HS PF

# MODULE HANDBOOK

## ENGINEERING AND MANAGEMENT/ INTERNATIONAL MANAGEMENT

## HS PF Engineering

**Head of programme:**
**Prof. Dr. Katharina Kilian-Yasin**

**SPO 2024**
**Start of programme: Winter semester 2024/2025**

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

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

**Note on the modules:**
The modules usually last one semester. The "Semester of study" section indicates the respective semester. If a module spans two consecutive semesters, both semesters are indicated in the above section. All modules of the programme are usually offered every semester; compulsory elective and advanced courses may be an exception. These may be cancelled if the legally prescribed minimum number of registered participants is not reached. Examinations are generally graded on a scale from 1 ("very good") to 5 ("unsatisfactory"). The exception to this are the courses marked as "ungraded examination performance" (UPL) in the special section of the study and examination regulations and in this module handbook. These are graded as "pass" or "fail", cf. § 24 (1, 2) SPO.

**Note on the length of written work:**
A Bachelor's thesis typically comprises 50-80 pages. Project work typically comprises 40-60 pages, although other artefacts may also be defined in advance as the expected project outcome. Term papers typically comprise 20-40 pages.

## LIST OF ABBREVIATIONS

| | |
|---|---|
| CP | Credit Point according to ECTS (1 CP corresponds to 25-30 working |
| hours. | |
| | this document, the workload calculations are shown with the maximum possible workload. They may also be lower.) |
| ECTS | European Credit Transfer and Accumulation System |
| PLH | Examination performance Term paper |
| PLK | Examination performance written examination |
| PLM | Oral examination |
| PLP | Examination performance Project work |
| PLR | Examination performance Presentation |
| PLS | Examination performance: Term paper |
| PLT | Examination performance thesis |
| PVL | Preliminary examination |
| PVL-BVP | Preliminary examination for the bachelor's preliminary examination |
| PVL-BP | Preliminary examination for the Bachelor's examination |
| PVL-MP | Preliminary examination requirement for the Master's examination |
| PVL-PLT | Preliminary examination requirement for the thesis |
| STA1 | First stage of studies |
| STA2 | Second stage of study |
| SWS | Semester weekly hour(s) |
| UPL | Unmarked examination |

# I. Compulsory module / First stage of study

## 1. Fundamentals of Mechanical Engineering

| "Fundamentals of Mechanical Engineering" | |
|---|---|
| Reference number | **BWI10001** |
| Semester | 1st semester |
| Level | Entry level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10002 Technical Mechanics<br>BWI10003 Introduction to Design Engineering |
| Recommended prerequisites | Upper secondary level mathematics |
| Examination type(s), examination duration (only for PLK/PLM) | PLK (90 minutes) Module examination |
| Language | German |
| Module coordinator | Prof. Dr.-Ing. Jakob |
| Lecturers | Technical Mechanics: Dr Frank<br>Introduction to Design Engineering: Prof. Dr.-Ing. Jakob |
| Curriculum assignment | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject, 1st semester |
| Teaching methods used in the module's courses | Lectures with exercises |
| Objectives | Students will master the basic knowledge of these disciplines. They will be able to apply this knowledge correctly in the development and optimisation of products and in the creation and optimisation of manufacturing facilities.<br><br>**Technical mechanics:**<br>Students will master the basic concepts and methods of technical mechanics and learn about the applications of statics and strength of materials as well as their specific procedures.<br><br>**Introduction to design engineering:**<br>Participants will be able to find design solutions based on simple tasks. They will be able to read complex technical drawings and create simple technical drawings. Participants will be able to apply the design principles of material-locked component connections. |
| Interdisciplinary Qualification objectives | The module contributes to:<br>• Social skills<br>    ○ Communication skills in a technical context<br>• Self-reflection<br>• Teamwork |
| Contents | **Technical mechanics:**<br>• Physical fundamentals of mechanics (force, torque, etc.)<br>• Plane force systems, internal forces and moments, trusses, line loads<br>• Introduction to strength of materials<br><br>**Introduction to design engineering:**<br>• Fundamentals of technical drawing, standards, technical drawings as information carriers<br>• Component tolerances and fits |

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|---|---|
| | • Material-based component connections<br>• Methods for creative problem solving and evaluating solution variants |
| Literature | **Technical mechanics:**<br>Gabbert, U., Raecke, I. (2021): *Technical Mechanics for Industrial Engineers.* Hanser: Munich.<br><br>**Introduction to Design Engineering:**<br>• Hoischen, H.; Fritz, A. (2018): *Technical Drawing.* Cornelsen: Berlin.<br>• VDI Guideline 2221: Development of Technical Products and Systems (2019). Beuth: Berlin.<br>• VDI Guideline 2222: *Design Methodology* (1997). Beuth: Berlin.<br>• Naefe, P.; Luderich, J. (2020): Design Methodology for Practice: Current Methods in Product Development. Springer Vieweg: Wiesbaden.<br>• Spura, C.; Fleischer, B.; Wittel, H.; Jannasch, D. (2025): *Roloff/Matek Machine Elements: Standardisation, Calculation, Design.* Springer Vieweg: Wiesbaden.<br>• Jorden, W.; Schütte, W. (2017): Form and position tolerances: Handbook for study and practice. Hanser: Munich. |
| Workload | Workload: 5 ECTS x 30 hours = 150 hours.<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 90 hours. |
| Media | Slides, blackboard notes, projector, simulations, audience response techniques, instructional videos, university e-learning platform (Moodle), inverted classroom |

## 2. Fundamentals of engineering

| "Fundamentals of Engineering" | |
|---|---|
| Reference number | **BWI10004** |
| Semester | 1st semester |
| Level | Entry level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10005 Materials Science<br>BWI10006 Introduction to Physics |
| Examination type(s), examination duration (only for PLK/PLM) | Materials Science: PLK (45 minutes)<br>Introduction to Physics: UPL |
| Recommended prerequisites | Good school knowledge of mathematics |
| Language of instruction | German |
| Module coordinator | Prof. Dr.-Ing. Mazilu-Eyaz |
| Lecturers | Materials science: Prof. Dr.-Ing. Mazilu-Eyaz<br>Introduction to Physics: Dr Frank |
| Curriculum assignment | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject 1st semester |
| Teaching methods used in the module's courses | Materials Science: Lecture with exercises<br>Introduction to Physics: Seminar |
| Objectives | **Materials science:**<br>Students will learn about the concepts, methods and technical possibilities of modern materials technology as a key discipline in the global field of engineering. Basic skills for understanding and working with materials are taught. Participants will be able to competently address simple materials science questions, such as the structure of materials, materials testing, materials designations, heat treatment and its effects on the material structure and its properties.<br><br>**Introduction to physics:**<br>Students recognise and understand fundamental physical relationships and are able to analyse and mathematically solve simple electrical engineering problems. |
| Interdisciplinary Qualification objectives | The module contributes to:<br>• Teamwork: Solving tasks in groups<br>• Social skills: Presenting and explaining solutions<br>• Self-reflection: Reflecting on feedback on the presentation |
| Contents | **Materials science**<br>Introduction to materials science, lecture (introduction – atom – structure – microstructure – component)<br><br>**Introduction to physics**<br>Quantities and units, technical calculations, forces, electrical components, simple physical systems, electrical networks and their modelling |
| Literature | **Materials Science:**<br>• Bargel, H., Schulze, G. (2012): *Materials Science* (VDI book). 9th edition, Springer: Dordrecht.<br>• Hornbogen, E., Jost, N. (2005): *Questions, Answers, Terms on Materials.* 5th edition, Springer: Dordrecht. |

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| | **Introduction to physics:**<br>• Hagmann, G. (2017): *Fundamentals of Electrical Engineering.* Aula: Wiebelsheim<br>• Hering, Ekbert; Martin, Rolf; Stohrer, Martin. *Physics for Engineers*. Springer-Verlag, 12th edition, 2016. |
| Workload | Workload: 5 ECTS x 30 hours = 150 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 90 hours. |
| Media | Blackboard, overhead projector, projector, simulations, experiments, peer instruction, audience response techniques |

## 3. Mathematics

| "Mathematics" | |
|---|---|
| Reference number | **BWI10007** |
| Semester | 1st semester |
| Level | Entry level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10008 Mathematics 1 |
| Examination type(s), examination duration (only for PLK/PLM) | PLK (90 minutes) Module examination |
| Recommended prerequisites | Good school knowledge of mathematics |
| Language | German |
| Module coordinator | Prof. Dr. Galler |
| Lecturers | Mathematics 1: Prof. Dr. Galler, Dr. Heinemeyer, Dr. Frank |
| Curriculum assignment | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject 1st semester |
| Teaching methods used in the module's courses | Lecture with exercises |
| Objectives | **Contribution to the qualification objectives of the programme:**<br>Students will learn the fundamentals of mathematics that are required in economics, engineering and all natural science disciplines, i.e. linear algebra and differential and integral calculus for one variable. They will be able to apply the relevant methods and will thus have the mathematical skills required to continue their studies in a meaningful way.<br><br>**Learning objectives:**<br>Students<br>• will master vector calculus and matrix calculus,<br>• can differentiate functions of one variable and thus solve extreme value problems,<br>• can calculate limits of functions,<br>• are familiar with important mathematical functions,<br>• are proficient in integral calculus and are familiar with its most important applications. |
| Interdisciplinary qualification goals | Students learn to interpret subject-related problems, solve them mathematically, and reflect on and discuss the solutions together. |
| Contents | • Vector calculus, matrix and determinant calculus<br>• Differential and integral calculus of functions with one variable |
| Literature | • Papula, L (2018): *Mathematics for Engineers and Scientists Volume 1,* 15th edition, Springer Vieweg Wiesbaden<br>• Papula, L (2012): *Mathematics for Engineers and Scientists Volume 2,* 13th edition, Springer Vieweg Wiesbaden<br>• Gohout, W. (2011): *Mathematics for Economics and Technology*. 2nd edition, Oldenbourg: Munich. |
| Workload | Workload: 5 ECTS x 30 hours = 150 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 90 hours. |

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| Media | Slides, blackboard work, e-learning platform, tutorials |

## 4. Computer science

| "Computer Science" | |
|---|---|
| Reference number | **BWI10009** |
| Semester | 1st semester |
| Level | Introduction |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10010 Introduction to Computer Science<br>BWI10011 Computer Science Laboratory |
| Recommended prerequisites | Upper secondary school mathematics or<br>Mathematics bridge courses |
| Examination type(s), examination duration (only for PLK/PLM) | Introduction to Computer Science: PLK (90 minutes) Module examination<br>Computer science laboratory: UPL |
| Language of instruction | German |
| Module coordinator | Prof. Dr. Volz |
| Lecturers | Prof. Dr. Volz |
| Curriculum assignment | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject 1st semester |
| Teaching methods used in the module's courses | Lecture with discussion, laboratory |
| Objectives | Students<br>• can actively and responsibly help shape the information society,<br>• can handle information,<br>• are familiar with the fundamental structural characteristics of data,<br>• are familiar with the structural characteristics of software systems,<br>• work with modern hardware and software systems,<br>• are familiar with the principles of presenting, processing and interpreting information,<br>• have knowledge and skills in computer modelling. |
| Interdisciplinary Qualification objectives | The module contributes to:<br>• Personal initiative<br>• Analytical skills<br>• Self-reflection |
| Contents | **Introduction to computer science:**<br>• Example: Spreadsheets as programmable applications<br>• Data types<br>• Functions<br>• Statement logic<br>• Objects and states<br>• Algorithms and programmes<br>• State modelling<br>• Classes and generalisation<br>• (Recursive) data structures (lists, trees, graphs)<br>• Formal languages and finite automata<br>• How a computer works<br>• Limits of computability<br><br>**Computer science laboratory:**<br>• Basic tools of software engineering |

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| | • Description languages (HTML and CSS)<br>• Programming languages (JavaScript and TypeScript)<br>• Use of software libraries<br>• Simple distributed applications |
| Literature | • Volz, R. (2019): Lecture script – *Introduction to Computer Science*, eLearning at Pforzheim University<br>• Hubwieser, P. et al. (2007): *Computer Science 2, Textbook for secondary schools.* Ernst Klett: Stuttgart<br>• Hubwieser, P. et al. (2008): *Computer Science 3, Textbook for secondary schools.* Ernst Klett: Stuttgart<br>• Hubwieser, P. et al. (2009): *Computer Science 4, Textbook for secondary schools.* Ernst Klett: Stuttgart<br>• Hubwieser, P. et al. (2010): *Computer Science 5, Textbook for secondary schools.* Ernst Klett: Stuttgart |
| Workload | Workload: 5 ECTS x 30 hours = 150 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, independent practice in the laboratory, preparation and completion of the examination: 90 hours. |
| Media | Lectures with slides (PowerPoint with projector), computer-assisted programming in the PC lab, e-learning units and videos for lab preparation, computer-assisted learning outcome checks in the lab, accompanying material is made available on the university's own e-learning platform (Moodle) |

## 5. Business Administration I

| "Business Administration I" | |
|---|---|
| Reference number | **BWI10012** |
| Semester | 1st semester |
| Level | Entry level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10013 Fundamentals of Business Administration |
| Recommended prerequisites | None |
| Examination type(s), examination duration (only for PLK/PLM) | PLK (60 minutes) Module examination |
| language of instruction | German |
| Module coordinator | Prof. Dr. Martin |
| Lecturers | Prof. Dr. Martin, Prof. Dr. Schubert |
| Curriculum assignment | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject 1st semester |
| Teaching methods used in the module's courses | Lectures, seminar-style teaching |
| Objectives | The Business Administration I module teaches students the classic fundamentals of business thinking and action.<br><br>Students first gain a general overview of the significance, objectives, tasks and procedures of external and internal accounting. They are able to illustrate typical issues in these areas using examples and apply the methods of cost and performance accounting, bookkeeping and financial reporting.<br><br>They will be able to explain the structure and content of a balance sheet and profit and loss statement (P&L) and know how to analyse them and use them for management decisions. They will be familiar with the terms, systems and methods of cost and revenue accounting (including full cost accounting, partial cost accounting and cost variance analysis). This enables them to perform calculations independently and analyse costs within the company in a targeted manner. |
| Interdisciplinary Qualification objectives | The module contributes to the analytical skills of the students. |
| Contents | • Cost type accounting<br>• Cost centre accounting<br>• Cost unit accounting (calculation) and cost unit time accounting (income statement)<br>• Balance sheet and profit and loss statement<br>• Annual financial statement analysis with key figures<br>• Introduction to company valuation using key figures<br>• Fundamentals of double-entry bookkeeping<br>• Postings for current business transactions and annual financial statements |
| Literature | • Joosé, G. (2018): *Basic knowledge of cost accounting.* 7th edition, Beck im DTV: Munich.<br>• Britzelmaier, B. (2020): *Accounting*. 2nd edition, Kiehl: Herne.<br>• Weber, M., Paa, K. U. (2020): *Balance Sheets*, 5th edition, Haufe: Freiburg. |

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| Workload | Workload: 5 ECTS x 30 hours = 150 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 90 hours. |
| Media | Slides, blackboard work, essays, case studies and exercises |

## 6. English

| "English" | |
|---|---|
| Reference number | **BWI10176** |
| Semester | 1st/2nd semester |
| Level | Entry level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10177 Advanced Business English<br>BWI10178 Advanced English for Engineers |
| Recommended prerequisites | B2 English (CEFR) – no prior knowledge of the subject matter required |
| Examination type(s), examination duration (only for PLK/PLM) | Advanced Business English: PLH/PLK/PLP/PLR (60 minutes)<br>Advanced English for Engineers: PLH//PLK/PLP/PLR (60 minutes) |
| Language of instruction | English |
| Module coordinator | Prof. Dr Kilian-Yasin |
| Lecturers | Advanced Business English: Mr Correa<br>Advanced English for Engineers: Mr Correa |
| Curriculum assignment | WI/IM, WI/CEE, WI/IMo – Compulsory subject 1st/2nd semester |
| Teaching methods used in the module's courses | Lecture, seminar-style teaching |
| Objectives | **Advanced Business English:**<br>Effective communication in English in international companies in a variety of technical and business functions. Language skills for communication within and between different business areas and contact with international customers, partners, suppliers, developers and teams.<br><br>**Advanced English for Engineers:**<br>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 a plenary session. They can research, present and write academic presentations and texts on topics related to technology, mobility and the circular economy in English. |
| Interdisciplinary Qualification goals | The course contributes to the development of students' social and teamwork skills by having them work in groups to prepare and deliver presentations. Self-reflection skills are improved through role-playing and the preparation and presentation of a personal SWOT analysis. |
| Contents | **Advanced Business English:**<br>• Business structures<br>• Types of business organisations and entrepreneurship<br>• Corporate culture<br>• Intercultural management<br>• CSR<br>• Management strategies<br>• Business strategies<br>• Marketing and advertising<br>• Outsourcing<br>• Case study on companies |

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| | • Life cycle assessment and circular economy<br><br>**Advanced English for Engineers:**<br>• New Drive Systems<br>• Mobility of the future<br>• Product Development and Innovation<br>• Materials Engineering<br>• Production and manufacturing processes<br>• Energy efficiency<br>• Sustainable technologies<br>• Life cycle assessment |
| Literature | **Advanced Business English:**<br>• MacKenzie, I. (2010): *English for Business Studies.* Cambridge University Press.<br>• The Times 100 Case Studies. www.business-casestudies.co.uk<br>• Current texts will be provided during the course<br><br>**Advanced English for Engineers:**<br>• Brieger, N., Pohl, A. (2008): *Technical English - Vocabulary and Grammar.* Langenscheidt: Munich.<br>• Ibbotson, M. (2008): *Cambridge English For Engineering.* Cambridge University Press.<br>• Bonamy, D. (2011): *Technical English 4.* Pearson Longman<br>• Current texts will be provided during the course |
| Workload | Workload: 5 ECTS x 30 hours = 150 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 90 hours |
| Media | Slides, blackboard work, exercises and videos |

## 7. Economics

| **"Economics"** | |
|---|---|
| Reference number | **ECO1400** |
| Semester | 1st/2nd semester |
| Level | Entry level |
| Credits | 5 |
| SWS | 4 |
| Related courses | ECO1303 Economics 1<br>ECO1401 Economics 2 |
| Recommended prerequisites | Only prior knowledge of mathematics is required for Economics 1.<br>For Economics 2, the contents of Economics 1 are required. |
| Examination type(s), examination duration (only for PLK/PLM) | Economics 1: PLK (60 minutes)<br>Economics 2: PLK (60 minutes) |
| Language of instruction | German |
| Module coordinator | Prof. Dr. Sascha Wolf |
| Lecturers | Economics 1: Prof. Dr. Sascha Wolf<br>Economics 2: Prof. Dr Sascha Wolf |
| Curriculum assignment | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject 1st/2nd semester |
| Teaching methods used in the module's courses | Lecture with discussion |
| Objectives | Industrial engineers work at the interface between technology and economics. By analysing markets, the consequences of government intervention and operational processes, they make a significant contribution to improving product and innovation management and optimising processes within companies. The aim of the course is to prepare students optimally for this interdisciplinary field of work.<br><br>Students...<br>• ...are able to think abstractly and structure complex problems – this is achieved by thinking in models.<br>• ...understand how markets function in an economy based on the division of labour and recognise the importance of the regulatory framework.<br>• ...can assess and critically question the operational consequences of government intervention.<br>• ...are familiar with the consequences of market failure and the special features of network and platform industries, e.g. in the IT or transport sectors.<br>• ...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 behaviour and solidarity in a market economy and the consequences of free riding and misguided incentives. By discussing different macroeconomic concepts and the impact of economic activity on the environment, participants in the programme strengthen their analytical and critical thinking skills. |
| Contents | • Subject matter, basic concepts and methods of economics<br>• Different economic systems |

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|---|---|
| | • Demand and supply in goods markets, elasticities; consumer and producer surplus<br>• Price formation: perfect and imperfect competition, monopolistic price formation, oligopoly markets<br>• Government intervention in market pricing: maximum prices, minimum prices, taxes, internalisation of external effects<br>• Network externalities, platform economics and special goods characteristics<br>• Competition policy<br>• Macroeconomic objectives: inflation, unemployment, growth, economic fluctuations<br>• Macroeconomic policy: Keynesianism versus supply-side economics<br>• Monetary theory and monetary policy |
| Literature | **Economics 1:**<br>• Beck, H. (2012): *Economics*. Oldenbourg: Munich.<br>• Mankiw, N. and Taylor, M. (2021): *Principles of Economics*. 8th edition, Schäffer-Poeschel: Stuttgart.<br>• Pindyck, R. and Rubinfeld, D. (2018): *Microeconomics.* 9th edition, Pearson: Munich.<br><br>**Economics 2:**<br>• Beck, H. (2012): *Economics*. Oldenbourg: Munich.<br>• Blanchard, O., Illing, G. (2021): *Macroeconomics*. 8th edition, Pearson: Munich.<br>• Mankiw, N. and Taylor, M. (2021): *Principles of Economics*. 8th edition, Schäffer-Poeschel: Stuttgart. |
| Workload | Workload: 5 ECTS x 30 hours = 150 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 90 hours. |
| Media | Blackboard, slides, projector, audience response techniques/interactive app, university e-learning platform (Moodle), instructional videos, alfaview (if required) |

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| "Manufacturing Technology I" | |
|---|---|
| Reference number | **BWI10020** |
| Semester | 2nd semester |
| Level | Entry level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10021 Production Engineering 1<br>BWI10022 Production Engineering 1 Laboratory |
| Recommended prerequisites | Upper secondary level mathematics<br>Materials science<br>Introduction to design engineering<br>Electrical engineering and physics at secondary school level |
| Examination type(s), examination duration (only for PLK/PLM) | Production engineering 1: PLK (60 minutes)<br>Production Engineering 1 Laboratory: UPL |
| Language of instruction | German |
| Module coordinator | Prof. Dr. Oßwald |
| Lecturers | Production Engineering 1: Prof. Dr. Oßwald<br>Manufacturing Technology 1 Laboratory: Prof. Dr. Oßwald, Prof. Dr. Baum |
| Curriculum assignment | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject 2nd semester |
| Teaching methods used in the module's courses | Lectures with exercises<br>Laboratory |
| Objectives | Students<br>• are familiar with the technological properties and processes involved in common manufacturing processes for metals in the following areas: cutting, joining, coating<br>• understand the implementation possibilities and limitations of these manufacturing processes,<br>• can determine the most cost-effective manufacturing processes for functional products<br>• are familiar with the design and technology of manufacturing machines and equipment. |
| Interdisciplinary Qualification objectives | • Social skills<br>o Technical language skills in an engineering context<br>• Self-reflection<br>• Ability to work in a team<br>o Working in interdisciplinary teams |
| Contents | Subject area: Metal manufacturing technology:<br>Functionality, performance characteristics and areas of application of the following manufacturing processes:<br>• Cutting<br>• Joining<br>• Coating |
| Literature | • Schulze, G. (2018): *Manufacturing Technology*. 12th edition, VDI: Düsseldorf.<br>• Schmid, D. et al. (2019): *Industrial Manufacturing*. Europa-Lehrmittel: Haan.<br>• Awiszus, B. (2020): *Fundamentals of Manufacturing Technology*, 7th edition, Hanser: Freiburg. |

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| Workload | Workload: 5 ECTS x 30 hours = 150 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 90 hours. |
| Media | Slides, blackboard notes, projector, simulations, audience response techniques, instructional videos, university e-learning platform (Moodle)<br>Laboratory exercises |

## 9. Physics

| "Physics" | |
|---|---|
| Reference number | **BWI10023** |
| Semester | 2nd semester |
| Level | Entry level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10024 Physics |
| Recommended prerequisites | Mathematics skills at technical college entrance qualification level |
| Examination type(s), examination duration (only for PLK/PLM) | PLK (60 minutes) Module examination |
| Language | German |
| Module coordinator | Prof. Dr.-Ing. Dolgov |
| Lecturers | Prof. Dr.-Ing. Dolgov, Dr. Frank |
| Curriculum assignment | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject 2nd semester |
| Teaching methods used in the module's courses | Lecture / inverted classroom with exercises and tutorials |
| Objectives | Students<br>• recognise and understand fundamental physical relationships,<br>• can analyse simple physics problems and solve them mathematically. |
| Interdisciplinary Qualification goals | The module contributes to:<br>• Social skills: peer instruction<br>• Self-reflection: Reviewing one's own level of knowledge through audience response techniques<br>• Teamwork: 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.<br>• Hering, E., Martin, R., Stohrer, M. (2017): *Physics for Engineers.* Springer: Berlin<br>• University of Colorado (Boulder): *Interactive Simulations – PhET* (Physics Education Technology). http://phet.colorado.edu/de/ |
| Workload | Workload: 5 ECTS x 30 hours = 150 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 90 hours. |
| Media | Blackboard notes, projector, simulations, videos, peer instruction, audience response techniques, problem-based learning |

## 10. Quantitative Methods I

| **"Quantitative Methods I" / "Quantitative Methods I"** | |
|---|---|
| Reference number | **BWI10025** |
| Semester | 2nd semester |
| Level | Entry level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10026 Statistics 1<br>BWI10027 Mathematics 2 |
| Recommended prerequisites | Mathematical knowledge equivalent to university entrance qualification; Mathematics 1 lecture |
| Examination type(s), examination duration (only for PLK/PLM) | PLK (90 minutes) Module examination |
| Language | German |
| Module coordinator | Prof. Dr. Bulander |
| Lecturers | Statistics 1: Prof. Dr. Bulander, Dr. Heinemeyer<br>Mathematics 2: Prof. Dr. Galler, Dr. Heinemeyer, Dr. Frank |
| Assignment to the curriculum | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject, 2nd semester |
| Teaching methods used in the module's courses | Lecture with exercises |
| Objectives | **Contribution to the qualification objectives of the programme:**<br>Students are familiar with the fundamentals of mathematics that are uniformly required in economics, technical and all scientific disciplines, i.e. differential and integral calculus for multiple variables. They can apply the corresponding methods and are thus mathematically capable of continuing their studies in a meaningful way.<br><br>Students will also master descriptive statistical concepts and methods. They will be able to apply the relevant concepts and methods confidently and will thus be able to meet the quantitative requirements of their further studies.<br><br>**Learning objectives:**<br>Students<br>• can differentiate functions of several variables and thus solve extreme value problems,<br>• can calculate sequences and series,<br>• are familiar with complex numbers and their arithmetic operations,<br>• are proficient in the integral calculus of functions with multiple variables and are familiar with its most important applications,<br>• can recognise descriptive statistical concepts and procedures and apply them. |
| Interdisciplinary Qualification objectives | Students learn to interpret subject-related problems, solve them mathematically, and reflect on and discuss the solutions together. |
| Contents | **Statistics 1:**<br>• Introduction to statistics<br>• Teaching the basics of descriptive statistics |

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

## 11. International Business and Cross-Cultural Management

| "International Business and Cross-Cultural Management" / "International Business and Cross-Cultural Management" | |
|---|---|
| Reference number | **BWI10102** |
| Semester | 2nd semester |
| Level | Advanced level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10103 International Business 1<br>BWI10104 Cross Cultural Management 1 |
| Recommended prerequisites | English language skills at level B2 or C1 (CEFR)<br>Basic knowledge of business administration<br>For ISP students: no engineering background needed |
| Examination type(s), examination duration (only for PLK) | PLH/PLK/PLP/PLR (60 minutes) |
| Language of instruction | English |
| Module coordinator | Prof. Dr Kilian-Yasin |
| Lecturers | International Business 1: Prof. Dr. Kilian-Yasin<br>Cross Cultural Management 1: Prof. Dr. Mahadevan |
| Curriculum assignment | WI/IM – Compulsory subject 2nd semester |
| Teaching methods used in the module's courses | Lecture with interactive elements,<br>Seminar-style teaching |
| Objectives | **International Business 1:**<br>Students<br>• are familiar with the fundamental theories and concepts of international trade,<br>• are familiar with the fundamental theories and concepts of international business activities,<br>• can distinguish between different types and strategies of internationalisation in companies,<br>• can analyse foreign markets and industrial locations,<br>• understand the role of supra- and international treaties and institutions in foreign business,<br>• understand how the current balance of power in the global economy has developed historically,<br>• can apply the above knowledge to practical cases of international business activities,<br>• can develop viable solutions for complex questions and problems in international business activities in industrial engineering,<br>• reflect critically on cultural and ethical aspects of international business activities.<br><br>**Cross-Cultural Management 1:**<br>Students<br>• are familiar with the concept of culture,<br>• are familiar with basic ethnographic methods and test their application,<br>• are familiar with basic intercultural management theories, concepts and models and test their application. |
| Interdisciplinary Qualification objectives | Social skills, teamwork and self-reflection are core components of the module. |
| Contents | **International Business 1:** |

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| | • Introduction to International Business in Industrial Engineering<br><br>**Cross-Cultural Management 1:**<br>• Concept of culture<br>• Introduction to ethnographic methods<br>• Introduction to Intercultural Management and Intercultural Communication<br>• Culture Shock and Intercultural Competence |
| Literature | **International Business 1:**<br>• Cairns, G. and Sliwa, M. (2008): A very short, fairly interesting and reasonably cheap book about International Business. Sage Publications: London<br>• Hill, Charles and Hult, G. T. M. (2017). International Business. Competing in the Global Market Place. International Edition. New York: McGraw Hill<br>• Crane, Andrew and Matten, Dirk. (2016). Business ethics: managing corporate citizenship and sustainability in the age of globalisation. Oxford: Oxford University Press.<br><br>**Cross Cultural Management 1:**<br>• Mahadevan, J. (2017): *A Very Short, Fairly Interesting and Reasonably Cheap Book about Cross-Cultural Management.* London: Sage (selected chapters)<br>• Mahadevan, J. (2023), *Cross-Cultural Management: A Contemporary Approach*, London: Sage (selected sections) |
| Workload | Workload: 5 ECTS x 30 hours = 150 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 90 hours |
| Media | Interactive lecture with case studies.<br>Seminar-style, interactive teaching, possibly with lecture elements (for PLK exam format: lecture).<br>Both courses are e-learning-based. |

### 12. Business Administration II

| "Business Administration II" | |
|---|---|
| Reference number | **BWI10031** |
| Semester | 2nd semester |
| Level | Entry level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10032 Financing and Investment<br>BWI10033 Business Management |
| Recommended prerequisites | Attendance of the module Business Administration I |
| Examination type(s), examination duration (only for PLK/PLM) | PLK (60 minutes) Module examination |
| Language | Financing and Investment: German<br>Business Management: English |
| Module coordinator | Prof. Dr. Schubert |
| Lecturers | Finance and Investment: Prof. Dr. Schubert<br>Business Management: Prof. Dr. Hinderer |
| Curriculum assignment | WI/IM, WI/CEE, WI/IMo – Compulsory subject, 2nd semester |
| Teaching methods used in the module's courses | Lecture |
| Objectives | Students will become familiar with the general thinking and acting patterns, methods and models of strategic and operational corporate management and its sub-functions (planning and control, organisation, human resource management). They will be able to prepare, analyse and understand strategic decisions.<br><br>In addition, students will learn about methods and procedures of corporate finance as well as methods for preparing investment decisions. They will acquire a sound knowledge of modern methods of finance, investment and strategic management. They will recognise 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 objectives | The module enables students to assess and evaluate the requirements for corporate social responsibility and sustainability in the management of a company.<br>Methods and exercises support the ability to meaningfully assess the current situation of the company internally and in the competitive environment, as well as opportunities and risks for the future.<br>Active participation in lectures also supports students' communication skills in both German and English. |
| Contents | **Financing and investment:**<br>Treatment of the basics of financing instruments and financial planning as well as investment appraisal. Special forms of financing such as financial investments and innovations in corporate financing and start-up financing are also explained.<br><br><br>**Corporate management:**<br>Starting with an introduction to well-known and recognised methods and tools of strategic management, the strategic management process is explained. The internal and external analy- |

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| | sis of the current situation and its classification in relation to current market events is treated as the basis for deriving strategic objectives, including the use of suitable key figures for a company in the market. The strategic implications in the management areas of products, markets, process and structural organisation, as well as important concepts for human resource management, are discussed and classified as areas of management with a closed control loop. |
| Literature | **Financing and investment:**<br>• Terstege, U., Ewert, J. (2018): *Business Financing – Quickly Understood.* 2nd edition, Springer Gabler: Berlin, Heidelberg<br>• Becker, H. P., Peppmeier, A. (2018): *Investment and Financing: Fundamentals of Corporate Finance*.<br>8th edition, Springer Gabler: Wiesbaden.<br>• Olfert, K. (2017): *Financing.* 17th edition, Kiehl: Ludwigshafen.<br><br>**Business management:**<br>• 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<br>• 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<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 90 hours. |
| Media | Lectures with presentations and case studies as well as exercises. |

## II. Second stage of study

### 13. Manufacturing Technology II

| **"Manufacturing Technology II"** | |
|---|---|
| Reference number | **BWI10034** |
| Semester | 3rd semester |
| Level | Advanced level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10035 Production Engineering 2<br>BWI10036 Production Engineering 2 Laboratory |
| Recommended prerequisites | Upper secondary level mathematics<br>Materials science<br>Design<br>Electrical engineering and physics at secondary school level<br>Manufacturing technology I |
| Examination type(s), examination duration (only for PLK/PLM) | Production Engineering 2: PLK (60 minutes)<br>Production Engineering 2 Laboratory: UPL |
| Language of instruction | German |
| Module coordinator | Prof. Dr. Oßwald |
| Lecturers | Production Engineering 2: Prof. Dr.-Ing. Baum<br>Manufacturing Technology 2 Laboratory: Prof. Dr.-Ing. Müller, Mr Hügel |
| Curriculum assignment | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject 3rd semester |
| Teaching methods used in the module's courses | Lecture, laboratory, exercises |
| Objectives | Students<br>• are familiar with the technological properties and processes of common manufacturing processes for metals (in the areas of primary forming, forming and changing material properties) and plastics,<br>• understand the implementation possibilities and limitations of these manufacturing processes,<br>• can determine the most cost-effective manufacturing processes for functional products,<br>• are familiar with the design and technology of production machines and equipment. |
| Interdisciplinary Qualification objectives | • Social skills<br>    ○ Technical language skills in an engineering context<br>• Self-reflection<br>• Ability to work in a team<br>    ○ Working in interdisciplinary teams |
| Contents | Subject area Metal manufacturing technology:<br>Functionality, performance characteristics and areas of application of the following manufacturing processes:<br>• Primary forming<br>• Forming<br>• Changing material properties<br><br>Manufacturing processes for plastics: |

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| | Properties of polymer materials, areas of application and potential, plastics processing technologies, machines and tools, production and material-appropriate design |
| Literature | • Schulze, G. (2018): *Manufacturing Technology*. 12th edition, VDI: Düsseldorf.<br>• Schmid, D. et al. (2019): *Industrial Manufacturing*. Europa-Lehrmittel: Haan.<br>• Awiszus, B. (2020): *Fundamentals of Manufacturing Technology*, 7th edition, Hanser: Freiburg.<br>• Hopmann, Chr.; Michaeli, W. (2015): *Introduction to Plastics Processing.* Hanser: Munich.<br>• Saechtling, H. (2013): *Plastics Pocket Book.* Hanser: Munich. |
| Workload | Workload: 5 ECTS x 30 hours = 150 hours.<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 90 hours. |
| Media | Slides, blackboard work, (laboratory) exercises, demonstrations |

### 14. Project management

| **"Project Management"** | |
|---|---|
| Reference number | **BWI10037** |
| Semester | 3rd semester |
| Level | Advanced level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10038 Project Management<br>BWI10039 Profile Project |
| Recommended prerequisites | None |
| Examination type(s), examination duration (only for PLK/PLM) | Project Management: PLK/PLP (60 minutes)<br>Profile project: PLH/ PLP/PLR |
| Language of instruction | Project management: German<br>Profile project: German or English |
| Module coordinator | Prof. Dr. Kühn |
| Lecturers | Project Management: Prof. Dr. Kühn<br>Profile project: Prof. Dr. Kilian-Yasin |
| Assignment to the curriculum | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – compulsory subject in the third semester (profile project adapted to each degree programme) |
| Teaching methods used in the module's courses | Lecture, seminar, project work |
| Objectives | Students<br>• are familiar with the fundamentals of project management,<br>• are familiar with the relevant standards, in particular IPMA (German Association for Project Management) and PMI (Project Management Institute),<br>• are familiar with methods and techniques used in project management and other areas, including risk and quality management,<br>• are familiar with methods and tools for generating creative ideas and implementing them visually,<br>• can explain the fundamentals of these techniques and apply concepts, methods and technical implementations to practical case studies,<br>• can independently familiarise themselves with a new subject area within the framework of a real project. |
| Interdisciplinary Qualification objectives | Students<br>• can work on the project as part of a team,<br>• can present team results in a goal-oriented manner appropriate to the target audience,<br>• develop social skills,<br>• and gain initial practical experience in organising and implementing projects. |
| Contents | **Project management:**<br>• General introduction to project management based on the project management standards of the German Association for Project Management e. V. / Project Management Institute (Pennsylvania, USA) / SCRUM, SCRUM.org<br>• Students learn a wide range of tools for modern project management, which can also be applied in a variety of areas beyond project management. |

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| | • Practical teaching of project management content through case studies/exercises.<br><br>**Profile project:**<br>• Students apply the project management content taught in the context of a fictional or real project.<br>• The exact task is specific to the degree programme and can therefore vary greatly in terms of subject matter. |
| Literature | **Project management:**<br>• Competence-based Project Management (PM4) (2019): *Handbook for Practice and Continuing Education in Project Management;* GPM Gesellschaft für Projektmanagement e. V.: Nuremberg<br>• Schulz, M. (2020): *Project Management: Goal-Oriented. Efficient. Clear*. UVK<br>• 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<br>• Scrum Guide (2020); Scrum.org<br><br>**Profile project:**<br>• Will be announced depending on the subject area. |
| Workload | Workload: 5 ECTS x 30 hours = 150 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, project work, exam preparation and completion: 90 hours. |
| Media | Slide presentations, project work, instructional videos, presentations, interactive exercises, group work and discussions |

## 15. Quantitative Methods II

| **"Quantitative Methods II"** | |
|---|---|
| Reference number | **BWI10040** |
| Semester | 3rd semester |
| Level | Advanced level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10041 Statistics 2<br>BWI10042 Operations Research |
| Recommended prerequisites | Mathematics 1<br>Mathematics 2<br>Quantitative Methods I |
| Examination type(s), examination duration (only for PLK/PLM) | PLK (90 minutes) Module examination |
| Language | German |
| Module coordinator | Prof. Dr. Galler |
| Lecturers | Statistics 2: Prof. Dr. Galler, Dr. Heinemeyer<br>Operations Research: Prof. Dr. Galler, Dr. Heinemeyer |
| Curriculum assignment | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject, 3rd semester |
| Teaching methods used in the module's courses | Lecture with exercises |
| Objectives | **Contribution to the qualification objectives of the programme:**<br>Students will master probability theory, estimation theory and test theory, as well as linear optimisation and its applications. They will be able to confidently apply the relevant concepts and procedures and will thus be able to meet the quantitative requirements of their further studies.<br><br>Students<br>• will master probability theory and important discrete and continuous distributions<br>• can apply estimators and perform statistical tests,<br>• can identify and solve linear optimisation problems. |
| Interdisciplinary qualification goals | Students learn to interpret subject-related problems, solve them mathematically, and reflect on and discuss the solutions together. |
| Contents | **Statistics 2:**<br>Probability theory, random variables and their distribution, estimation theory, test theory<br><br>**Operations research:**<br>Basic model of linear optimisation, graphical solution of an LP problem, simplex algorithm and special cases, duality, transport problems, assignment problem |
| Literature | **Statistics 2:**<br>• Papula, L (2016): *Mathematics for Engineers and Scientists Volume 3,* 7th edition, Springer Vieweg Wiesbaden<br>• Kuhlenkasper, T., Handl, A. (2018): *Introduction to Statistics: Theory and Practice with R,* Springer Spektrum<br>• Specht, K., Bulander, R., Gohout, W. (2014): *Statistics for Technology and Economics.* 2nd expanded edition, De Gruyter Oldenbourg: Munich. |

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

## 16. Business Information Systems

| "Business Information Systems" | |
|---|---|
| Reference number | **BWI10105** |
| Semester | 3rd semester |
| Level | Advanced level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10106 Business Information Systems<br>BWI10107 Business Information Systems Laboratory |
| Recommended prerequisites | BWI10010 Introduction to Computer Science<br>BWI10013 Fundamentals of Business Administration<br>BWI10177 Advanced Business English<br>BWI10178 Advanced English for Engineers |
| Examination type(s), examination duration (only for PLK/PLM) | Business Information Systems: PLK (60 minutes) Module examination<br>Business Information Systems Laboratory: UPL (assessment of laboratory report and learning progress tests) |
| Language of instruction | Business Information Systems: English or German<br>Business Information Systems Laboratory: German |
| Module coordinator | Prof. Dr.-Ing. Thimm |
| Lecturers | Business Information Systems: Prof. Dr.-Ing. Thimm<br>Business Information Systems Laboratory: Prof. Dr.-Ing. Thimm, Prof. Dr. Wunderlich |
| Curriculum assignment | WI/IM, WI/CEE, WI/IMo – compulsory subject, 3rd semester |
| Teaching methods used in the module's courses | Lectures with exercises, laboratory exercises on the PC (case studies) and self-reflection on the material covered by answering learning assessment questions and writing a laboratory report |
| Objectives | Students<br>• are familiar with the different types of business application systems, their basic functionalities, features and areas of application in business<br>• are familiar with the key success factors for the use of business application systems,<br>• can explain the different architectures and basic IT approaches and concepts of business application systems,<br>• can explain the relationship between business processes and business application systems,<br>• are familiar with the basic principles of ERP systems,<br>• have basic practical knowledge of working with ERP systems,<br>• can independently create simple CAD drawings and designs in SolidWorks and understand how design data from the CAD system is integrated into ERP-supported master data management,<br>• have practical knowledge of CAD software (SolidWorks), including the modelling and design of technical components<br>• understand the importance of integrating CAD data into ERP systems for consistent master data and process management,<br>• are familiar with the basic terminology and concepts of business analytics and analytical information systems,<br>• are familiar with current trends in operational application systems. |
| Interdisciplinary | Students |

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| Qualification objectives | • can describe the problems encountered in the exercises in a goal-oriented manner and in a way that is appropriate for the target audience,<br>• practise their self-reflection skills when writing the lab report,<br>• improve their oral expression and foreign language skills by participating in interactive teaching discussions,<br>• develop social skills by working on the laboratory case study,<br>• increase their communication skills in relation to technical issues through group discussions,<br>• deepen their technical expertise and communication skills in the use of CAD software and the integration of CAD data into operational information systems,<br>• promote problem-solving skills in technical tasks in the ERP and CAD environment, in particular through interdisciplinary teamwork. |
| Contents | **Business Information Systems:**<br>The lecture covers key aspects of IT applications and their operational use, with a particular focus on ERP systems and analytical information systems. The course material is taught interactively with discussions, case studies and multimedia examples. The course covers business application systems – general fundamentals, digital enterprise management, IT as an enabler, key business information processing tasks, IT business alignment, information as a competitive factor, classification of business processes, differences between standard software and custom software, analytical information systems and business analytics, characteristics and architecture of ERP systems.<br><br>**Operational Information Systems Laboratory:**<br>Case study on the IT-supported handling of the procedural flow of an order from acceptance to dispatch with the aid of an ERP system, creation of master data in materials management, entry of all order sizes and order monitoring, use of the integrated reporting system. In the second part of the laboratory (CAD laboratory), students learn the basics of computer-aided design using the CAD software SolidWorks as an example. The course material is taught via video tutorials and interactive teaching units that cover both the basics of CAD modelling and the interaction of CAD data with ERP systems. A SolidWorks application test is carried out in a final application unit. |
| Literature | **Business Information Systems:**<br>• Evans, J.R. (2021): *Business Analytics, Methods, Models, and Decisions*, Third Edition, Pearson Education<br>• Laudon, K., Laudon, J. (2019): *Management Information Systems: Managing the Digital Firm.* Edition 16e, Prentice Hall: Boston.<br>• Valacich, J., Schneider, C. (2017): *Information Systems Today: Managing the Digital World.* Global Edition, 8th Edition, Pearson.<br>• Pearlson, K. E., Saunders, C. S., Galletta, D. F. (2016): *Managing and Using Information Systems: A Strategic Approach.* 6th Edition, Wiley.<br><br>**Business Information Systems Laboratory:**<br>• Masutta, M., Cordts, S. (2016): *SAP ERP for Beginners.* 1st edition, Verlag mana Buch: Heide. |

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| | • Sarferaz, S. (2023): *ERP Software: Functionality and Concepts Based on SAP S/4HANA,* SpringerVieweg |
| Workload | Workload: 5 ECTS x 30 hours = 150 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 90 hours. |
| Media | Slides, blackboard work, videos with system examples. Exercise sheets for case studies. E-learning units and videos for self-study, video tutorials and e-learning concepts for CAD, accompanying material is made available on the university's own e-learning platform (Moodle). |

## 17. Operations Management

| **"Operations Management"** | |
|---|---|
| Reference number | **BWI10108** |
| Semester | 3rd semester |
| Level | Advanced |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10109 Operations Management Exercise<br>BWI10110 Operations Management Lecture<br>BWI10111 Operations Management Laboratory |
| Recommended prerequisites | None |
| Examination type(s), examination duration (only for PLK/PLM) | PLK (60 minutes) Module examination<br>Operations Management Laboratory: UPL |
| Language | English |
| Module coordinator | Prof. Dr. Kühn |
| Lecturers | Operations Management Exercise: Prof. Dr. Kühn<br>Operations Management Lecture: Prof. Dr. Kühn<br>Operations Management Laboratory: Prof. Dr. Kühn |
| Curriculum assignment | WI/IM, WI/CEE, WI/IMo – Compulsory subject, 3rd semester |
| Teaching methods used in the module's courses | Lectures, exercises, laboratory |
| Objectives | Students<br>• are familiar with the processes and methods involved in planning and controlling a production area and are able to apply them.<br>• understand the importance of operational and strategic perspectives in operations management and their interdependencies,<br>• recognise the interdependencies between production and logistics,<br>• are familiar with current trends in operations management and understand the logistical, organisational, production-related and business management implications for the organisation as a whole,<br>• can apply time management methods – time recording and predetermined time systems –<br>• are able to view operations holistically, have mastered essential methods and can transfer these to new (real) tasks. |
| Interdisciplinary Qualification objectives | The module contributes to<br>• Social skills<br>• Self-reflection<br>• Teamwork. |
| Content | Students understand methods and processes of operations management and production planning. They apply them and examine their mindset and problems.<br><br>Students learn about operational and strategic aspects of operations management and their interdependencies, as well as the interdependencies between product and service, and production and logistics. |
| Literature | • Heizer, Jay, et al. *Operations Management: Sustainability and Supply Chain Management*, Global Edition, Pearson Education, Limited, 2019. |

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| | • Slack, N. et al. *Operations and Process Management - principles and practice for strategic impact.* Pearson Education Limited, 2018.<br>• Thonemann, U. *Operations Management - Concepts, Methods and Applications*. Pearson Studium: Munich, 2015. |
| Workload | Workload: 5 ECTS x 30 hours = 150 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up for lectures, exercises and exams, exam preparation: 90 hours. |
| Media | Lectures, laboratory work, seminar-style teaching, project work |

## 18. Law

| **"Law"** | |
|---|---|
| Reference number | **LAW1300** |
| Semester | 3rd semester |
| Level | Advanced level |
| Credits | 5 |
| SWS | 4 |
| Related courses | LAW1301 Contract Management<br>LAW1302 Legal Issues in Business |
| Recommended prerequisites | None |
| Examination type(s), examination duration (only for PLK/PLM) | PLK (60 minutes) Module examination |
| language of instruction | German |
| Module coordinator | Prof. Dr. Lorinser |
| Lecturers | Contract management: Prof. Dr. Lorinser<br>Legal issues in business: Prof. Dr. Lorinser |
| Curriculum assignment | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject, 3rd semester |
| Teaching methods used in the module's courses | Lecture |
| Objectives | Students will master the legal fundamentals of contract and liability law, including product liability and product safety and environmental law, as a prerequisite for solving commercial law and business management problems within the scope of the professional tasks of an industrial engineer. |
| Interdisciplinary Qualification goals | Independent work on case studies (self-reflection), partly in group work (teamwork skills) and presentation of solutions (public speaking) as well as joint development of solutions. |
| Contents | • Civil law – conclusion of contracts, general terms and conditions, representation, etc., contract performance and performance disruptions, contractual and non-contractual liability<br>• 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.<br>• Gildeggen, R. et al. (current edition): *Private Commercial Law – Compact Knowledge for Business Administrators.* Oldenbourg: Munich.<br>• Eisenberg, C. et al. (current edition): Product Liability Law |
| Workload | Workload: 5 ECTS x 30 hours = 150 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 90 hours. |
| Media | Blackboard work, exercise sheets, e-learning modules, interactive teaching methods |

## 19. Production

| "Production" / "Production Engineering and Manufacturing" | |
|---|---|
| Reference number | **BWI10052** |
| Semester | 4th semester |
| Level | Advanced level |
| Credits | 6 |
| SWS | 4 |
| Related courses | BWI10053 Production 1<br>BWI10055 Production 1 Laboratory<br>BWI10054 Production 2 |
| Recommended prerequisites | Materials science<br>Physics<br>Manufacturing technology<br>Technical mechanics<br>Production management |
| Examination type(s), examination duration (only for PLK/PLM) | PLK (60 minutes) Module examination<br>Production 1 Laboratory: UPL |
| Language of instruction | Production 1: German<br>Production 1 Laboratory: German<br>Production 2: English |
| Module coordinator | Prof. Dr.-Ing. Saile |
| Lecturers | Production 1: Prof. Dr.-Ing. Saile<br>Production 1 Laboratory: Prof. Dr.-Ing. Saile<br>Production 2: Prof. Dr. Oßwald |
| Assignment to the curriculum | WI/IM, WI/CEE, WI/IMo – compulsory subject, 4th semester |
| Teaching methods used in the module's courses | Lecture with discussion, laboratory |
| Objectives | Students<br>• are familiar with the basic design principles of product development with regard to automation-compatible assembly,<br>• can identify different functional groups in automated product assembly and select the appropriate automation components depending on the task at hand,<br>• are familiar with modern forms of organisation in production and factory operations,<br>• understand the significance of the production system in relation to product characteristics and planning premises,<br>• understand the basic functioning of control loops in both the technical and organisational context of a production plant. |
| Interdisciplinary Qualification objectives | Students<br>• learn to work on complex issues in a team through group exercises<br>• reflect on their own knowledge growth through regular entrance tests and classification of their level of knowledge based on a matrix of relevant terms<br>• improve their communication skills in relation to technical issues by reflecting on the results of practical laboratory exercises. |
| Contents | **Production 1, Production 1 Laboratory:**<br>• Lean Production<br>• Electropneumatics<br>• Electrical measurement technology<br>• Assembly technology<br>• Thermography |

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| | • Human-robot collaboration<br>• Control engineering<br><br>**Production Engineering and Manufacturing / Production 2:**<br>• Automation Technology<br>• Connected Automation<br>• Sensors<br>• Machine Vision and Identification<br>• Fluidic Actuators<br>• Electrical Actuators |
| Literature | **Production 1:**<br>Brenner, Jörg (2016)<br>Lean Production, ISBN 978-3-446-45028-8<br><br>**Production 1 Laboratory and Production 2:**<br>Automation Technology, Fundamentals, Components and Sys-tems for Industry 4.0, Europa-Verlag, 2021, ISBN 9783808551653<br><br>**Production Engineering and Manufacturing:**<br>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<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 120 hours |
| Media | Lectures with discussion, exercises in the laboratory on ma-chines and experimental setups |

## 20. s and Controlling

| "Logistics and Management Accounting" / "Logistik und Controlling" | |
|---|---|
| Reference number | **BWI10056** |
| Semester | 4th semester |
| Level | Advanced level |
| Credits | 6 |
| SWS | 4 |
| Related courses | BWI10057 Logistics<br>BWI10058 Controlling 1 |
| Recommended prerequisites | None |
| Examination type(s), examination duration (only for PLK/PLM) | PLK (60 minutes) Module examination |
| Language | German or English |
| Module coordinator | Prof. Dr. Binder |
| Lecturers | Logistics: Prof. Dr.-Ing. Weyer, Prof. Dr. Peter<br>Controlling 1: Prof. Dr. Binder |
| Curriculum assignment | WI/MT, WI/ID – Compulsory subject 4th semester |
| Teaching methods used in the module's courses | Lecture with discussion |
| Objectives | **Logistics:**<br>Students will master the important fundamentals of logistics in the areas of micro and macro logistics.<br>The fundamentals of these areas will be explained and concepts, methods and technical implementations will be developed using practical case studies.<br><br>Furthermore, students will acquire the skills to design processes and strategies along the entire value chain. Participants will learn about the entirety of logistical business processes.<br><br>**Controlling 1:**<br>Students learn the thinking and actions involved in controlling. They become familiar with the methods and procedures used by controllers and their application in companies, and are able to assess the benefits and limitations of the instruments. |
| Interdisciplinary qualification goals | Students<br>• can work on case studies in teams,<br>• present team results in a goal-oriented manner appropriate to the target audience,<br>• develop social skills,<br>• solve case study tasks independently in presentation software exercises and develop self-reflection skills in the process |
| Contents | **Logistics:**<br>• Logistics definitions, logistics thinking, significance and perspectives of procurement logistics<br>• International procurement logistics, process design in purchasing, sourcing strategies, supplier management, supplier selection and evaluation, supplier controlling<br>• Interaction between procurement, production and distribution logistics |

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| | • Macro-logistics and transport logistics, international significance of modes of transport, trade-offs in transport decisions<br><br>**Controlling 1:**<br>This lecture teaches students the basic principles of controlling and provides an overview of the entire range of controlling tools. These tools are necessary to ensure effectiveness and efficiency in a company with the help of corporate planning and budgeting, key figures and key figure systems, and decision-relevant cost information. |
| Literature | **Logistics:**<br>• Chopra, S. (2018): *Supply Chain Management: Strategy, Planning, and Operation.* 7th Edition. Pearson: London.<br>• Heizer, J., Render, B. (2016): *Operations Management*. Global Edition, 11th Edition, Pearson: London.<br>• Van Weele, A. J. (2014): *Purchasing and Supply Chain Management*. 6th Edition, Cengage Learning: London.<br>• Handfield, R. B., Monczka, R. M., Giunipero, L. C., Patterson, J. L. (2016): *Sourcing and Supply Chain Management.* 6th Edition, Cengage Learning: Florence KY.<br>• Lecture notes provided by the lecturer<br><br>(Participants are requested to register for the courses "Logistics 1" and "Introduction to Controlling 1" in the e-learning platform (Moodle) and download the current lecture notes as a PDF file.)<br><br>**Controlling 1:**<br>• Horvath P. (2020), Controlling, 14th edition, Vahlen: Munich, 2020<br>• Joos-Sachse, T. (2014): *Controlling, Cost Accounting and Cost Management*. 5th edition, Gabler: Wiesbaden.<br>• Weber, J., Schäffer, U. (2016): *Introduction to Controlling.* 15th edition, Schäffer-Poeschel: Stuttgart. |
| Workload | Workload: 6 ECTS x 30 hours = 180 hours.<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 120 hours. |
| Media | PowerPoint, e-learning (Moodle), lectures with numerous case studies and exercises, including presentation software |

## 21. International Management and Business

| **"International Management and Business" / "International Management and Business"** | |
|---|---|
| Reference number | **BWI10112** |
| Semester | 4th semester |
| Level | Advanced level |
| Credits | 6 |
| SWS | 4 |
| Related courses | BWI10113 International Management 1<br>BWI10114 Specific Challenges in International Business<br>BWI10115 Specific Challenges in International Business Laboratory |
| Recommended prerequisites | None |
| Examination type(s), examination duration (only for PLK/PLM) | Module: PLH/PLK/PLP/PLR (60 minutes)<br>Specific Challenges in International Business Laboratory: UPL |
| Language of instruction | English |
| Module coordinator | Prof. Dr. Martin |
| Lecturers | International Management 1: Prof. Dr. Martin<br>Specific Challenges in International Business: Prof. Dr. Volkert<br>Specific Challenges in International Business Laboratory: Prof. Dr. Mahadevan |
| Curriculum assignment | WI/IM – Compulsory subject, 4th semester |
| Teaching methods used in the module's courses | Seminar-style teaching, lectures with discussion, also using case studies |
| Objectives | **International Management 1:**<br>Students<br>• are familiar with common management and organisational theories and understand their application in an international context.<br>• can solve typical management tasks in an international context in a structured manner using common approaches.<br><br>**Specific Challenges in International Business:**<br>Students<br>• are familiar with the basic concepts and functioning of international foreign exchange markets and the resulting risks (e.g. for corporate decisions).<br>• can assess determinants and central bank influences on exchange rate developments and the potential of flexible or fixed exchange rates and the euro area, as well as their risks.<br><br>**Specific Challenges in International Business Laboratory:**<br>Students can apply fundamental methods and concepts of international management and business. |
| Interdisciplinary Qualification goals | The module promotes analytical skills, empathy and self-reflection. |
| Contents | **International Management 1:**<br>• Consideration and evaluation of investment opportunities abroad.<br>• Socio-economic considerations of business environments and identification of potential problem areas.<br>• Methods for classifying business areas and products in global markets. |

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| | • Establishing learning organisations to increase competitiveness.<br>• International financing of projects<br>• Human resource management and policy in international business.<br><br>**Specific challenges in international business:**<br>• Exchange rates: fundamentals and determinants.<br>• Monetary policy influences of the central bank on the economy and companies with flexible and fixed exchange rates.<br>• Common currency areas – their prerequisites, potential and risks: the example of the euro area.<br><br>**Specific Challenges in International Business Laboratory:**<br>• Teaching specific skills in the field of international management and international business using interactive, problem-oriented and experience-based learning methods. |
| Literature | **International Management 1:**<br>• Martin, L. (ed.): *International Business Development*. Springer, 2021<br>• Pugh, D.D. & Hickson, D.J. (eds.): *Writers on Organisations*. 6th Edition, Sage Publications: London.<br>• Current specialist articles on individual topics will be provided.<br><br>**Specific Challenges in International Business**<br>• Feenstra, Robert C.; Taylor, Alan M. (2017*): International Economics*, 5th edition, Worth Publishers.<br>• Krugman, Paul R.; Obstfeld, Maurice; Melitz, Marc J. (2021): *International Economics. Theory and Policy*, 12th edition, Pearson<br><br>**Specific Challenges in International Business Laboratory:**<br>Will be announced during the course |
| Workload | Workload: 6 ECTS x 30 hours = 180 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 120 hours |
| Media formats | **International Management 1:**<br>Slide presentations, exercises, group discussions<br><br>**Specific Challenges in International Business**<br>Slide presentations, case studies, interactive exercises<br><br>**Specific Challenges in International Business Laboratory:**<br>Slide presentations and blackboard notes, as well as a suitable selection from: exercises, case study discussions, negotiation simulations, group work and discussions |

## 22. International Technical Sales

| "International Technical Sales" | |
|---|---|
| Reference number | **BWI10116** |
| Semester | 4th semester |
| Level | Advanced level |
| Credits | 6 |
| SWS | 4 |
| Related courses | BWI10117 International Technical Sales 1<br>BWI10118 International Technical Sales 2 |
| Recommended prerequisites | B2/C1 English (CEFR)<br>Attendance of the modules Business Administration I and II |
| Examination type(s), examination duration (only for PLK/PLM) | PLK (60 minutes) Module examination |
| Language of instruction | English |
| Module coordinator | Prof. Dr.-Ing. Hinderer |
| Lecturers | Prof. Dr.-Ing. Hinderer |
| Curriculum assignment | WI/IM, WI/CEE, WI/IMo – Compulsory subject 4th semester |
| Teaching methods used in the module's courses | Lecture with discussion |
| Objectives | Students will learn the basic concepts and tools as well as the mindset of technical sales and marketing as a dual management principle in companies. They will become familiar with the specifics of international technical sales and business-to-business marketing as well as industrial goods marketing. |
| Interdisciplinary Qualification objectives | Students deepen their communication skills in English and, through group tasks, strengthen their ability to work together ad hoc in teams and in various constellations.<br>Using case studies, they are able to analyse situations in the marketing of technical products and devise their own solutions, particularly for the appropriate use of communication tools. |
| Contents | • Introduction and fundamentals: Fundamentals of technical sales and marketing; marketing concepts and sales, particularly for capital goods and technology companies<br>• Differences in B2B and B2C sales<br>• The marketing mix: product policy, pricing policy, communication policy, distribution policy<br>• Special features of technical sales in relation to the various types of business in industrial goods marketing<br>• Development of communication strategies<br>• International customer relationship management in practice and with the support of suitable software systems for outbound and inbound marketing |
| Literature | **International Technical Sales 1:**<br>• Backhaus, K., Voeth, M. (2014): *Industrial Goods Marketing: Fundamentals of Business-to-Business Marketing.* 10th edition, Vahlen: Munich.<br>• Doole, I., Lowe, R. (2019): *International Marketing Strategy.* 8th edition, Andover.<br>• Kotler, P., Keller, L. K. (2016): *Marketing Management.* Pearson: Upper Saddle River.<br><br>**International Technical Sales 2:** |

| | |
|---|---|
| | • Kumar, V., & Reinartz, W. (2018). *Customer Relationship Management: Concept, Strategy, and Tools* (Third edition.). Berlin, Heidelberg: Springer.<br>• Blythe, Z., Zimmermann, A. (2017): *Business to Business Marketing Management.* Routledge.<br>• Buttle, F., Maklan, S., (2015): *Customer Relationship Management – Concept and Technologies.* Taylor & Francis Group: Amsterdam et al. |
| Workload | Workload: 6 ECTS x 30 hours = 180 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up for lectures, exercises and written examination, preparation for the examination: 120 hours. |
| Media | Slide presentations, tablet and blackboard work, video and print media as illustrative material |

### 23. Elective specialisation Module 1

The elective specialisations available will be announced via a list/notice board. Participation may be restricted by decision.

| **"Elective module" / "Major Elective Module"** | |
|---|---|
| Reference number | **BWI10065** |
| Semester | 4th semester |
| Level | Advanced level |
| Credits | 6 |
| SWS | 4 |
| Related courses | Depending on the current semester's course offerings |
| Recommended prerequisites | Content from previous semesters; if choosing an English-language subject, English at level B2. |
| Examination type(s), examination duration (only for PLK/PLM) | PLH/PLK/PLP/PLR |
| Language of instruction | German or English |
| Module coordinator | The programme director or the module coordinator for the chosen specialisation |
| Lecturers | Depending on the selected module |
| Assignment to the curriculum | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – compulsory subject in the 4th semester (adapted specialisations depending on the degree programme) |
| Teaching methods used in the module's courses | Depending on the chosen specialisation, possible course formats include seminars, lectures or projects |
| Objectives | Depending on the chosen specialisation |
| Interdisciplinary Qualification objectives | Depending on the chosen specialisation |
| Contents | Depending on the chosen specialisation |
| Literature | The literature depends on the courses in the chosen specialisation and will be published in the respective course syllabi before the start of the lecture period. |
| Workload | Workload: 6 ECTS x 30 hours = 180 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 120 hours |
| Media | Depending on the selected courses |

## 24. Academic Education and Methods

| "Academic Education and Methods" | |
|---|---|
| Reference number | **BWI10066** |
| Semester | 5th semester |
| Level | Advanced level |
| Credits | 5 |
| SWS | 4 |
| Related courses | BWI10067 General Science Seminar<br>BWI10068 Scientific Work |
| Recommended prerequisites | None |
| Examination type(s), examination duration (only for PLK/PLM) | General scientific seminar: UPL<br>Scientific Work: UPL |
| Language of instruction | General science seminar: German and English<br>Scientific work: German |
| Module coordinator | Prof. Dr. Mahadevan |
| Lecturers | General Science Seminar: Prof. Dr. Mahadevan<br>Scientific Work: Prof. Dr. Martin, Dr. Frank |
| Curriculum assignment | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject 5th semester |
| Teaching methods used in the module's courses | Workshops, e-learning, exercises |
| Objectives | **General science seminar:**<br>Students work independently on general scientific topics and use this to develop their individual profiles. They demonstrate both by submitting the relevant assignments.<br><br>**Scientific work:**<br>Students are familiar with the requirements and characteristics of scientific work and the standards expected of a scientific paper. They are able to approach a problem scientifically, examine it systematically and independently produce a scientific paper in accordance with the formal criteria. |
| Interdisciplinary Qualification goals | **General academic seminar:**<br>• Self-reflection is trained through learning reports = central element of the subject, for all students<br>• Social skills are trained through specific activities, e.g. holding tutorials, depending on profile development<br>• Teamwork skills are trained through specific activities, e.g. co-organising a specialist event or conference, depending on profile development<br><br>**Scientific work:**<br>• Includes units on self-reflection, e.g. academic writing and reflection on research<br>• Includes group work to train the ability to collaborate in scientific teams |
| Contents | **General scientific seminar:**<br>• Independence in student work<br>• Goal-oriented student work<br>• Summary and communication of general scientific content<br>• Individual profile development<br><br>**Scientific work:**<br>• Identifying and formulating problems |

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| | • Developing research questions<br>• Characteristics and style of scientific work<br>• Sources: researching, evaluating, citing<br>• Structure, outline and formal requirements of scientific work<br>• Tables and illustrations<br>• Planning and reviewing your own work |
| Literature | **General academic seminar:**<br>Depending on your profile, this will be announced in the semi-nar<br><br>**Scientific work:**<br>• Theisen, M. R. (2011): *Scientific Work. Technique – Meth-odology – Form.* 15th edition, Vahlen: Munich.<br>• Franck, N., Stary, J. (2011): *The Technique of Academic Work: A Practical Guide.* 16th edition, UTB/Schöningh: Pa-derborn et al. |
| Workload | Workload: 5 ECTS x 30 hours = 150 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 90 hours. |
| Media | Presentations, e-learning, exercises |

## 25. Practical semester

| "Practical semester" / Internship | |
|---|---|
| Reference number | **BWI10069** |
| Semester | 5th semester |
| Level | Advanced level |
| Credits | 25 |
| SWS | At least 100 days of attendance at the company |
| Related courses | None |
| Recommended prerequisites | Events in semesters 1-4<br>In particular, completed first stage of studies |
| Examination type(s), examination duration (only PLK, PLM) | UPL |
| Language of instruction | German or English |
| Module coordinator | The internship supervisors are responsible: Assignment according to WI homepage/practical semester |
| Lecturers | Not applicable |
| Assignment to the curriculum | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – compulsory subject in the 5th semester |
| Teaching methods for the module's courses | Exercise/training |
| Objectives | During the practical semester, students can apply and deepen the knowledge they have acquired during their studies in industrial and business practice. The activities and working methods of industrial engineers are experienced in everyday life and can be compared with the theoretical material.<br><br>Students expand their experience in terms of methodological and social skills, learn about technological, commercial and organisational contexts, and increase their understanding of business processes. Together with other company employees, they learn to work on specific tasks and projects in a team and to integrate themselves into the company hierarchy.<br><br>By reflecting on the course content in relation to practical activities, students gain a better understanding of the career opportunities available to them and are highly motivated to continue their studies. The practical experience gained and the feedback received also enable them to make better choices regarding their thesis and future career path based on their individual inclinations and abilities. The practical semester thus ultimately paves the way for the subsequent start of professional life. |
| Interdisciplinary Qualification objectives | Information on the contribution of the module or individual courses to<br>• social skills<br>    o Working in corporate structures<br>    o Interaction with other company levels<br>    o Interaction in customer/supplier relationships<br>    o Ability to engage in dialogue<br>    o Ability to take criticism<br>    o Interpersonal skills<br>• Self-reflection<br>    o Self-positioning within the professional spectrum WI<br>    o Self-efficacy within company structures<br>    o Self-assessment of specialist knowledge and skills |

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| | • Teamwork<br>  ○ Teamwork in a corporate context<br>  ○ Teamwork in response to external demands |
| Contents | The practical semester should relate to the degree programme and focus on the application of the theoretical knowledge acquired during the course of study, as well as familiarising students with the processes and structures of a company or other practical placement. Both technical and commercial activities can be carried out, whereby activities that lie at the interface between the two areas are particularly suitable for reflecting the nature of the chosen course of study.<br>Ongoing contact with the respective supervisor in the company ensures that students gain sufficient insight into the commercial and/or technological operational contexts through qualified work.<br><br>The practical study semester is a supervised training period that is integrated into the degree programme, regulated by the university and determined in terms of content. It is intended to provide students with practical experience and knowledge to supplement the course content.<br><br>The practical study semester comprises at least 20 weeks (100 days of attendance) in a company or other professional practice institution (practical training centre). Students are required to write a detailed report on the practical semester, which shows that the required content and activities were actually completed in the company. |
| Literature | Varies depending on the topic |
| Workload | 25 ECTS x 30 hours = 750 hours = 100 days at 7.5 hours per day |
| Media | Not applicable |

## 26. Elective subjects

Students must choose 6 credits from the elective subject catalogue for the degree programme. Of these, 3 credits must be chosen from subjects marked with "Technology". The catalogue will be announced on the notice board. The modules/subjects must be chosen in consultation with the degree programme director. Participation may be restricted by decision of the degree programme.

| **"Elective subjects" / "Electives"** | |
|---|---|
| Reference number | **BWI10122** |
| Semester | 6th semester |
| Level | Advanced level |
| Credits | 6 |
| SWS | 4 |
| Related courses | BWI10123 Elective subject: Depending on the current semester course offerings<br>BWI10124 Elective subject Technology: Depending on the current semester course offerings |
| Recommended prerequisites | Content from previous semesters; if choosing an English-language subject, English at level B2. |
| Examination type(s), examination duration (only for PLK/PLM) | PLH/PLK/PLP/PLR |
| Language of instruction | German or English |
| Module coordinator | The programme director |
| Lecturers | Depending on the selected courses |
| Assignment to the curriculum | WI/IM – Compulsory subject 6th semester |
| Teaching methods used in the module's courses | Depending on the selected courses, possible course formats include seminars, lectures or projects |
| Objectives | Depending on the selected courses |
| Interdisciplinary Qualification goals | Depending on the selected courses |
| Contents | Depending on the selected courses |
| Literature | The literature depends on the selected courses and will be published in the respective course syllabi before the start of the lecture period. |
| Workload | Workload: 6 ECTS x 30 hours = 180 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 120 hours. |
| Media | Depending on the selected courses |

## 27. Project Methods and Creativity

| **"Project in Methods and Creativity"** | |
|---|---|
| Reference number | **BWI10071** |
| Semester | 6th semester |
| Level | Professional academic level |
| Credits | 6 |
| SWS | 4 |
| Recommended prerequisites | First stage of studies completed |
| Examination type(s), examination duration (only PLK, PLM) | PLH/PLP/PLR |
| Language of instruction | German |
| Module coordinator | Prof. Dr.-Ing. Jakob |
| Lecturers | Prof. Dr.-Ing. Jakob, Dr. Heinemeyer |
| Curriculum assignment | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject 6th semester |
| Teaching methods used in the module's courses | Seminar-based teaching |
| Objectives | • 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. In doing so, they should become familiar with various project methods and learn to apply them according to the respective requirements.<br>• Promotion of creativity: Students should learn to use their creativity to find innovative solutions to complex problems. In doing so, they should become familiar with various creativity techniques and learn to apply them in projects.<br>• Developing 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.<br>• Improving self-reflection: Students should learn to critically reflect on their own skills and methods and optimise their working methods. In doing so, they should reflect on and evaluate their decision-making processes and creative methods.<br>• Presentation skills: Students should learn to communicate their work results in the form of presentations. In doing so, they should learn how to present information effectively and appealingly and how to obtain feedback from others.<br>• Development of problem-solving skills: Students should learn how to identify, analyse and solve problems. In doing so, they should become familiar with various problem-solving methods and learn how to apply them to complex problems.<br>• Promotion of 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 teamwork. |

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| | • Social skills: The course includes 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.<br>• Self-reflection: The course includes exercises in self-reflection, e.g. through feedback from other participants or through critical examination of one's own mistakes. Participants learn how to reflect on and improve their own behaviour and thought processes.<br>• Teamwork: In the course, participants will work in teams to plan, implement and present projects. In doing so, they will learn how to collaborate effectively with others and contribute their strengths and weaknesses to a team. They will also learn how to use 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:<br>• Technical project management: definition of technical projects, project phases, project management methods and techniques in the technical field, project planning and monitoring, risk management.<br>• 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.<br>• Teamwork: Fundamentals of teamwork, team dynamics, team building, team meetings, conflict management in the technical field, cooperation and communication.<br>• Technical problem-solving techniques: Analysis of technical problems, problem-solving techniques such as troubleshooting and fault finding, design thinking in the technical field, technical brainstorming and mind mapping.<br>• Technical decision-making: definition of decisions, decision-making methods, decision-making processes, decision-making strategies and techniques.<br>• Technical entrepreneurship: fundamentals 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 21st Century Toolkit for Any Business to Succeed. Vahlen: Munich.<br>• Eppler, M. J., Hoffmann, F., & Pfister, R. A. (2017). Creability: Creative Together – Innovative Methods for Idea Development in Teams. Schäffer-Poeschel.<br>• Fox, D., Püttmann, T. et al. (2018): Build, experience, understand: fischertechnik models for makers. dpunkt: Heidelberg.<br>• Lewrick, M., Link, P., & Leifer, L. (2017). The Design Thinking Playbook: With traditional, current and future success factors. Vahlen.<br>• 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<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, project work, exam preparation and completion: 120 hours. |

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| Media | Project work, assessed milestone presentations and project discussions |

## 28. Focus module: Management

The available focus modules in management[1] will be announced via a list/notice board. Participation may be restricted by decision.

| "Focus module Management" / "Management Elective" | |
|---|---|
| Reference number | **BWI10073** |
| Semester | 6th semester |
| Level | Advanced level |
| Credits | 6 |
| SWS | 4 |
| Related courses | Depending on the current semester's course offerings |
| Recommended prerequisites | Content from previous semesters; if choosing an English-language subject, English at level B2. |
| Examination type(s), examination duration (only for PLK/PLM) | PLH/PLK/PLP/PLR (60 minutes) Module examination |
| Language of instruction | German or English |
| Module coordinator | Course director or the module coordinator of the selected specialisation module |
| Lecturers | Depending on the choice of module |
| Assignment to the curriculum | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject, 6th semester<br>(Adapted focus modules for each degree programme) |
| Teaching methods used in the module's courses | Depending on the selected courses, seminar-style teaching, lectures or projects |
| Objectives | Students acquire in-depth knowledge in the field of management through specialisation subjects of their own choosing. Courses in this module contribute to fulfilling the qualification framework for industrial engineering – management component. |
| Interdisciplinary Qualification goals | Depending on the selected courses |
| Contents | The content depends on the selected courses from the "Focus Modules Management" elective list and will be published in the course syllabi before the start of the lecture period. |
| Literature | The literature depends on the selected courses from the "Focus Modules Management" elective list and will be published in the course syllabi before the start of the lecture period. |
| Workload | Workload: 6 ECTS x 30 hours = 180 hours<br>Attendance time: 4 hours per week x 15 weeks = 60 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 120 hours. |
| Media | Depending on the selected courses |

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

## 29. International Management

| **"International Management"** | |
|---|---|
| Reference number | **BWI10125** |
| Semester | 6th/7th semester |
| Level | Professional academic level |
| Credits | 12 |
| SWS | 8 |
| Related courses | BWI10126 International Business 2<br>BWI10127 Cross-Cultural Management 2<br>BWI10128 International Management 2<br>BWI10129 Specific Challenges in International Management |
| Recommended prerequisites | For all courses:<br>• Completion of the practical semester<br>• Participation in general academic seminar and academic work<br><br>For International Business 2: Successful participation in International Business 1<br><br>For Cross-Cultural Management 2: Successful participation in Cross-Cultural Management 1<br><br>For International Management 2 / Specific Challenges in International Management: successful participation in International Management 1, Cross-Cultural Management 1 and International Business 1 |
| Examination type(s), examination duration (only for PLK/PLM) | PLH/PLP/PLR/PLK (60 minutes) |
| Language of instruction | English |
| Module coordinator | Prof. Dr. Mahadevan |
| Lecturers | International Business 2: Prof. Dr. Kilian-Yasin<br>Cross Cultural Management 2: Prof. Dr. Mahadevan<br>International Management 2: Prof. Dr. Martin<br>Specific Challenges in International Management: Prof. Dr. Mahadevan |
| Curriculum assignment | WI/IM – Compulsory subject 6th/7th semester |
| Teaching methods used in the module's courses | Seminar-based teaching, project |
| Objectives | **International Business 2:**<br>Students<br>• will have in-depth theoretical knowledge and methodological skills in international industrial engineering, particularly with regard to corporate responsibility and sustainability in an international environment.<br>• can analyse practical case studies in depth and discuss and present them orally and in writing at an academic level using appropriate theories and methods,<br>• can make responsible and ethically sound decisions for complex problems in international industrial engineering.<br><br>**Cross Cultural Management 2:**<br>Students<br>• can apply intercultural theories, concepts and models to real situations and/or problems |

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| | • are able to critically reflect on the framework conditions and fields of action of intercultural management<br><br>**International Management 2:**<br>Students<br>• are familiar with issues relating to the internationalisation of companies and common methods of minimising the associated risks<br>• understand socio-economic contexts and can transfer these contexts to international environments in order to apply learned management approaches in a targeted manner.<br><br>**Specific Challenges in International Management:**<br>Students<br>• apply specialist knowledge and methods of international management to a current topic. |
| Interdisciplinary Qualification goals | Social skills, teamwork and self-reflection are core components of all subjects in the module. |
| Contents | **International Business 2:**<br>• In-depth knowledge of the ethical principles of corporate responsibility and sustainability<br>• Interactive analysis and discussion of case studies from international industrial engineering<br>• Transfer of specialist knowledge and methodological skills to practical applications<br>• Preparation of an academic paper in the field of international industrial engineering<br><br>**Cross-Cultural Management 2:**<br>• In-depth intercultural theories, concepts and methods<br>• In-depth intercultural competence<br>• Cultural complexity, diversity and identity<br><br>**International Management 2:**<br>• Considerations and evaluation of investment opportunities abroad<br>• Socio-economic considerations of business environments and identification of potential problem areas<br>• Corruption and nepotism<br>• Building learning organisations to increase competitiveness<br><br>**Specific Challenges in International Management:**<br>• Current topics in the field of teaching |
| Literature | **International Business 2:**<br>• Brandenburg, M., Hahn, G. J. & Rebs, T. (Eds.). 2018. Social and Environmental Dimensions of Organisations and Supply Chains: Tradeoffs and Synergies. Cham: Springer International Publishing<br>• de Souza Campos, Lucila Maria and Vázquez-Brust, Diego (2023) The Social Dimensions of the Circular Economy. Cham: Springer<br>• Current specialist articles and case studies are provided<br><br>**Cross Cultural Management 2:**<br>• Mahadevan, J. (2023), Cross-Cultural Management: A Contemporary Approach, London: Sage.<br>• Further reading: updated each semester and announced in the seminar accordingly |

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| | **International Management 2:**<br>• Deresky, H. (2018) International Management: Managing across borders and cultures. 9th Ed. Pearson.<br>• Current specialist articles and case studies on individual topics will be provided<br><br>**Specific Challenges in International Management:**<br>• Updated each semester and announced in the seminar accordingly |
| Workload | Information per course:<br>Workload: 3 ECTS x 30 hours = 90 hours<br>Attendance time: 2 hours per week x 15 weeks = 30 hours<br>Preparation/follow-up, exercises, preparation and conduct of the examination: 60 hours. |
| Media formats | Blackboard notes, slide presentations, project work/service learning, instructional videos, learning portfolio, presentations, interactive exercises, case study discussions, negotiation simulation, group work and discussions (selection from these formats) |

## 30. Elective specialisation Module 2

One module (12 credits) must be selected from the specialisation modules A and B (see Section III, Specialisations) and a list that is published each semester on the selection date. Elective specialisation module 1 may be a prerequisite for elective specialisation module 2. Participation in the specialisation modules may be restricted by decision of the programme director.

| **"Elective specialisation module 2" / "Major Elective Module 2"** | |
|---|---|
| Reference number | **BWI10130** |
| Semester | 6th/7th semester |
| Level | Advanced level |
| Credits | 12 |
| SWS | 8 |
| Related courses | Depending on the current semester's course offerings |
| Recommended prerequisites | Content from previous semesters; if choosing an English-language subject, English at level B2. |
| Examination type(s), examination duration (only for PLK/PLM) | PLH/PLK/PLP/PLR |
| Language of instruction | German or English |
| Module coordinator | The programme director or the module coordinator for the chosen specialisation |
| Lecturers | Depending on the selected module |
| Assignment to the curriculum | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – compulsory subject in the 6th/7th semester (adapted specialisations depending on the degree programme) |
| Teaching methods used in the module's courses | Depending on the chosen specialisation, possible course formats include seminars, lectures or projects |
| Objectives | Depending on the chosen specialisation |
| Interdisciplinary Qualification objectives | Depending on the chosen specialisation |
| Contents | Depending on the chosen specialisation |
| Literature | The literature depends on the courses in the chosen specialisation and will be published in the respective course syllabi before the start of the lecture period. |
| Workload | Workload: 12 ECTS x 30 hours = 360 hours<br>Attendance time: 8 hours per week x 15 weeks = 120 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 240 hours. |
| Media | Depending on the selected courses |

## 31. Interdisciplinary project work

| "Interdisciplinary Project" | |
|---|---|
| Reference number | **BWI10076** |
| Semester | 7th semester |
| Level | Professional academic level |
| Credits | 4 |
| SWS | 4 |
| Related courses | Interdisciplinary project work |
| Recommended prerequisites | Completion of the first stage of studies. Specialist lecture on the respective project topic. Passing all examinations of the second stage of studies up to and including the sixth semester, if possible. |
| Examination type(s), examination duration (only PLK, PLM) | PLP |
| Language of instruction | German and English |
| Module coordinator | All professors in the department |
| Lecturers | All full-time professors can be examiners. |
| Assignment to the curriculum | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – compulsory subject in the 7th semester |
| Teaching methods used in the module's courses | Project |
| Objectives | Students will be able to work systematically and scientifically on interdisciplinary tasks and problems in industrial engineering in teams of 2 to 5 students. This includes, for example<br>• data collection and analysis,<br>• the development and evaluation of solution concepts,<br>• implementing a solution concept,<br>• documentation and subsequent presentation. |
| Interdisciplinary Qualification objectives | As part of the project work, students learn to work in a team to develop results and present them to their supervisor. They also deal with a specific interdisciplinary issue and 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 | Changing but interdisciplinary topics in which students<br>• apply their knowledge, skills and competencies in economics and engineering,<br>• use standard tools for project management and data analysis,<br>• Plan and implement projects in terms of timing, organisation and content,<br>• Conducting independent research and, where necessary, data collection and analysis.<br>• Document and present progress and results. |
| Literature | To be chosen by the students. |
| Workload | Workload: 4 ECTS x 30 hours = 120 hours per student<br>Attendance time = 0 hours per week; preparation, literature research, working on the project in a team: 120 hours per student |
| Media | Current literature, lectures, intensive individual supervision by supervisor, final presentation |

## 32. Specialist scientific colloquium

| "Scientific Colloquium" | |
|---|---|
| Reference number | **COL4998** |
| Semester | 7th semester |
| Level | Professional academic level |
| Credits | 2 |
| SWS | 2 |
| Related courses | None |
| Participation requirements according to SPO | At the earliest in the 6th semester. To be eligible, all examinations up to and including the 4th semester must have been successfully completed. |
| Recommended prerequisites | Completion of the seminar "Scientific Work" in the 5th semester |
| Examination type(s), examination duration (only for PLK/PLM) | UPL |
| Language of instruction | German and English |
| Module coordinator | All professors in the department |
| Lecturers | All full-time professors can be examiners. |
| Assignment to the curriculum | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – compulsory subject in the 7th semester |
| Teaching methods used in the module's courses | Colloquium with individual students. Preparation for the thesis. |
| Objectives | While writing their thesis, students should be able to solve complex and comprehensive tasks of particular difficulty independently, methodically and without errors. The essential elements of scientific work taught during the course are applied and further deepened. Individual weaknesses are identified and addressed in consultation with the supervising professor. The ability to engage in critical self-reflection is encouraged. |
| Interdisciplinary Qualification goals | Students are able to present complex topics in a differentiated manner from different perspectives and prepare them according to academic standards. In doing so, they train their analytical thinking skills and critical judgement. They are able to plan and carry out an academic thesis project over a longer period of time, demonstrating their perseverance. |
| Contents | Depending on the individual student: in particular, subjects in which the individual student or his/her supervising professor identifies deficits in the thesis; in-depth study of methodological issues. |
| Literature | Depending on the planned topic of the thesis. |
| Workload | Workload: 2 ECTS x 30 hours = 60 hours<br>Attendance time: 2 hours per week x 15 weeks = 30 hours<br>Preparation and follow-up: 30 hours |
| Media formats | Not applicable |

## 33. Bachelor's thesis

| "Bachelor's thesis" / "Bachelor Thesis" | |
|---|---|
| Reference number | **THE4999** |
| Semester | 7th semester |
| Level | Professional academic level |
| Credits | 12 |
| SWS | 0 |
| Related courses | None |
| Participation requirements according to SPO | The Bachelor's thesis can be registered in the 6th semester at the earliest. To do so, all examinations up to and including the 4th semester must have been successfully completed. |
| Recommended prerequisites | Attendance at the specialist colloquium and the seminar "Scientific Work".<br>All examinations in the second stage of the programme should have been completed. |
| Examination type(s), examination duration (only for PLK/PLM) | PLT |
| Language of instruction | German and English |
| Module coordinator | All professors in the department |
| Lecturers | All professors and lecturers for special tasks can be primary assessors. |
| Assignment to the curriculum | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – compulsory subject, 7th semester |
| Teaching methods used in the module's courses | Not applicable |
| Objectives | With their thesis, students demonstrate their ability to solve scientific problems independently. They are able to transfer and apply methods and thought structures to mostly practical problems within a given time frame.<br><br>Through the appropriate gathering and use of information, complex thought processes and factual contexts are brought together to form a holistic solution. This requires researching, narrowing down and evaluating relevant literature. The topic must be systematically organised in a meaningful way and a line of argumentation must be developed.<br><br>Students select scientific methods and procedures, apply them and develop them further to solve the problem. Results are critically evaluated against the latest state of research.<br><br>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 different perspectives and prepare them in accordance with academic standards. In doing so, they train their analytical thinking skills and critical judgement. They are able to plan and carry out an academic thesis project over a longer period of time, demonstrating their perseverance. |
| Contents | The Bachelor's thesis is the first major academic paper. The topic of the thesis is determined by the primary supervisor in consultation with the student and depends on the chosen subject area or specific problem. |

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| | In terms of subject matter, it must be related to industrial engineering in general and the chosen degree programme in particular, and must deal with subject-specific topics or current issues arising from these. Suggestions for topics often come from companies. |
| Literature | Topic-specific literature, to be selected by the students. |
| Workload | 12 credits x 30 hours = 360 hours |
| Media | Not applicable |

## III. Specialisations

In consultation with the programme director, students must select 12 credits (6 credits in the 6th semester and 6 credits in the 7th semester), i.e. one elective module A or B from the range of electives described on the following pages. Participation in the specialisation modules may be restricted by decision.

### A Operations Management

| **"Operations Management"** | |
|---|---|
| Reference number | **BWI10131** |
| Semester | 6th/7th semester |
| Level | Professional academic level |
| Credits | 12 |
| SWS | 8 |
| Related courses | BWI10132 Supply Chain Management<br>BWI10133 Quality and Improvement<br>BWI10134 Production Design<br>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 |
| Examination type(s), examination duration (only for PLK/PLM) | Per course: PLH/PLK/PLP/PLR (60 minutes) |
| Language | Supply Chain Management: English<br>Quality and Improvement: English<br>Production Design: English<br>Production Controlling: German or English |
| Module coordinator | Prof. Dr. Kühn |
| Lecturers | Supply Chain Management: Prof. Dr. Peter<br>Quality and Improvement: Prof. Dr.-Ing. Mazilu-Eyaz<br>Production Design: Prof. Dr. Kühn<br>Production Controlling: Prof. Dr. Schnell |
| Assignment to the curriculum | WI/IM, WI/CEE, WI/IMo – Elective subject 6th/7th semester |
| Teaching methods used in the module's courses | Seminar-style course, laboratory sessions, project work |
| Objectives | Students learn<br>• methods for analysing logistics and manufacturing processes and describing their characteristic parameters,<br>• understand the specific characteristics of different manufacturing principles,<br>• optimise existing processes in the production and logistics environment or fundamentally redesign them. Quality assurance management and continuous improvement methods can be applied in a targeted manner for this purpose,<br>• describe the phases of factory planning,<br>• independently implement layout planning and workplace design based on ergonomic aspects using case studies,<br>• 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.<br>• Apply tools for measuring and controlling production efficiency and know how to identify starting points for optimising manufacturing efficiency. |

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| Interdisciplinary<br>Qualification objectives | The module contributes to<br>• Social skills<br>• Self-reflection<br>• Teamwork<br>• Interdisciplinary thinking and action |
| Contents | **Supply chain management:**<br>Fundamentals 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.<br><br>**Quality and improvement:**<br>Concepts and methods of quality management with particular relevance to production and logistics processes, including factory planning; concepts and methods of continuous improvement.<br><br>**Production design:**<br>Design and optimisation of processes, workplaces and layouts in the production environment, taking into account technical, economic and ergonomic aspects; phases of factory planning; familiarisation with and application of relevant methods in production design.<br><br>**Production controlling:**<br>Ensuring effectiveness and efficiency in the production area, for example through the use of manufacturing key figures and key figure systems, through the use of standard cost accounting or selected decision-making calculations. |
| Literature | **Supply chain management:**<br>• Chopra, S. (2018): *Supply Chain Management: Strategy, Planning and Operation.* 7th Edition, Pearson: London.<br>• Heizer, J., Render, B. (2016): *Operations Management.* 11th Edition, Pearson: London.<br>• Handfield, R. B., Monczka, R. M., Giunipero, L. C., Patterson, J. L. (2016): *Sourcing and Supply Chain Management.* 6th Edition, Cengage Learning: Florence (KY).<br><br>Additional recommended practitioner journals:<br>• Inside Supply Management<br>• Supply Chain Quarterly<br><br>**Quality and Improvement:**<br>Will be announced in the syllabus at the beginning of each semester.<br><br>**Production design:**<br>Will be announced in the syllabus at the beginning of each semester.<br><br>**Production Controlling:**<br>• Klein, A. (2018): *Modern Production Controlling Modern Production Controlling for Industry 4.0: Concepts, Instruments and Key Figures.* Haufe: Munich.<br>• Schnell, H.; Klein, A.: Production Controllers! – More in demand than ever! In: Controller Magazine 7/8-2018, Issue 4/2018, pp. 78–81<br>• Schnell, H.: Production Controlling – How Controllers Contribute to Success in Production. In: Process and Function |

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| | Controlling, edited by Gleich, R.; Freiburg – Haufe: 2021, pp. 125–138 |
| Workload | Information per course:<br>Workload: 3 ECTS x 30 hours = 90 hours<br>Attendance time: 2 hours per week x 15 weeks = 30 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 60 hours |
| Media | Lectures, laboratory work, seminar-style teaching, project work |

**B International Technical Sales**

| **"International Technical Sales"** | |
|---|---|
| Reference number | **BWI10087** |
| Semester | 6th/7th semester |
| Level | Professional academic level |
| Credits | 12 |
| SWS | 8 |
| Related courses | BWI10088 International Marketing<br>BWI10089 Business Plan and Business Models<br>BWI10090 International Technical Sales 3<br>BWI10091 Marketing Simulations |
| Participation requirements accord-ing to SPO | 1. Completion of the first stage of studies |
| Recommended requirements | Successful participation in the International Technical Sales course |
| Examination type(s), examination duration (only for PLK/PLM) | Per course: PLH/PLK/PLP/PLR (60 minutes) |
| Language of instruction | German or English |
| Module coordinator | Prof. Dr.-Ing. Bührer |
| Lecturers | International Marketing: Prof. Dr.-Ing. Bührer<br>Business Plan and Business Models: Prof. Dr.-Ing. Hinderer<br>International Technical Sales 3: Prof. Dr.-Ing. Bührer Marketing Simulations: Prof. Dr.-Ing. Hinderer |
| Curriculum assignment | WI/MT, WI/ID, WI/IM, WI/CEE, WI/IMo – Compulsory subject 6th/7th semester |
| Teaching methods used in the module's courses | Seminar-based teaching |
| Objectives | Students will learn the important fundamentals of marketing in the areas of international marketing, market research search and technical sales. The fundamentals of these areas are explained and explored in depth, and concepts, methods and technical implementations are developed using practical case studies.<br><br>Students are able to apply insights gained from environmental analysis and market research to proposals for business model design and successful market development. In addition, partici-pants develop marketing-specific alternative solutions in se-lected practical projects. |
| Interdisciplinary qualification goals | Through group tasks, students strengthen their ability to work together ad hoc in teams and in various constellations.<br><br>Using case studies, they are able to analyse situations in the marketing of technical products and devise their own solutions, particularly for the appropriate use of communication tools. |
| Contents | **International Marketing:**<br>Cultural Environment of Global Marketing, International Busi-ness Activities and Multinational Market Groups, Corporate Context of Marketing.<br><br>**Business Plan and Business Models:** |

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| | Students independently develop business models and business plans for specific projects or business ideas. This brings together aspects of product and service development, market research, marketing and corporate planning.<br><br>**International Technical Sales 3:**<br>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 in-depth market research. Preparation for international sales situations.<br><br>**Marketing simulations:**<br>Simulation of realistic cases from the perspective of market-oriented corporate management. Designed as a simulation (or business game), in which participants make marketing decisions on their own responsibility. All marketing mix elements are applied in specific business situations within the framework of a simulated market with competing companies. For example, communication campaigns are to be designed to support a specific sales situation. Participants must justify and explain their marketing and sales-specific decisions. |
| Literature | **International Marketing:**<br>• Usunier, J. (2000): *Marketing Across Cultures.* 4th edition, Prentice Hall: Harlow.<br>• Backhaus, K., Büschken, J., Voeth, M. (2003): *International Marketing.* Schäffer-Poeschel: Stuttgart.<br>• Backhaus, K., Büschken, J., Voeth, M. (2005): *International Marketing.* Palgrave MacMillan: Basingstoke.<br>• Usunier, J. (2004): *Marketing international: développement des marchés et management multiculturel.* 2nd edition, Vuibert: Paris.<br><br>**Business plans and business models:**<br>• Nagl, A. (2018): *The Business Plan – Creating Professional Business Plans.* Springer Gabler: Wiesbaden.<br>• Wupperfeld, U. (1999): *The Business Plan for a Successful Start.* mvg-Verlag.<br>Backhaus, K., Schneider, H. (2019): *Strategic Marketing.* Schäffer-Pöschl: Stuttgart.<br><br>**International Technical Sales 3:**<br>• Backhaus, K., Voeth, M. (2010): *International Marketing.* 10th edition, Schäffer-Poeschel: Stuttgart.<br>• Kotler, P., Keller, K. L., Bliemel, F. (2007): *Marketing Management – Strategies for Value Creation*. 12th edition, Pearson: Munich.<br>• Meffert, H. et al. (2007): *Marketing – Fundamentals of Market-Oriented Business Management.* 10th edition, Gabler: Wiesbaden.<br><br>**Marketing simulations:**<br>• Kotler, P. (2012): *Marketing Management.* 2nd European Edition. Pearson: Munich.<br>• Meffert, H. et al. (2015): *Marketing – Fundamentals of Market-Oriented Business Management*. 12th edition, Springer-Gabler: Wiesbaden.<br>• Wöhe, G. (2011): *Introduction to Business Administration.* 24th edition, Vahlen: Munich. |

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| | • Backhaus, K., Voeth, M. (2010): *International Marketing.* 10th edition, Schäffer-Poeschel: Stuttgart. |
| Workload | Information per course:<br>Workload: 3 ECTS x 30 hours = 90 hours<br>Attendance time: 2 hours per week x 15 weeks = 30 hours<br>Preparation/follow-up, exercises, preparation and completion of the examination: 60 hours. |
| Media formats | Presentation, workshops, project reports and documentation |