HS PF

MODULE HANDBOOK

ENGINEERING AND MANAGEMENT/ CIRCULAR ECONOMY ENGINEERING

HS PF Engineering

Head of study program: Prof. Dr. Jörg Woidasky

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

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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 the above 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 are 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.

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 exercises
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 familiar with the applications of statics and strength of materials as well as their specific methods. **Introduction to Design Theory:** Participants are able to find the design solution 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 exercises, 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 exercises 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 exercises, 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 study 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, 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 r.
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,practical 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	BWI10176
Semester of study	1st/2nd semester
Level	Preliminary level
Credits	5
SWS	4
Associated courses	BWI10177 Advanced Business English BWI10178 Advanced English for Engineers
Recommended prerequisites	B2 English (CEFR) - no prior knowledge of content required
Type(s) of examination, duration (only for PLK/PLM)	Advanced Business English: PLH/PLK/PLP/PLR (60 minutes) Advanced English for Engineers: PLH//PLK/PLP/PLR (60 minutes)
Teaching language	English
Person responsible for the module	Prof. Dr. Kilian-Yasin
Teachers	Advanced Business English: Mr. Correa, N.N. Advanced English for Engineers: Mr. Correa, N.N.
Assignment to the curriculum	WI/IM, WI/CEE, WI/IMo - compulsory subject 1st/2nd semester
Teaching forms of the courses of the module	Lecture, seminar-based teaching
Goals	**Advanced Business English:** Effective communication in English in international companies in a variety of technical and business functions. Language competence for communication in and between different business areas and contact with international customers, partners, suppliers, developers and teams. **Advanced English for Engineers:** Students consolidate the skills learned in Advanced Business English and expand their knowledge of topics related to technical processes. They are able to give a presentation in English on topics related to technology, mobility and the circular economy and lead a discussion in plenary. They can research, present and write academic presentations and texts in English on topics related to technology, mobility and the circular economy.
Interdisciplinary qualification goals	The course contributes to the development of students' social and teamwork skills by working in groups to prepare and deliver presentations. Self-reflection skills are improved through role-playing and by preparing and presenting a personal SWOT analysis.
Contents	**Advanced Business English:** • Corporate structures • Types of business organizations and entrepreneurship • Corporate culture • Intercultural management • CSR • Management strategies • Corporate strategies • Marketing and advertising • Outsourcing • Company case study • Life cycle assessment and circular economy

	Advanced English for Engineers: • New drive systems • Mobility of the future • Product development and innovation • Materials engineering • Production and manufacturing processes • Energy efficiency • Sustainable technologies • Life cycle assessment
Literature	**Advanced Business English:** • MacKenzie, I. (2010): *English for Business Studies.* Cambridge University Press. • The Times 100 Case Studies. www.business-casestudies.co.uk • Current texts are provided in the course **Advanced 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 • Current texts are provided in the course
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 (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; 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. Product Design and Evaluation

"Produktgestaltung und -bewertung" / "Product Design and Assessment"	
Code number	BWI10166
Semester of study	2nd semester
Level	Advanced level
Credits	5
SWS	4
Associated courses	BWI10167 Life Cycle Assessment and Product Carbon Footprint BWI10168 Computer-aided Product Development / CAD with Laboratory
Recommended prerequisites	No special knowledge from other courses required
Type(s) of examination, duration of examination (only for PLK)	Life Cycle Assessment and Product Carbon Footprint: PLK/PLH/PLP/PLR (45 min) Computer-aided Product Development / CAD with Laboratory: PLP
Teaching language	Life Cycle Assessment and Product Carbon Footprint: English Computer-aided Product Development / CAD with Laboratory: German
Responsible for the module	Prof. Dr. Woidasky
Teachers	Life Cycle Assessment and Product Carbon Footprint: Prof. Dr. Woidasky, N. N. (INEC) Computer-aided Product Development / CAD with Laboratory: Prof. Dr.-Ing.
Assignment to the curriculum	WI/CEE - compulsory subject 2nd semester
Teaching forms of the courses of the module	**Life Cycle Assessment and Product Carbon Footprint:** Lecture with individual seminar elements and practical application exercises **Computer-aided Product Development / CAD with Laboratory:** Introduction to the CAD software used and teaching of the necessary theoretical principles. Support in the implementation of project work, which is carried out in small teams.
Goals	The students • can create mechanical components/parts using standardized CAD tools. • can analyze sketches, design guidelines and other technical boundary conditions and feed them into integrated product development in a consolidated form • are able to design subcomponents in such a way that they can be combined into complex assemblies in the project team • can visualize CAD models photorealistically.
Interdisciplinary qualification goals	**Life Cycle Assessment and Product Carbon Footprint:** • Self-reflection through guided and feedback-supported application exercises • Teamwork skills through group exercises in the lecture context **Computer-aided Product Development / CAD with Laboratory:**

	The students • are proficient in common computer programs for solving business and technical tasks. • are able to apply analytical skills constructively and critically to complex problems. • demonstrate in practical tasks that they are able to work successfully in a team.
Contents	**Life Cycle Assessment and Product Carbon Footprint:** • Five life cycle phases as a basis for life cycle thinking, assessment, management, engineering • Life Cycle Assessment Standard(s): DIN EN ISO 14040 series: LCA method • Selected environmental impact categories: Acronyms, definitions, scientific background, calculation, impacts; Kyoto protocol • Product carbon footprint according to DIN EN ISO 14067 • GHG Protocol: Product life cycle accounting and reporting standard; Scope 1 to 3 industrial GHG reporting • Product environmental footprint method • Tools for LCA implementation in process and product development **Computer-aided Product Development / CAD with Laboratory:** • Introduction to Solidworks • Project award • Introduction to sketching • Basics of part modeling • Creating assemblies • Project review • Surface modeling • Hybrid modeling • Repair of imported geometry • Trouble shooting • Visualization • Final review
Literature	**Life Cycle Assessment and Product Carbon Footprint:** • Frischknecht, Rolf (2020): Textbook of life cycle assessment. Berlin, Heidelberg: Springer Spektrum • Walter Klöpffer, Birgit Grahl (2014): Life Cycle Assessment (LCA): A Guide to Best Practice. WILEY-VCH Verlag GmbH & Co KGaA, Weinheim, ISBN: 9783527329861 • Life cycle assessment standards: DIN EN ISO 14040 series, in particular 14040 (principles), 14044 (requirements), 14045 (eco-efficiency analysis), 14050 (environmental management terms), 14067 (product carbon footprint) • **Computer-aided Product Development / CAD with Laboratory:** • Vogel, H.: "Konstruieren mit Solidworks"; Hanser; 9th edition; 2021. • Almattar, T.: "Learn Solidworks"; Packt Publishing; 2nd edition; 2022.
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	Slide presentations, project work, instructional videos, presentations, interactive exercises, group work and discussions

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	Financing and investment: German Corporate management: English
Person responsible for the module	Prof. Dr.-Ing. Hinderer
Teachers	Financing and Investment: N.N. Corporate Management: Prof. Dr.-Ing. Hinderer
Assignment to the curriculum	WI/IM, WI/CEE, WI/IMo - 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, methods and models of strategic and operational corporate management and its sub-functions (planning and control, organization, personnel management). They are able to prepare, analyze and understand strategic decisions. In addition, students are familiar with methods and procedures of corporate financing and methods for preparing investment decisions and 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 models of strategic management can be used.
Interdisciplinary qualification goals	The module enables students to assess and evaluate the requirements for the management of a company in terms of corporate social responsibility and sustainability. Methods and exercises support the ability to make sense of the company's current situation internally and in a competitive environment as well as of opportunities and risks for the future. Active participation in lectures also supports your own communication skills in both German and English.
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 management process is explained on the basis of an introduction to known and recognized methods and tools of strategic management. The internal and external analysis of the current situation and its classification in relation to current events in the market is discussed as the basis for deriving a strategic objective for a company in the market, also using suit-

	able key figures, and the strategic implications in the management areas of products, markets, process and organizational structure as well as important concepts for personnel management are discussed and classified as areas of management with a closed control loop.
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. (2017): *Financing.* 17th ed., Kiehl: Ludwigshafen. **Corporate Management:** • Thomas L. Wheelen, J. David Hunger, Alan N. Hoffmann, Charles E. Bamford (2015): *Strategic Management and Business* Policy, 11th and 14th Global ed., Upper Saddle River, New Jersey, Pearson • Bruce. R. Barringer, R. Duane Ireland (2019) *Entrepreneurship - Successfully Launching New Ventures*, 6th Global ed., London, UK, Pearson Education.
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 with 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 o Technical language skills in an engineering context • Self-reflection • Ability to work in a team o 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. Business Information Systems

"Business Information Systems"	
Code number	BWI10105
Semester of study	3rd semester
Level	Advanced level
Credits	5
SWS	4
Associated courses	BWI10106 Business Information Systems BWI10107 Business Information Systems Laboratory
Recommended prerequisites	BWI10010 Introduction to Computer Science BWI10013 Fundamentals of Business Administration BWI10177 Advanced Business English BWI10178 Advanced English for Engineers
Type(s) of examination, duration (only for PLK/PLM)	Business Information Systems: PLK (60 minutes) Module examination Business Information Systems Laboratory: UPL (assessment laboratory report and learning progress tests)
Teaching language	Business Information Systems: English Business Information Systems Laboratory: German
Person responsible for the module	Prof. Dr.-Ing. Thimm
Teachers	Business Information Systems: Prof. Dr.-Ing. Laboratory for Business Information Systems: Prof. Dr.-Ing.
Assignment to the curriculum	WI/IM, WI/CEE, WI/IMo - compulsory subject 3rd semester
Teaching forms of the courses of the module	Lecture with practical exercises, laboratory exercises on the computer (case studies) and self-reflection on the subject matter covered in the context of answering learning control questions and preparing a laboratory report
Goals	The students • are familiar with the different types of business application systems, their basic functionalities, features and operational areas of application, • are familiar with the most important success factors for the use of business application systems, • can explain the different architectures and basic information technology approaches and concepts of business application systems, • can explain the relationship between business processes and business application systems, • understand the basic principles of ERP systems, • have initial practical basic knowledge of ERP systems, • know the basic terminology and basic concepts of business analytics and analytical information systems, • know current trends in business application systems.
Interdisciplinary qualification goals	The students • can verbally describe the problems that arise during the exercises systematically and appropriately, • practise their self-reflection skills when preparing the laboratory report, • improve their oral expression and foreign language skills by participating in interactive discussions, • develop social skills when working on the laboratory case study, • increase communication skills in connection with technical issues through group discussions.

Contents	**Business Information Systems:** Business application systems - general basics, management of the digital enterprise, IT as an enabler, central operational information processing tasks, IT business alignment, information as a competitive factor, classification of business processes, differences between standard software and individual software, analytical information systems and business analytics, characteristics and architecture of ERP systems. **Laboratory for Business Information Systems:** Case study on the IT-supported handling of the process flow of an order from acceptance to dispatch with the help of an ERP system, creation of master data in materials management, entry of all order variables and order monitoring, use of the integrated reporting system.
Literature	**Business Information Systems:** • Evans, J.R. (2021): *Business Analytics, Methods, Models, and Decisions*, Third Edition, Pearson Education • Laudon, K., Laudon, J. (2019): *Management Information Systems: Managing the Digital Firm.* Edition 16e, Prentice Hall: Boston. • Valacich, J., Schneider, C. (2017): *Information Systems Today: Managing the Digital World.* Global Edition, 8th Edition, Pearson. • Pearlson, K. E., Saunders, C. S., Galletta, D. F. (2016): *Managing and Using Information Systems: A Strategic Approach.* 6th Edition, Wiley. **Laboratory for Business Information Systems:** • Masutta, M., Cordts, S. (2016): *SAP ERP for beginners.* 1st edition, Verlag mana Buch: Heide. • Sarferaz, S. (2023): *ERP Software: Functionality and Concepts Based on SAP S/4HANA,* SpringerVieweg
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, videos with system examples. Exercise sheets for case studies. E-learning units and videos for self-study, accompanying material is made available on the university's own e-learning platform (Moodle).

17. Operations Management

"Operations Management"	
Code number	BWI10108
Semester of study	3rd semester
Level	Advanced level
Credits	5
SWS	4
Associated courses	BWI10109 Operations Management 1 BWI10110 Operations Management 2 BWI10111 Operations Management 1 Lab
Recommended prerequisites	None
Type(s) of examination, duration (only for PLK/PLM)	PLK (60 minutes) Module examination Operations Management 1 Lab: UPL
Teaching language	English
Person responsible for the module	Prof. Dr. Kühn
Teachers	Operations Management 1: Prof. Dr. Kühn Operations Management 2: Prof. Dr. Kühn Operations Management 1 Lab: Prof. Dr. Kühn
Assignment to the curriculum	WI/IM, WI/CEE, WI/IMo - compulsory subject 3rd semester
Teaching forms of the courses of the module	Lectures, practical exercises, laboratory
Goals	The students • are acquainted with processes and methods for planning and controlling a production area and can apply them, • understand the importance of operational and strategic perspectives in operations management and their mutual dependencies, • recognize the mutual dependencies between production and logistics, • are familiar with current trends in operations management and understand logistical, organizational, production-related and business management implications for the overall organization, • know the basics of ergonomics and occupational health and safety and can apply them, • can apply methods of time management - time tracking and predetermined time systems, • are able to take a holistic view of operations, master essential methods and can apply these to new (real-life) tasks.
Interdisciplinary qualification goals	The module contributes to • Social skills • Self-reflection • Ability to work in a team.
Contents	**Operations Management 1 and 2 - Lectures with parallel practical exercises and laboratory units:** Students understand the methods and processes of operations management and production planning. They apply them and are able to adopt the correct approach to solve problems. Students learn about operational and strategic aspects of operations management

	and their interdependencies, as well as the mutual dependencies between product and service and between production and logistics.
Literature	• Heizer, Jay, et al. *Operations Management: Sustainability and Supply Chain Management*, Global Edition, Pearson Education, Limited, 2019. • Slack, N. et al. *Operations and Process Management - principles and practice for strategic impact.* Pearson Education Limited, 2018. • Thonemann, U. *Operations Management - Concepts, Methods and Applications*. Pearson Studium: Munich, 2015.
Workload	Workload: 5 ECTS x 30 hours = 150 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up of lectures, practical exercises and written exam, preparation for the exam: 90 hours.
Media forms	Lecture, laboratory work, seminar-style teaching, project work

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 basics 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

"Produktion" / "Production Engineering and 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	Production 1: German Production 2: English Production 1 Lab: German
Person responsible for the module	Prof. Dr.-Ing. Saile
Teachers	Production 1: Prof. Dr.-Ing. Saile Production 2: Prof. Dr. Oßwald Production 1 Laboratory: Prof. Dr.-Ing.
Assignment to the curriculum	WI/IM, WI/CEE, WI/IMo - 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 the practical laboratory exercises
Contents	**Production 1, Production 1 Laboratory:** • Lean Production • Electropneumatics • Electrical measurement technology • Assembly technology

	• Thermography • Human-robot collaboration • Control engineering **Production Engineering and Manufacturing / Production 2:** • Automation Technology • Connected Automation • Sensors • Machine Vision and Identification • Fluidic Acutators • Electrical Actuators
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 **Production Engineering and Manufacturing:** Sands/Verstappen: A Guide to the Automation Body of Knowledge, Third Edition, International Society of Automation
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.
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 requested 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. Processes in the Circular Economy

"Processes in the circular economy / "Circular Economy Processes"	
Code number	BWI10181
Semester of study	4th semester
Level	Advanced level
Credits	6
SWS	4
Associated courses	BWI10169 Technologies and Processes in the Circular Economy with Laboratory BWI10170 Digitalization in the Circular Economy with Laboratory
Recommended prerequisites	BWI10010 Introduction to Computer Science BWI10013 Fundamentals of Business Administration BWI10167 Life Cycle Assessment and Product Carbon Footprint BWI10168 Computer-aided Product Dvelopment / CAD with Laboratory BWI10169 Technologies and Processes in the Circular Economy with Laboratory
Type(s) of examination, duration (only for PLK/PLM)	Technologies and Processes in the Circular Economy with Laboratory: PLK/PLH/PLP (45 min) Digitalization in the Circular Economy with Laboratory: PLH/PLP/PLR
Teaching language	German
Person responsible for the module	Prof. Dr. Woidasky
Teachers	Technologies and Processes in the Circular Economy with Laboratory: Prof. Dr. Woidasky Digitalization in the Circular Economy with Lab: Prof. Dr. Thimm
Assignment to the curriculum	WI/CEE - compulsory subject 4th semester
Teaching forms of the courses of the module	Seminar-based teaching with laboratory exercises
Goals	**Technologies and Processes in the Circular Economy with Laboratory:** The students • know the definition and areas of application of the circular economy in both the social and industrial context • know the options for implementing the circular economy in the fields of product development, raw material extraction, product manufacture, logistics, use and disposal. • are familiar with the technological approaches to the circular economy in the areas of collection, sorting, recycling, treatment and disposal of products and materials. • have experience with dismantling and recycling and testing of selected products • have experience with the scientific documentation of dismantling and recycling tests in the laboratory by preparing a laboratory report **Digitalization in the Circular Economy with Lab:** The students • know the main goals, drivers, key players and areas of application in the digitalization of the circular economy, • know the particular difficulties and challenges of digitizing the circular economy,

	• can describe the current state of digitalization of the circular economy and future trends, • are familiar with the main internal and external data management tasks and the associated information artifacts (e.g. digital product passport, official reporting data) of the circular economy, • know essential data cycles and key digital technologies of the circular economy, • have an overview of the possible uses of IT as part of a company's sustainability strategy geared towards the circular economy • have an overview of relevant digitalization technologies and solutions (IT infrastructures, data rooms, IoT, digital twin, RPA, distributed ledger technology/blockchain), • are familiar with the CE-specific functional scope of operational and inter-company information systems, • know features of decision support and assistance systems for the circular economy • can evaluate appropriate digitalization solutions based on relevant criteria.
Interdisciplinary qualification goals	• Self-reflection through guided and feedback-supported application exercises • Teamwork skills through group exercises and work in laboratory groups • Acquisition of practical skills in handling tools and laboratory equipment and facilities
Contents	**Technologies and Processes in the Circular Economy with Laboratory:** • EU Circular Economy Package and current/associated regulations as a framework for the circular economy (CE): e.g. Packaging Regulation, right to repair, bio-based polymers (updated in line with the current status of policy development) • Starting points for CE: product development and product life cycle phases • Circular economy levels and associated technologies for the collection, sorting, recycling, treatment and disposal of products and materials, in particular identification processes for plastics and metals • Recycling processes for plastics and composites; material technology challenges and limits • Laboratory: Selection and disassembly of an electrical household or office appliance with a large proportion of plastic • Laboratory: Identification of plastic and metal components of the product by infrared (ATR) and XRF measurements of selected components • Material characterization by particle size analysis through test sieving, determination of drying and annealing loss • Laboratory: Material (mechanical) recycling of the plastic part of the product by shredding, extrusion, injection molding of standard test rods, carrying out tensile tests • Laboratory: Preparation of scientific documentation of dismantling and recycling tests in the form of a laboratory report **Digitalization in the Circular Economy with Lab:** • Digitalization in general and in the context of the circular economy

	• In-house and inter-company data management tasks, information artifacts (e.g. digital product passport) and key digital technologies (e.g. IoT, RPA, digital twin) of the circular economy • Classic and CE-compliant operational and inter-company environmental information systems and information systems for product life cycle management • Decision support systems, assistance systems and AI-based solutions for the circular economy • Private-sector and public-sector IT systems/platforms and databases for handling circular economy processes • Selected digitalization solutions in current CE practice and outlook on future developments and trends
Literature	**Technologies and Processes in the Circular Economy with Laboratory:** • Kranert, M.; Cordt-Landwehr, K.: Introduction to waste management. Springer Verlag/Vieweg+Teubner, 2010 (new edition 2023/24): https://doi.org/10.1007/978-3-8348-9681-0 • Martens, H.; Goldmann, D.: Recyclingtechnik. Textbook for teaching and practice. Springer Vieweg. 2016, ISBN 978-3-658-02785-8 • Speidel, N.; Antic, A. K.: Praxishandbuch Abfallmanagement. Haufe Verlag, Freiburg. 2023. ISBN 978-3-648-16697-0 • DIN 66165-1:2022-06 : Particle size analysis - Sieve analysis - Part 1: Fundamentals • DIN 66165-2:2016-08: Particle size analysis - Sieve analysis - Part 2: Implementation • DIN EN 15935:2021-10: Soil, waste, treated biowaste and sludge - Determination of loss on ignition; German version EN 15935:2021 • DIN EN 15934:2012-11: Sludge, treated biowaste, soil and waste - Calculation of dry mass fraction after determination of dry residue or water content; German version EN 15934:2012 **Digitalization in the Circular Economy with Lab:** • Roth, S., Corsten, H. (2022): Handbook of digitization, Vahlen • Jacob, M. (2019): Digitalization & Sustainability, Springer Vieweg • Förtsch, G., Meinholz, H. (2023): Handbook of Corporate Circular Economy, Springer Vieweg • Pagano, D., Krause, G. (2019): Environmental management and digitization - Practical approaches to improving environmental performance, German Environment Agency
Workload	Workload: 6 ECTS x 30 hours = 180 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up work, exercises, preparation for and completion of the exam: 120 hrs.
Media forms	Slide presentations, project work, instructional videos, presentations, interactive exercises, group work and discussions

22. International Technical Sales

"Internationaler Technischer Vertrieb" / "International Technical Sales"	
Code number	BWI10116
Semester of study	4th semester
Level	Advanced level
Credits	6
SWS	4
Associated courses	BWI10117 International Technical Sales 1 BWI10118 International Technical Sales 2
Recommended prerequisites	B2/C1 English (CEFR) Attendance of the modules Business Administration I and II
Type(s) of examination, duration (only for PLK/PLM)	PLK (60 minutes) Module examination
Teaching language	English
Person responsible for the module	Prof. Dr.-Ing. Hinderer
Teachers	Prof. Dr.-Ing. Hinderer
Assignment to the curriculum	WI/IM, WI/CEE, WI/IMo - compulsory subject 4th semester
Teaching forms of the courses of the module	Lecture with discussion
Goals	Students are familiar with the basic concepts and instruments as well as an understanding of technical sales and marketing as a dual management principle of companies. They are familiar with the special features of international technical sales and business-to-business marketing as well as industrial goods marketing.
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	• Introduction and basics: basics of technical sales and marketing; marketing conception and sales especially for capital goods and technology companies • Differences in B-to-B and B-to-C sales • The marketing mix: product policy, pricing policy, communication policy, distribution policy • Special features of technical sales in relation to the various business types in industrial goods marketing • Development of communication strategies • International customer relationship management also in practice and with the support of suitable software systems for outbound and inbound marketing
Literature	**International Technical Sales 1:** • Backhaus, K., Voeth, M. (2014): Industriegütermarketing: Grundlagen des Business-to-Business Marketing. 10th ed., Vahlen: Munich. • Doole, I., Lowe, R. (2019): International Marketing Strategy. 8th ed., Andover. • Kotler, P., Keller, L. K. (2016): Marketing Management. Pearson: Upper Saddle River.

	International Technical Sales 2: • Kumar, V., & Reinartz, W. (2018). *Customer Relationship Management: Concept, Strategy, and Tools* (Third edition.). Berlin, Heidelberg: Springer. • Blythe, Z., Zimmermann, A. (2017): *Business to Business Marketing Management.* Routledge. • Buttle, F., Maklan, S., (2015): *Customer Relationship Management - Concept and Technolgies.* Taylor & Francis Group: Amsterdam et al.
Workload	Workload: 6 ECTS x 30 hours = 180 hours Attendance time: 4 SWS x 15 weeks = 60 hours Preparation/follow-up of lectures, exercises and written exam, preparation for the exam: 120 hours.
Media forms	Slide presentation, tablet and 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- anguage 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	Depending on 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	BWI10119
Semester of study	5th semester
Level	Advanced level
Credits	5
SWS	4
Associated courses	BWI10120 Academic Seminar BWI10121 Academic Work
Recommended prerequisites	None
Type(s) of examination, duration (only for PLK/PLM)	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 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 an academic 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 formation • 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, exercises, preparation for and completion of the exam: 90 hours.
Media forms	Presentations, e-learning, practical exercises

25. Internship

"Internship semester" / "Internship"	
Code number	BWI10069
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 from their previous studies 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 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 the 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 chosen from the compulsory electives catalog of the study program.
The catalog will beposted 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	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 (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 selected module
Teachers	Subject to the selected module
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 module selected, possible course formats are seminar-based teaching, lecture or project
Goals	Determined by the selected module
Interdisciplinary qualification goals	Determined by the selected module
Contents	Determined by the selected module
Literature	The literature is determined by the courses of the selected module 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, practical exercises, project work, preparation and examination: 120 hours.
Media forms	Project work, assessed milestone presentations and project meetings

28. Management Focus Module

The Management[1] focus modules available for selection are announced via a 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 of examination (only for PLK/PLM)	PLH/PLK/PLP/PLR (60 minutes) Module examination
Teaching language	German or English
Person responsible for the module	Head of the 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. Circular Economy Engineering

" Circular Economy Engineering" / "Circular Economy Engineering"	
Code number	BWI10171
Semester of study	6th/7th semester
Level	Professionally qualifying academic level
Credits	12
SWS	8
Associated courses	BWI10172 CE Business Model Development and Control BWI10173 CE Data Analytics and Controlling BWI10174 Development of Circular Products and Processes
Recommended prerequisites	Attendance of the lecture Controlling 1 for a basic understanding of controlling Successful completion of the course "Technologies and Processes in the Circular Economy" Completion or successful completion of the course "Methods of Product Development" (elective area) Attend other events: Introduction to computer science Fundamentals of Business Administration Mathematics 2 Statistics 1 Statistics 2
Type(s) of examination, duration (only for PLK/PLM)	Each PLH/PLK/PLP/PLR (60 minutes)
Teaching language	CE Business Model Development and Control: English CE Data Analytics and Controlling: German Development of Circular Products and Processes: German
Module coordinator	Prof. Dr. Woidasky
Lecturers	CE Business Model Development and Control: Prof. Dr. Binder CE Data Analytics and Controlling: Prof. Dr. Thimm Development of Circular Products and Processes: Prof. Dr. Woidasky
Assignment to the curriculum	WI/CEE - compulsory subject 6th/7th semester
Teaching forms of the courses of the module	**CE Business Model Development and Control, CE Data Analytics and Controlling:** Seminar-style teaching, interactive discussions, working on case studies and **presentations** **Development of Circular Products and Processes**: Interdisciplinary "Challenge Based Learning" in predominantly self-organized group work on selected topics in cooperation with usually external "topic mentors" and at least weekly coaching consultation with the lecturer as well as a day event in block/lecture format at the beginning and a plenary final presentation day event
Goals	**CE Business Model Development and Control:** Students learn how to think and act within controlling case studies that are to be integrated and maintained in IT systems. They know the methods and procedures in controlling as well as the use of specific controlling instruments in the company and can assess the benefits and limitations of the instruments as well as their IT implementation options. **CE Data Analytics and Controlling**:

	Students know the essential terminology and core concepts of data analytics from a general perspective. They will be able to transfer and apply the concepts to important concrete data analytics requirements of the circular economy, especially in the context of controlling tasks. They are familiar with typical data analytics and controlling problems of the circular economy (e.g. environmental accounting, ESG reporting) and common IT approaches to solving these problems. They are familiar with the functional handling supported by business information systems for these tasks. They can implement smaller IT-based demonstrators (e.g. dashboards). **Development of Circular Products and Processes**: Students design a project on a current practical topic in the field of product/process development with circularity references in a professional environment, implement this project as far as possible independently and document their results in the form of a final presentation with discussion and a final scientific report.
Interdisciplinary qualification goals	**CE Business Model Development and Control,** **CE Data Analytics and Controlling:** The students • can work on the case studies in a team, • can present team resultssystematically and appropriately, • develop social skills in interaction within the team and with the plenum, • solve case study tasks independently and develop self-reflection. **Development of Circular Products and Processes**: • Professional appearance and communication in cooperation with external (corporate) partners • Ability to work in a team and self-organization through group work • Application of project management methods • scientific verbal and written presentation of results appropriate to the target audience
Contents	**CE Business Model Development and Control:** The course starts by teaching the basic concepts and instruments as well as the processes and key figures in a company. Students then learn how to integrate company case studies into various IT systems. **CE Data Analytics and Controlling:** The teaching portfolio consisting of seminar-style teaching talks, digital teaching units, discussion of case studies and laboratory exercises teaches the following content: • Fundamentals, methods, core concepts and technology building blocks of data analytics • General and controlling-specific operational tasks, processes and information artifacts of the circular economy that require the use of data analytics • Common evaluations, key figures and reports from the main players in the circular economy • Functional scope of operational information systems for data analytics and controlling in the circular economy **Development of Circular Products and Processes:**

	• Independent selection of a topic of practical relevance from a shortlist (usually agreed with external company partners) and formation of a project team to work on this topic. The topics are clearly related to circularity and environmental aspects of business activities and are redefined each semester with different company partners (see https://businesspf.hs-pforzheim.de/studium/studierende/bachelor/bwl_nachhaltigkeitsmanagement_ressourceneffizienz_management_bsc/praxisprojekte). • Conducting a scientific literature search and documenting the results in the form of a presentation and a chapter in a scientific paper • Application of the previous study content to the specific project content as part of a scientific approach including weekly coaching sessions and further methodological and technical support • Scientific documentation and oral presentation and discussion of the results
Literature	**CE Business Model Development and Control:** • Kütz, M. (2013), IT-Controlling für die Praxis - Konzeption und Methoden, 2nd edition, Heidelberg 2013 • Dillerup R., Stoi R. (2012), Case studies in corporate management. 2nd ed. Munich: Vahlen • Keimer I., Egle U. (2020), Controlling - Grundlagen für den erfolgreichen digitalen Wandel im Controlling, in: Keimer I., Egle U. (eds.), die Digitalisierung der Controlling-Funktion, Wiesbaden 2020, pp. 1 - 16 • Horvath P., Gleich R., Seiter M. (2017), Controlling: 10 case studies from corporate practice, 3rd ed., Munich: Vahlen **CE Data Analytics and Controlling:** • Schön, D. (2018): Planning and reporting in BI-supported controlling, basics, business intelligence, mobile BI and big data analytics, 3rd edition, SpringerGabler • Baar, H., Kemper, H.-G. (2021): Business Intelligence & Analytics - Grundlagen und praktische Anwendungen, Ansätze der IT-basierten Entscheidungsunterstützung, 4th edition, SpringerVieweg **Development of Circular Products and Processes:** • ACATECH/Circular Economy Initiative Deutschland (ed.): Circular Business Models: Overcoming Barriers, Unlocking Potential. Berlin 2021. https://www.circular-economy-initiative.de/s/AG-GM_Gesamtbericht-DE_DOI_Stand-1204.23_NEW • Scholz, U. et al: Practical handbook on sustainable product development. SpringerGabler, 2018 • VDI guidelines, including 2206 (V-model/mechatronics), 2221 (development methodology), 2243 (recycling-friendly product development)
Workload	Details per course: Workload: 3 ECTS x 30 hours = 90 hours Attendance time: 2 SWS x 15 weeks = 30 hours Preparation/follow-up, practical exercises, preparation for and completion of the exam: 60 hours.

Media forms	Blackboard work, slide presentations, project work/practical tasks, challenge-based learning, teaching videos, learning portfolio, presentations, interactive exercises, case study discussions, negotiation simulation, group work and discussions. student presentations, feedback discussion (selection from these forms)

30. Elective Module 2

Students must choose a module (12 credits) from the specialization modules A and B (see Section III, Specializations) and a list that is published for each semester on the registration date. Elective Module 1 can be a prerequisite for Elective Module 2. Participation in the specialization modules may be limited by the head of study program.

"Wahlvertiefung Modul 2" / "Major Elective Module 2"	
Code number	BWI10175
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 study stage 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 have been successfully completed.
Recommended prerequisites	Completion of the seminar "Academic work" in the 5th semester
Type(s) of examination, duration of examination (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 "Acaemic work" seminar. All examinations of the 2nd study stage should have been completed.
Type(s) of examination, duration (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 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 doing so.
Contents	The Bachelor's thesis is the first major piece of academic work. The topic of the thesis is determined by theprimary assessor in consultation with the student and depends on the chosen field and the specific problem. It must be broadly related to industrial engineering in general 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 Operations Management

"Operations Management"	
Code number	BWI10131
Semester of study	6th/7th semester
Level	Professionally qualifying academic level
Credits	12
SWS	8
Associated courses	BWI10132 Supply Chain Management BWI10133 Quality and Improvement BWI10134 Production Design BWI10135 Production Controlling
Recommended prerequisites	Sound prior knowledge from previous courses in the modules Production Engineering I and II, Operations Management and Logistics and Controlling
Type(s) of examination, duration (only for PLK/PLM)	PLH/PLK/PLP/PLR (60 minutes)
Teaching language	Supply Chain Management: English Quality and Improvement: English Production Design: English Production Controlling: German or English
Person responsible for the module	Prof. Dr. Kühn
Teachers	Supply Chain Management: Prof. Dr. Peter Quality and Improvement: Prof. Dr. Oßwald Production Design: Prof. Dr. Kühn Production Controlling: Prof. Dr. Schnell
Assignment to the curriculum	WI/IM, WI/CEE, WI/IMo - compulsory elective subject 6th/7th semester
Teaching forms of the courses of the module	Seminar course, laboratory courses, project work
Goals	The students are able to • describe methods for the analysis of logistical and manufacturing processes and their characterizing parameters, • understand the specific characteristics of different manufacturing principles, • optimize existing processes in production and logistics or plan new ones. Quality assurance management and continuous improvement methods can applied systematically. • describe the phases of factory planning, • independently implement layout planning and workplace design in a case study taking ergonomic aspects into account, • understand relevant trends and new developments in terms of their opportunities and risks, as well as their implications for operations management, and apply them as far as possible.

	• apply instruments for measuring and controlling the profitability of production and know how to identify starting points for optimizing production efficiency.
Interdisciplinary qualification goals	The module contributes to • Social skills • Self-reflection • Ability to work in a team • Interdisciplinary way of thinking and acting.
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, coordination in the supply chain, supply chain configuration in theory and practice. **Quality and Improvement:** Concepts and methods of quality management with particular relevance for production and logistics processes, including factory planning; concepts and methods of continuous improvement. **Production Design:** Design and optimization of processes, workplaces and layouts in the production environment, taking into account technical, economic and ergonomic aspects; phases of factory planning; familiarization with and application of relevant methods in production design. **Production Controlling:** Ensuring effectiveness and efficiency in the production area, for example through the use of production management key figures and key figure systems, through the use of standard costing or selected decision calculations.
Literature	**Supply Chain Management:** • Chopra, S. (2018): *Supply Chain Management: Strategy, Planning and Operation.* 7th Edition, Pearson: London. • Heizer, J., Render, B. (2016): *Operations Management.* 11th Edition, Pearson: 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). Additional recommended Practitioner journals: • Inside Supply Management • Supply Chain Quarterly **Quality and Improvement:** Will be announced in the syllabus for each semester. **Production Design:** Will be announced in the syllabus for each semester. **Production Controlling:** • Klein, A. (2018): Modernes Produktionscontrolling Modern Production Controlling for Industry 4.0: Concepts, Instruments and Key Figures. Haufe: Munich. • Schnell, H.; Klein, A.: Production controller! - More in demand than ever! In: Controller Magazin 7/8-2018, Issue 4/2018, p. 78 - 81

	• Schnell, H.: Produktionscontrolling - How controllers contribute to success in production. In: Production and function controlling, edited by Gleich, R.; Freiburg - Haufe : 2021, p. 125 - 138
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	Lecture, laboratory work, seminar-style teaching, project work

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 (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 important 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 and multinational market groups, corporate context of marketing. **Business Plan and Business 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 Business 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