First stage of studies completed. Lecture on the respective project topic. Passing all examinations of the 2nd stage of studies up to and including the 6th semester if possible
Type(s) of examination, duration (PLK, PLM only)	PLP
Teaching language	German and English
Person responsible for the module	All professors in the department
Teachers	All full-time professors can be examiners
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 7th semester
Teaching forms of the courses of the module	Project
Goals	Students are able to work systematically and scientifically on interdisciplinary tasks and problems in industrial engineering in a team of 2 to 5 students. This includes, for example • data collection and analysis, • the development and evaluation of solutions, • the implementation of a solution, • the documentation and ensuing presentation.
Interdisciplinary qualification goals	As part of the project work, students learn to develop results in a team and present them to their supervisor. They also deal with a specific interdisciplinary problem and its possible solutions. This promotes the application of the content learned during their studies on a professional level and, the deepening of communication and problem-solving skills on a personal level.
Contents	Diverse interdisciplinary topics in which the students • apply economic and engineering knowledge, skills and competencies, • Use standard tools for project management and data analysis, • Plan and implement projects in terms of time, organization and content, • carry out independent research and, if necessary, data collection and analysis, • Document and present progress and results.
Literature	To be chosen by the students.
Workload	Workload: 4 ECTS x 30 hours = 120 hours per student Attendance time = 0 SWS; preparation, literature research, working on the project in a team: 120 hours per student
Media forms	Current literature, lectures, intensive individual supervision by supervisor, final presentation

32. Scientific colloquium

"Fachwissenschaftliches Kolloquium" / "Scientific Colloquium"	
Code number	COL4998
Semester of study	7th semester
Level	Professionally qualifying academic level
Credits	2
SWS	2
Associated courses	None
Participation requirements according to SPO	In the 6th semester at the earliest. All examinations up to and including the 4th semester must be successfully completed.
Recommended prerequisites	Completion of the seminar "Academic Work" in the 5th semester
Type(s) of examination, duration (only for PLK/PLM)	UPL
Teaching language	German and English
Person responsible for the module	All professors in the department
Teachers	All full-time professors can be examiners
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 7th semester
Teaching forms of the courses of the module	Colloquium with individual students. Preparation for the thesis.
Goals	Students should be able to solve complex and wide-ranging tasks independently, methodically and accurately when writing their thesis. The essential elements of scientific work taught during their studies are applied and explored in-depth. Individual weaknesses are recognized and resolved in consultation with the supervising professor. The ability for critical self-reflection is encouraged.
Interdisciplinary qualification goals	Students are able to present complex topics in a differentiated manner from various perspectives and prepare them according to academic standards. They train their analytical thinking skills and critical judgment. They are able to plan and carry out an academic thesis project over a longer period of time and demonstrate their resilience in doing so.
Contents	Depending on the individual student: in particular, subjects in which the individual student or his/her supervising professor recognizes specific shortcomings in the process of writing the thesis; addressing methodological issues.
Literature	Determined by the planned topic of the thesis.
Workload	Workload: 2 ECTS x 30 hours = 60 hours Attendance time: 2 SWS x 15 weeks = 30 hours Preparation and follow-up: 30 hours.
Media forms	No application

33. Bachelor Thesis

"Bachelor-Thesis" / "Bachelor Thesis"	
Code number	THE4999
Semester of study	7th semester
Level	Professionally qualifying academic level
Credits	12
SWS	0
Associated courses	None
Participation requirements according to SPO	The Bachelor's thesis can be registered in the 6th semester at the earliest. All examinations up to and including the 4th semester must have been successfully completed.
Recommended prerequisites	Attendance of the Scientific Colloquium and the seminar "Academic Work". All examinations of the 2nd study stage should have been completed.
Type(s) of examination, duration of examination (only for PLK/PLM)	PLT
Teaching language	German and English
Person responsible for the module	All professors in the department
Teachers	All professors and qualified lecturers can be primary assessors
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 7th semester
Teaching forms of the courses of the module	Not applicable
Goals	The thesis demonstrates that students are able to solve scientific problems independently. They are able to transfer and apply methods and thought processes to solving mostly practical problems within a given period of time. Holistic solutions can be achieved through complex thinking and factual analysis as well as the appropriate retrieval and use of information. Relevant literature must be researched, filtered and evaluated. The topic must be addressed systematically; a line of argumentation must be developed. Students select scientific methods and procedures, apply them and develop them further to solve the problem. Results are critically evaluated using the most recent research. The findings and results are presented by the students clearly and in an academically appropriate form in a written paper.
Interdisciplinary qualification goals	Students are able to present complex topics in a differentiated manner from various perspectives and prepare them according to academic standards. They train their analytical thinking skills and critical judgment. They are able to plan and carry out an academic thesis project over a longer period of time and demonstrate their resilience in the process.
Contents	The Bachelor's thesis is the first major piece of academic work. The topic of the thesis is determined by the primary assessor in consultation with the student and depends on the chosen field andr the specific problem. It must be broadly related to industrial engineering and to the chosen study program in terms of content and cover specialized

	topics or current issues. A suggestion for this often comes from a company.
Literature	Topic-specific literature, to be chosen by the students.
Workload	12 credits x 30 hours = 360 hours.
Media forms	No application

III. Specializations

Students must choose 12 credits (6th semester 6 credits and 7th semester 6 credits), i.e. a compulsory elective module A or B, from the compulsory elective modules of the study program described on the following pages, in consultation with the head of the study program. Participation in the specialization modules can be limited by the study program.

A Logistics

"Logistik" / "Logistics"	
Code number	BWI10082
Semester of study	6th/7th semester
Level	Professionally qualifying academic level
Credits	12
SWS	8
Associated courses	BWI10083 Supply Chain Management BWI10084 Supply Chain Controlling BWI10085 Logistics Management Game BWI10086 International Procurement and Macrologistics
Participation requirements according to SPO	First study stage completed
Recommended prerequisites	Passing the written examination of the "Logistics and Controlling" module is a prerequisite. If there are more than 25 registrations, the grade from the "Logistics and Controlling" module determines participation.
Type(s) of examination, duration (only for PLK/PLM)	Per course: PLH/PLK/PLP/PLR (60 minutes)
Teaching language	Supply Chain Management: German or English Supply Chain Controlling: German Logistics Management Game: German International Procurement and Macrologistics: German or English
Person responsible for the module	Prof. Dr. Peter
Teachers	Supply Chain Management: Prof. Dr. Peter Supply Chain Controlling: Prof. Dr. Binder Logistics Management Game: Prof. Dr. Binder, Prof. Schnell International Procurement and Macrologistics: Prof. Dr. Weyer
Assignment to the curriculum	WI/MT, WI/ID - compulsory elective subject 6th/7th semester
Teaching forms of the courses of the module	Seminar-based teaching
Goals	The students know the important basics of in dustrial engineering in the areas of micro- and macrologistics. The basics of these areas are explained and concepts, methods and technical implementations are developed using practical case studies. Furthermore, skills for designing processes and strategies along the entire value chain are taught. Participants are familiar with logistics business processes and learn how to implement them in interdisciplinary projects in companies and how to prepare and make decisions based on key figures in a business environment. In addition, participants work on selected practical projects to develop logistical solutions.

	The objectives of supply chain controlling relate directly to supporting SCM and controlling. This includes, for example, ensuring logistical processes between the individual players in a supply chain or introducing a joint system of key performance indicators to monitor throughput times.
Interdisciplinary qualification goals	The module contributes to • Social skills and ability to work in a team • Decision-making and structured problem solving. The students in the Logistics Management Game • can work on the presentations for the strategy meeting, the annual press conference and the final presentation in a team, • can present team results systematically and appropriately • develop social skills in the presentation of their role in the management of a printing company • develop their optimal market position in self-reflection during 6 plan periods The students in the subject Supply Chain Controlling • can work on case studies in a team, • can present team results systematically and appropriately. • develop social competence in the presentation of several socially relevant behavioural patterns in case study work with various organizational examples • solve case study tasks in presentation software exercises independently and develop self-reflection in the process
Contents	**Supply Chain Management**: Basics and definition of supply chain management, planning levels of supply chain management, supply chain strategy, supply chain planning, supply chain execution, strategic sourcing in theory and practice. **Supply Chain Controlling**: Planning, management and control of the supply chain with the help of suitable controlling instruments such as processes in activity-based costing, market-oriented costs in target costing, best-practice comparisons in benchmarking, a logistics balanced scorecard and other logistics key figures in controlling. **Logistics Management Game:** Logistics and production management game with strategic and operational elements. The core topic is the optimization of procurement, production and sales logistics. Learners are shown the effects of various (logistics) decisions on the costs and lead times of products. Important topics include make-or-buy decisions, e-commerce and the implementation of internal process optimization. Furthermore, the planning, management and control of a printing company is practiced in various scenarios (strategy presentation to the Supervisory Board, balance sheet press conference, presentation of results to the Supervisory Board and rating event at Sparkasse Pforzheim-Calw). **International Procurement and Macrologistics:** International procurement logistics, process design in purchasing, sourcing strategies, negotiation and negotiation management in procurement logistics, supplier management, location theory and location models, infrastructure equipment and transport management (traffic values and affinities), modes of

	transport and their combination, transport policy (transport regulation and deregulation).
Literature	**Supply Chain Management:** • Heizer, J., Render, B. Munson, C. (2023): *Operations Management*. 14th Edition, Pearson: London. • Van Weele, A., -Rozemeijer, F. (2022): *Purchasing and Supply Chain Management*. 8th Edition, Cengage Learning: London. • Handfield, R. B., Monczka, R. M., Giunipero, L. C., Patterson, J. L. (2020): *Sourcing and Supply Chain Management.* 7th Edition, Cengage Learning: Florence KY. **Supply Chain Controlling:** • Torsten Czenskowsky, Jochem Piontek, "Logistikcontrolling: Marktorientiertes Controlling der Logistik und der Supply Chain", 2nd updated and expanded edition, Deutscher Betriebswirte-Verlag, Gernsbach 2012, ISBN 978-3-88640-153-6 • Jürgen Weber, Hannes Blum, "Logistik-Controlling: Konzept und empirischer Stand", Wiley-VCH, Weinheim 2005, ISBN 3-527-50164-9 • International Council on Clean Transportation: http://www.theicct.org/ **Logistics Management Game:** • TOPSIM Logistics seminar documents are provided by the seminar leader. • Binder B.C.K., Dietrich M., Wenzel A. (2014), Performance measurement for earnings and liquidity management, in: Schwägele S., Zürn B., Trautwein F. (eds.), Planspiele - Erleben was kommt, ZMS-Schriftenreihe 5, 103 - 116 • Jürgen Weber, Carl Marcus Wallenburg: "Logistik- und Supply-Chain-Controlling", 6th completely revised edition, 2010, Schäffer Poeschel, Stuttgart 2010, ISBN 978-3-7910-2656-5 **International Procurement and Macrologistics:** • Lecture notes devised by the lecturer
Workload	Details per course: Workload: 3 ECTS x 30 hours = 90 hours Attendance time: 2 SWS x 15 weeks = 30 hours. Preparation/follow-up, exercises, preparation for and completion of the exam: 60 hrs.
Media forms	PowerPoint, e-learning (Moodle), negotiation simulation

B International Technical Sales

"Internationaler Technischer Vertrieb" / "International Technical Sales"	
Code number	BWI10087
Semester of study	6th/7th semester
Level	Professionally qualifying academic level
Credits	12
SWS	8
Associated courses	BWI10088 International Marketing BWI10089 Business Plan and Business Models BWI10090 International Technical Sales 3 BWI10091 Marketing Simulations
Participation requirements according to SPO	1st study stage completed
Recommended prerequisites	Successful participation in the course International Technical Sales
Type(s) of examination, duration of examination (only for PLK/PLM)	Per course: PLH/PLK/PLP/PLR (60 minutes)
Teaching language	German or English
Person responsible for the module	Prof. Dr.-Ing. Bührer
Teachers	International Marketing: Prof. Dr.-Ing. Bührer Business Plan and Business Models: Prof. Dr.-Ing. Hinderer International Technical Sales 3: Prof. Dr.-Ing. Bührer Marketing Simulations: Prof. Dr.-Ing. Hinderer
Assignment to the curriculum	WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo - compulsory subject 6th/7th semester
Teaching forms of the courses of the module	Seminar-based teaching
Goals	Students know the fundamentals of marketing in the areas of international marketing, market re search and technical sales. The basics of these areas are explained and consolidated, and concepts, methods and technical implementations are developed using practical case studies. Students are able to apply findings from environmental analysis and market research in proposals for business model design and successful market development. In addition, participants work on selected practical projects to develop marketing-specific solutions.
Interdisciplinary qualification goals	Students strengthen their ability to work together on group tasks ad hoc in teams and in different constellations. They are able to use case studies to analyze situations in the marketing of technical products and design their own solutions, especially for the appropriate use of communication tools.
Contents	**International Marketing:** Cultural environment of global marketing, international business activities andmmultinational market groups, corporate context of Marketing. **Business Plan and Bsiness Models:** Students independently develop business models and business plans for specific projects or business ideas. Aspects of product and service development, market research, marketing and corporate planning are brought together.

	International Technical Sales 3: International capital goods and services marketing, analysis of international markets and derivation of market entry and market development strategies using real case studies based on sound market research. Preparation of international sales situations. **Marketing Simulations:** Simulation of realistic cases from the perspective of market-oriented corporate management designed as a simulation (possibly also as a business simulation) in which the participants make marketing decisions independently. All marketing mix elements are applied in specific company situations within the framework of a simulated market with competing companies. For example, communication campaigns are designed to support a specific sales situation. The participants have to justify their marketing and sales-specific decisions.
Literature	**International Marketing:** • Usunier, J. (2000): *Marketing Across Cultures.* 4th ed., Prentice Hall: Harlow. • Backhaus, K., Büschken, J., Voeth, M. (2003): *International Marketing.* Schäffer-Poeschel: Stuttgart. • Backhaus, K., Büschken, J., Voeth, M. (2005): *International Marketing.* Palgrave MacMillan: Basingstoke. • Usunier, J. (2004): *Marketing international: développement des marchés et management multiculturel.* 2nd ed., Vuibert: Paris. **Business Plan and Bbusiness Models:** • Nagl, A. (2018): The business plan - Creating business plans professionally. Springer Gabler: Wiesbaden. • Wupperfeld, U. (1999): The business plan for a successful start. mvg-Verlag. • Backhaus, K., Schneider, H. (2019): Strategic marketing. Schäffer-Pöschl: Stuttgart. **International Technical Sales 3:** • Backhaus, K., Voeth, M. (2010): *International Marketing.* 10th ed., Schäffer-Poeschel: Stuttgart. • Kotler, P., Keller, K. L., Bliemel, F. (2007): *Marketing Management - Strategies for value-creating action*. 12th ed., Pearson: Munich. • Meffert, H. et al. (2007): *Marketing - Grundlagen marktorientierter Unternehmensführung.* 10th ed., Gabler: Wiesbaden. **Marketing Simulations:** • Kotler, P. (2012): *Marketing Management.* 2nd European Edition. Pearson: Munich. • Meffert, H. et al. (2015): *Marketing - Grundlagen marktorientierter Unternehmensführung*. 12th edition, Springer-Gabler: Wiesbaden. • Wöhe, G. (2011): *Introduction to Business Administration.* 24th ed., Vahlen: Munich. • Backhaus, K., Voeth, M. (2010): *International Marketing.* 10th ed., Schäffer-Poeschel: Stuttgart.
Workload	Details per course: Workload: 3 ECTS x 30 hours = 90 hours. Attendance time: 2 SWS x 15 weeks = 30 hrs.

	Preparation/follow-up, exercises, preparation for and completion of the exam: 60 hrs.
Media forms	Presentation, workshops, project protocols and documentation