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**MODULE HANDBOOK**

**INTERNATIONAL ENGINEERING  
AND MANAGEMENT**

**HS PF Engineering**

**Study program director:  
Prof Dr Katharina Kilian-Yasin**

**Examination regulations no. 1  
Applicable as from winter semester 2015/16**

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**The courses are aimed at the following group sizes:**

Lecture: 70-80 students

Seminars: 35 students

Language courses: 25-30 students

**Note on the modules:**

The duration of the modules is usually one semester. The field "semester" indicates the respective semester. If a module extends over two consecutive semesters, the two relevant semesters are shown in this field. All modules of the program are usually offered every semester. An exception may be electives and specializations. These can be omitted if the statutory minimum number of participants has not been reached. Examinations are generally graded on the basis of a grade scale from 1 ("very good") to 5 ("insufficient"). The exceptions are the courses specified in the Special Part of the Study and Examination Regulations - and in this module handbook - "Ungraded examination requirement" (UPL). These are evaluated as "passed" and "failed", cf. § 24 (1, 2) SPO.

**LIST OF ABBREVIATIONS**

CR	Credit according to the ECTS system (1 CR corresponds to 30 working hours)
ECTS	European Credit Transfer and Accumulation Systems
PLH	Examination requirement: assignment
PLK	Examination requirement: examination
PLL	Examination requirement: laboratory work
PLM	Examination requirement: oral examination
PLP	Examination requirement: project work
PLR	Examination requirement: presentation
PLS	Examination requirement: seminar paper
PLT	Examination requirement: thesis
PVL	Pre-examination requirement
PVL-BVP	Pre-examination requirement for preliminary bachelor qualification
PVL-BP	Pre-examination requirement for bachelor qualification
PVL-MP	Pre-examination requirement for master qualification
PVL-PLT	Pre-examination requirement for thesis
STA1	Section 1 of study program
STA2	Section 2 of study program
SWS	Contact hours per week
UPL	Ungraded examination requirement
WI	(= <i>Wirtschaftsingenieurwesen</i> ) Engineering and Management
WI INT	(= <i>Wirtschaftsingenieurwesen International</i> ) International Engineering and Management

## I. Compulsory Modules / Section 1 of study program

### 1. Technical Basics

"Technical Basics"	
Code	MEN1280
Semester	1
Level	Preliminary level
Credits / ECTS	9
Contact hours per week	8
Related courses	MEN1281 Engineering Mechanics MEN1282 Introduction to Mechanical Design MEN1283 Introduction to Material Science
Recommended prerequisites	High school level in mathematics
Type and duration of examination (only in case of PLK/PLM)	Introduction to Material Science (60 min.) & Introduction to Mechanical Design (60 min.): PLK (120 min.) Engineering Mechanics: PLK (45 min.)
Language	German
Module coordinator	Prof Dr Oßwald
Lecturer	Introduction to Material Science: Dr Gietzelt (lecturer) Introduction to Mechanical Design: Prof Dr Eberhardt, Mr Stöberl (lecturer) Engineering Mechanics: Dr Frank, Prof Dr Oßwald
Relation to curriculum	WI, WI INT – Compulsory subject in 1 <sup>st</sup> semester
Teaching methodology	Lectures with practical work
Objectives / intended learning outcomes	<p>Material Science, Mechanical Design and Engineering Mechanics are among the core disciplines in Mechanical Engineering. Students acquire knowledge on the basics of these disciplines. They are able to correctly apply this knowledge when developing and optimizing products, and when creating and optimizing production facilities.</p> <p><b>Material Science:</b> Students learn concepts, methods and technical capabilities of modern material technology as a key discipline in the global field of the engineering sciences. Basic skills for understanding metallic materials and their practical applications are taught. The objective of this course is to enable the students to competently answer simple questions regarding materials, for instance, in the areas of material structure, material testing, designations, thermal treatment of materials and their effects on the material structure.</p> <p><b>Mechanical Design:</b> The participants learn to find design solutions based on simple tasks. They are also able to read complex technical drawings and can apply the constructional principles of material components.</p> <p><b>Engineering Mechanics:</b> The students have a good understanding of the basic concepts and methods of Engineering Mechanics and learn the applications of the statics and strength theory as well as their specific methods.</p>

Content	<p><b>Material Science:</b> Introduction to Material Science of metallic materials, lecture (introduction - atom - structure - microstructure - component)</p> <p><b>Mechanical Design:</b></p> <ul style="list-style-type: none"> <li>• Basics of technical drawing, standards, technical designs as information medium</li> <li>• Component tolerances and fits</li> <li>• Material component connections</li> <li>• Methods for finding creative solutions</li> </ul> <p><b>Engineering Mechanics:</b></p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Physical Basics of Mechanics</li> <li>• Statics</li> <li>• Introduction to strength theory</li> </ul>
Reading list	<p><b>Introduction to Material Science:</b></p> <ul style="list-style-type: none"> <li>• Bargel, H. / Schulze, G. (2012): Werkstoffkunde (VDI-Buch). 9<sup>th</sup> edition., Springer: Dordrecht.</li> <li>• Hornbogen, E. / Jost, N. (2005): Fragen, Antworten, Begriffe zu Werkstoffe. 5<sup>th</sup> edition., Springer: Dordrecht.</li> </ul> <p><b>Introduction to Mechanical Design:</b></p> <ul style="list-style-type: none"> <li>• Hoischen, H. (2007): Technisches Zeichnen. Cornelsen: Berlin.</li> <li>• Böttcher, P. / Forberg, R. (1998): Technisches Zeichnen. Stuttgart et al.: Teubner.</li> <li>• VDI-Richtlinie 2222: Konstruktionsmethodik (1997). Beuth: Berlin.</li> <li>• Wittel, H. / Muhs, D. (2013): Maschinenelemente: Normung, Berechnung, Gestaltung. Wiesbaden: Vieweg.</li> </ul> <p><b>Engineering Mechanics:</b></p> <ul style="list-style-type: none"> <li>• Gabbert, U. / Raecke, I. (2013): Technische Mechanik für Wirtschaftsingenieure. München: Hanser.</li> </ul>
Workload	<p>Workload: 9 ECTS x 30 hrs = 270 hrs                  Class attendance: 8 SWS x 15 weeks = 120 hrs                  Preparation and follow-up, practical work, preparation for and completion of examination: 150 hrs</p>
Media employed	<p>Slides, blackboard, data projector, simulations, audience response techniques, educational videos, e-learning platform of the university (Moodle)</p>

## 2. Mathematics

"Mathematics"	
Code	MNS1010
Semester	1
Level	Preliminary level
Credits / ECTS	8
Contact hours per week	6
Related courses	MNS1011 Linear Algebra MNS1012 Calculus
Type and duration of examination (only in case of PLK/PLM)	PLK (120 mins) module examination
Recommended prerequisites	Good school knowledge in mathematics
Language	German
Module coordinator	Prof Dr Dr Gohout
Lecturer	Linear Algebra: Prof Dr Dr Gohout, Dr Frank Calculus: Prof Dr Dr Gohout, Dr Frank
Relation to curriculum	WI, WI INT – Compulsory subject in 1 <sup>st</sup> semester
Teaching methodology	Lecture with tutorials
Objectives / intended learning outcomes	<p>The students learn mathematical basic principles that are consistently applied in economics, technical and all scientific disciplines, i.e. linear algebra and differential and integral calculus for single or multiple variables. They are able to use the appropriate mathematical methods and, therefore, possess the prerequisites for further studies.</p> <p><b>Learning Objectives:</b> The students</p> <ul style="list-style-type: none"> <li>• are acquainted with vector calculus and matrix calculus</li> <li>• are able to differentiate the functions of one variable and, thus, solve extremum problems</li> <li>• are able to calculate the limits of functions, sequences and series</li> <li>• comprehend complex numbers and their arithmetic operations</li> <li>• understand the concepts of integral calculus and know its important applications</li> </ul>
Content	<p>The module consists of the following courses:</p> <p><b>Linear algebra:</b> Vector, matrices and determinant calculations, eigenvalues etc</p> <p><b>Calculus:</b> Differential and integral calculus, sequences, series, limit values, trigonometry, complex numbers etc</p>
Reading list	<ul style="list-style-type: none"> <li>• Gohout, W. (2012): Mathematik für Wirtschaft und Technik. München: De Gruyter Oldenbourg.</li> <li>• Gohout, W. / Reimer, D. (2005): Formelsammlung Mathematik für Wirtschaft und Technik. Haan-Gruiten: Europa-Lehrmittel.</li> <li>• Reimer, D. / Gohout, W. (2009): Aufgabensammlung Mathematik für Wirtschaft und Technik. Haan-Gruiten: Europa-Lehrmittel.</li> </ul>
Workload	<ul style="list-style-type: none"> <li>• Workload: 8 ECTS x 30 hrs = 240 hrs</li> <li>• Class attendance: 6 SWS x 15 weeks = 90 hrs</li> </ul>

	Preparation and follow-up, tutorials, preparation for and completion of examination: 150 hrs
Media employed	<ul style="list-style-type: none"><li>• Slides, blackboard, tutorials</li></ul>

### 3. Business Administration I

"Business Administration I"	
Code	BAE1120
Semester	1
Level	Preliminary level
Credits / ECTS	5
Contact hours per week	4
Related courses	BAE1021 Cost Accounting BAE1022 Financial Accounting
Recommended prerequisites	None
Type and duration of examination (only in case of PLK/PLM)	Module examination: PLK (60 mins)
Language	German
Module coordinator	Prof Dr Martin
Lecturer	Prof Dr Martin
Relation to curriculum	WI, WI INT – Compulsory subject in 1 <sup>st</sup> semester
Teaching methodology	Lecture, seminar style course
Objectives / intended learning outcomes	<p>The Business Administration I module provides students with the basics of economic theory and practice.</p> <p>Initially, the students receive a general overview of the importance, objectives, tasks and procedures of external and internal accounting. They can address the typical issues in these areas and use methods of costing and performance calculation as well as bookkeeping and accounting to tackle them.</p> <p>They acquire knowledge of the basics of bookkeeping methodology and, in particular, annual financial report analysis. They can recognise and explain the structure and contents of a balance sheet and a profit and a loss statement, are in a position to analyse them and use them in making management decisions.</p> <p>The students are acquainted with the terminology, systems and methods of cost and revenue accounting (including complete cost accounting, direct sectional cost accounting and cost deviation analysis). They, therefore, are able to independently do calculations and systematically analyze costs in a company.</p>
Content	<p><b>Cost Accounting:</b></p> <ol style="list-style-type: none"> <li>1. Cost type accounting</li> <li>2. Cost centre accounting</li> <li>3. Unit-of-output costing (calculation) and cost unit period accounting (financial statement)</li> </ol> <p><b>Financial Accounting:</b></p> <ol style="list-style-type: none"> <li>1. Introduction</li> <li>2. Balance and profit and loss statement</li> <li>3. Annual financial statement - analysis with indicators</li> <li>4. Basics of double-entry book keeping</li> <li>5. Routine accounting transactions</li> <li>6. Annual financial statement transactions</li> <li>7. Summary and perspectives of 'Financial Control'</li> </ol>



Reading list	<ul style="list-style-type: none"> <li>• Bussiek, J. / Ehrmann, H. (2008): Buchführung. 8<sup>th</sup> edition, Ludwigshafen: Kiehl.</li> <li>• Joos-Sachse, T. (2014): Controlling, Kostenrechnung und Kostenmanagement. 5<sup>th</sup> edition, Wiesbaden: Gabler.</li> <li>• Olfert, K. (2008): Kostenrechnung. 15<sup>th</sup> edition, Ludwigshafen: Kiehl.</li> <li>• Zschenderlein, O. (2007): Kompakttraining Buchführung. 4<sup>th</sup> edition, Ludwigshafen: Kiehl.</li> </ul>
Workload	<p>Workload: 7 ECTS x 30 hrs = 210 hrs            Class attendance: 6 SWS x 15 weeks = 90 hrs            Preparation and follow-up, practical work, preparation for and completion of examination: 120 hrs</p>
Media employed	Slides, blackboard, case studies and practical work

#### 4. Economics

“Economics“	
Code	ECO1300
Semester	1 + 2
Level	Preliminary level
Credits / ECTS	6
Contact hours per week	6
Related courses	ECO1301 Economics 1 ECO1302 Economics 2/3
Recommended prerequisites	<ul style="list-style-type: none"> <li>ECO1301 Economics 1: only previous knowledge in mathematics required</li> <li>ECO1302 Economics 2/3: knowledge of Economics 1 required</li> </ul>
Type and duration of examination (only in case of PLK/PLM)	Economics 1: PLK (45 mins), <ul style="list-style-type: none"> <li>Economics 2/3: PLK (90 mins)</li> </ul>
Language	German
Module coordinator	Prof Dr Beck
Lecturer	Economics 1: Prof Dr Noll / Prof. Dr. Beck Economics 2/3: Prof Dr Noll / Prof. Dr. Beck
Relation to curriculum	WI, WI INT – Compulsory subject in 1 <sup>st</sup> + 2 <sup>nd</sup> semester
Teaching methodology	Lecture with discussion, lecture with case study
Objectives / intended learning outcomes	<ul style="list-style-type: none"> <li>The students are able think abstractly and structure complex problems – based on use of models</li> <li>They can identify the key elements that determine the success of an economic system and the competitiveness of a location.</li> <li>They are in a position to assess economic policy decisions focussing on the impact on micro and macro economics.</li> <li>They learn how to use micro-economic analysis techniques in order to understand the function mode of various markets and government interventions.</li> <li>Macroeconomic analysis will give the students an understanding of the main macroeconomic environmental factors of operational activity: unemployment, inflation, economic growth, structural change and economic fluctuations. They will be able to explain these phenomena, and can, therefore, evaluate economic policy options for correcting macroeconomic imbalances and their impact on business decisions.</li> <li>The students can independently assess the macroeconomic framework conditions of corporate activities and draw appropriate conclusions for investment and pricing decisions from them.</li> </ul>
Content	<ul style="list-style-type: none"> <li>Aspects, basic concepts and methods of economics</li> <li>Economic systems: planned economy and social market economy</li> <li>Demand and supply in goods markets, elasticities; consumer and producer surplus</li> <li>Pricing: perfect and imperfect competition, monopolistic pricing, oligopoly markets</li> <li>State intervention in market pricing: highest prices, lowest prices, taxes, internalisation of externalities</li> <li>Competition policy</li> </ul>

	<ul style="list-style-type: none"> <li>• Macro-economic goals: inflation, unemployment, growth, economic fluctuation</li> <li>• Macro-economic policy: keynesianism versus supply policy</li> <li>• Monetary theory and monetary policy, interest rates and causes of inflation</li> <li>• Structural change: causes and effects</li> <li>• Foreign trade theory and theory of factor movements; balance of payments, exchange rate policies and currency systems</li> </ul>
Reading list	<p><b>Economics 1:</b></p> <ul style="list-style-type: none"> <li>• Beck, H. (2013): Volkswirtschaftslehre. München: Oldenbourg.</li> <li>• Mankiw, N. G. (2012): Principles of Economics. 6<sup>th</sup> edition, Forth Worth: South-Western.</li> </ul> <p><b>Economics 2/3:</b></p> <ul style="list-style-type: none"> <li>• Beck, H. (2013): Volkswirtschaftslehre. München: Oldenbourg.</li> <li>• Beck (2016): Globalisierung und Außenwirtschaft. Eine praktische Einführung mit vielen Beispielen und Übungsaufgaben, Vahlen Verlag, München.</li> <li>• Mankiw, N. G. (2012): Principles of Economics. 6<sup>th</sup> edition, Forth Worth: South-Western.</li> <li>• Blanchard, O. / Illing, G. (2009): Makroökonomie. 5<sup>th</sup> edition, München: Pearson.</li> <li>• Krugman, P. / Obstfeld, M. / Melitz, M. (2009): Internationale Wirtschaft. 9<sup>th</sup> edition, München: Pearson.</li> </ul>
Workload	<p>Workload: 6 ECTS x 30 hrs = 180 hrs  Class attendance: 6 SWS x 15 weeks = 90 hrs  Preparation and follow-up, practical work, preparation for and completion of examination: 90 hrs</p>
Media employed	Reserved reference shelf, blackboard, slides

## 5. Computer Science I

"Computer Science I"	
Code	BAE1180
Semester	1 + 2
Level	Preliminary level
Credits / ECTS	6
Contact hours per week	6
Related courses	BAE1081 Object-oriented Programming BAE1082 Programming Laboratory BAE1034 Programming Project 1
Recommended prerequisites	Programming skills in computer science acquired at school helpful, but not mandatory
Type and duration of examination (only in case of PLK/PLM)	Object-oriented Programming: PLK (90 mins), Programming Laboratory: (UPL) Programming Project 1: (PLL)
Language	German
Module coordinator	Prof Schätter
Lecturer	Object-oriented Programming: Dr Heinemeyer Programming Laboratory: Dr Heinemeyer Programming Project 1: Prof Dr Thimm
Relation to curriculum	WI, WI INT – Compulsory subject in 1 <sup>st</sup> + 2 <sup>nd</sup> semester
Teaching methodology	Lecture with laboratory tutorials Project with lecture
Objectives / intended learning outcomes	<p>The students</p> <ul style="list-style-type: none"> <li>learn the basic approach to software development and can write simple programs and databases and use them to solve problems</li> <li>learn the object-oriented paradigm and can apply it</li> <li>can identify programming problems, work out algorithms and implement these in a programming language</li> <li>can design and implement simple database systems and database applications independently, create and evaluate complex database designs</li> <li>gain initial experience in organizing and implementing projects.</li> </ul>
Content	<p>This module provides basic concepts of computer science and consists of the following courses:</p> <p><b>Object-oriented programming:</b></p> <ul style="list-style-type: none"> <li>Algorithms and data structures</li> <li>Program design</li> <li>Object-oriented programming versus structured programming</li> <li>Event-oriented programming and graphical development environment</li> <li>Practical implementation with visual basic</li> <li>Design and operation of computer systems</li> </ul> <p><b>Programming Laboratory:</b></p> <ul style="list-style-type: none"> <li>Programming practice for the course "Object-oriented Programming"</li> <li>students' tutorials</li> </ul> <p><b>Programming Project 1:</b></p> <ul style="list-style-type: none"> <li>Role of operational database systems</li> </ul>

	<ul style="list-style-type: none"> <li>• Data modeling with the Entity-Relationship Model</li> <li>• Design relational database systems</li> <li>• Normalized database design</li> <li>• Synchronization, data integrity, consistency, transactions</li> <li>• SQL basics featuring DDL, DML and DQL</li> </ul> <p>Project work with MS Access including VBA; Programming a class module with SQL access</p>
Reading list	<p><b>Object-oriented Programming / Programming Laboratory:</b></p> <ul style="list-style-type: none"> <li>• Gumm, H.-P. / Sommer, M. (2012): Einführung in die Informatik. München: Oldenbourg.</li> <li>• Theis, T. (2010): Einstieg in Visual Basic 2010. Bonn: Galileo Computing.</li> <li>• Chrissostomou, D. (2010): Visual Basic 2010. Video-Training, DVD.</li> <li>• Lahres, B. / Rayman, G. (2009): Objektorientierte Programmierung. Bonn: Galileo Computing.</li> <li>• RRZN (2010): Visual Basic 2010 - Grundlagen der Programmierung. s.l.: Herdt.</li> <li>• Hansen, H. R. / Neumann, G. (2009): Wirtschaftsinformatik 1. Stuttgart: UTB.</li> </ul> <p><b>Programming Project 1:</b></p> <ul style="list-style-type: none"> <li>• Heuer, A. / Saake, G. / Sattler, K. (2003): Datenbanken kompakt. 2<sup>nd</sup> edition, Bonn: mitp.</li> <li>• RRZN Handbuch (2011): Access 2010 - Grundlagen für Datenbankentwickler. s.l.: Herdt.</li> <li>• Minhorst, A. (2013): Access 2010 - Das Grundlagenbuch für Entwickler. München: Addison-Wesley.</li> </ul>
Workload	<p>Workload: 6 ECTS x 30 hrs = 180 hrs                  Class attendance: 6 SWS x 15 weeks = 90 hrs                  Preparation and follow-up, tutorials, preparation for and completion of examination: 90 hrs</p>
Media employed	<p>Lecture with slides (PowerPoint, data projector) and blackboard, tutor based programming on computer, e-learning and videos for self-study, supplementary material available on the university's e-learning platform (Moodle)</p>

## 6. English

“English“	
Code	LAN1510
Semester	1 + 2
Level	Preliminary level
Credits / ECTS	5
Contact hours per week	4
Related courses	LAN1511 Advanced Business English LAN1512 Advanced English for Engineers
Recommended prerequisites	B2/C1 English (CEFR) – no previous content knowledge required
Type and duration of examination (only in case of PLK/PLM)	Advanced Business English: PLK (60 mins) English for Engineers: PLH/PLR/PLK (60 mins)
Language	English
Module coordinator	Gabriella Loveday
Lecturer	Advanced Business English: Gabriella Loveday Advanced English for Engineers: Prof Dr Kilian-Yasin, Gabriella Loveday
Relation to curriculum	WI INT – Compulsory subject in 1 <sup>st</sup> + 2 <sup>nd</sup> semester
Teaching methodology	Lecture, seminar style course
Objectives / intended learning outcomes	<p><b>Advanced Business English:</b></p> <ul style="list-style-type: none"> <li>The aim of this course "Advanced Business English" is for students to develop their English language skills. Our graduates are expected to perform a wide variety of technical and business management functions in internationally operating companies. They will have to liaise within different business fields and forge links to foreign markets. Therefore, a very high level of English is required to enable them to communicate effectively. So, this course aims to facilitate both oral and written communication within a business context. students will be provided with ample opportunity to practice all four language skills – listening, reading, speaking and writing. They will also address the challenges of conducting business with partners from different cultural backgrounds and areas of operation.</li> </ul> <p><b>Advanced English for Engineers:</b></p> <ul style="list-style-type: none"> <li>Students consolidate the skills they learned in Business English 1 and extend their knowledge of topics relating to engineering processes. Students know how to deliver a presentation on a technical issue in English and how to moderate a class discussion. Students know how to research and write short academic assignments about engineering topics in English.</li> </ul>
Content	<p><b>Advanced Business English:</b></p> <ul style="list-style-type: none"> <li>Company structures</li> <li>Types of business organizations and entrepreneurship</li> <li>Corporate culture</li> <li>Mergers &amp; acquisitions</li> <li>Project management</li> <li>Corporate strategies - corporate social responsibility</li> <li>Team working</li> <li>New business</li> <li>Marketing</li> </ul>

	<ul style="list-style-type: none"> <li>• Brands</li> <li>• Investment and finance</li> </ul> <p><b>Advanced English for Engineers:</b>                  Topics discussed in class are:</p> <ul style="list-style-type: none"> <li>• Product development/innovation/engineering design</li> <li>• Materials technology</li> <li>• Production and manufacturing processes</li> <li>• Sustainable technologies</li> <li>• Technical sales</li> </ul>
Reading list	<p><b>Advanced Business English:</b></p> <ul style="list-style-type: none"> <li>• Trappe, T. / Tullis, G. (2008): Intelligent Business. Harlow: Pearson.</li> <li>• Allison, J. / Appleby, R. / de Chazal, E. (2013): The Business. Oxford: Macmillan.</li> <li>• MacKenzie, I. (2010): English for Business Studies. Cambridge University Press.</li> </ul> <p><b>Advanced English for Engineers:</b></p> <ul style="list-style-type: none"> <li>• Trappe, T. / Tullis, G. (2008): Intelligent Business. Harlow: Pearson.</li> <li>• Brieger, N. / Pohl, A. (2008): Technical English. Vocabulary and Grammar. München: Langenscheidt.</li> <li>• Ibbotson, M. (2008): Cambridge English For Engineering. Cambridge University Press.</li> <li>• Ibbotson, M. (2009): Professional English in Use: Engineering. Cambridge University Press.</li> </ul>
Workload	Workload: 5 ECTS x 30 hrs = 150 hrs Class attendance: 4 SWS x 15 weeks = 60 hrs Preparation and follow-up, written tasks, preparation for and completion of examination: 90 hrs
Media employed	Slides, blackboard, written tasks/experiments, videos

## 7. Law

"Law"	
Code	LAW1300
Semester	2
Level	Preliminary level
Credits / ECTS	5
Contact hours per week	4
Related courses	LAW1301 Contract Management LAW1302 Corporate Law
Recommended prerequisites	None
Form and duration of examination (only in case of PLK/PLM)	PLK (90 mins) module examination
Language	German
Module coordinator	Prof Dr Schmitt
Lecturer	Contract Management: Prof Dr Harriehausen, Prof Dr Schweizer Corporate Law: Prof Dr Harriehausen, Prof Dr Schweizer
Relation to curriculum	WI, WI INT – Compulsory subject in 2 <sup>nd</sup> semester
Teaching methodology	Lecture
Objectives / intended learning outcomes	Students comprehend the legal basics of contract law and law of obligations including product liability. This is one of the prerequisites for solving economic, legal and business problems, and is one of the professional duties of an industrial engineer.
Content	<ul style="list-style-type: none"> <li>• Civil law - general section contract law, terms and conditions, proxy etc.</li> <li>• Civil law - law of obligations breach of contract, consumer protection, product liability etc.</li> </ul>
Reading list	<ul style="list-style-type: none"> <li>• Köhler, H. (2014): Bürgerliches Gesetzbuch BGB. München: Deutscher Taschenbuch Verlag.</li> <li>• Hefermehl, W. (2014): Handelsgesetzbuch HGB. München: Deutscher Taschenbuch Verlag.</li> <li>• Gildeggen, R. et al. (2013): Wirtschaftsprivatrecht. Kompaktwissen für Betriebswirte. München: Oldenbourg.</li> <li>• Müssig, P. (2014): Wirtschaftsprivatrecht. Rechtliche Grundlagen wirtschaftlichen Handelns. Heidelberg et al.: Müller.</li> <li>• Frenz, W. (2008): Recht für Ingenieure. Zivilrecht, Öffentliches Recht, Europarecht. Berlin et al.: Springer.</li> <li>• (most recent edition in each case)</li> </ul>
Workload	Workload: 5 ECTS x 30 hrs = 150 hrs Class attendance: 4 SWS x 15 weeks = 60 hrs Preparation and follow-up, practical work, preparation for and completion of examination: 90 hrs
Media employed	Blackboard, worksheets, interactive teaching methods



## 8. Physics

"Physics"	
Code	MNS1180
Semester	2
Level	Preliminary level
Credits / ECTS	5
Contact hours per week	4
Related courses	MNS1181 Physics
Recommended prerequisites	Entrance level qualification in mathematics for a university of applied sciences, knowledge of physics equivalent to 10 <sup>th</sup> grade in German school system
Type and duration of examination (only in case of PLK/PLM)	Physics: PLK (60 mins)
Language	German
Module coordinator	Prof Dr Lindenlauf
Lecturer	Prof Dr Lindenlauf, Dr Frank
Relation to curriculum	WI, WI INT – Compulsory subject in 2 <sup>nd</sup> semester
Teaching methodology	Lecture with integrated excercises, tutorials and seminar
Objectives / intended learning outcomes	The students <ul style="list-style-type: none"> <li>• recognize and understand basic physical relationships</li> <li>• can analyze simple physical tasks and solve them mathematically</li> </ul>
Content	Basics, quantities and units, kinematics, translational dynamics, mechanical forces, rotational dynamics, oscillations and waves, fundamentals of thermodynamics
Reading list	<ul style="list-style-type: none"> <li>• Rybach, J.: Physik für Bachelors. München: Hanser.</li> <li>• Hering, E. / Martin, R. / Stohrer, M.: Physik für Ingenieure. Berlin: Springer.</li> <li>• University of Colorado (Boulder): Interactive Simulations – PhET (Physics Education Technology). <a href="http://phet.colorado.edu/de/">http://phet.colorado.edu/de/</a></li> </ul>
Workload	Workload: 5 ECTS x 30 hrs = 150 hrs Class attendance: 4 SWS x 15 weeks = 60 hrs Preparation and follow-up, practical work, preparation for and completion of examination: 90 hrs
Media employed	Blackboard, data projector, simulations, Peer instruction, audience response techniques, problem-based learning

## 9. Manufacturing Technology

“Manufacturing Technology“	
Code	MEN1270
Semester	2
Level	Preliminary level
Credits / ECTS	6
Contact hours per week	6
Related courses	MEN1271 Manufacturing Technology 1 MEN1272 Manufacturing Technology 1 Laboratory
Recommended prerequisites	High school level in mathematics MEN1281 Engineering Mechanics MEN1282 Introduction to Mechanical Design MEN1283 Introduction to Material Science
Type and duration of examination (only in case of PLK/PLM)	Manufacturing Technology 1: PLK (90 mins) Manufacturing Technology 1 Laboratory: UPL
Language	German
Module coordinator	Prof Dr Oßwald
Lecturer	Manufacturing Technology 1: Prof Dr Eberhardt, Prof Dr Oßwald Manufacturing Technology 1 Laboratory: Prof Dr Eberhardt, Prof Dr Oßwald
Relation to curriculum	educational videos
Teaching methodology	Lectures with practical work, laboratory tutorial
Objectives / intended learning outcomes	<p>The most important production processes for metallic components will be examined. This includes primary forming, cutting, shaping as well as coating and material property alteration.</p> <p>The students</p> <ul style="list-style-type: none"> <li>• are familiar with the basic manufacturing processes</li> <li>• comprehend the use of key data in typical operational areas as well as efficiencies and accuracies of the processes</li> </ul> <p>The knowledge acquired will help future engineers working in planning and production processes</p> <ul style="list-style-type: none"> <li>• plan, optimise and conduct production processes and their technological coordination</li> <li>• develop products that are optimally production-ready and thus reduce manufacturing costs</li> </ul>
Content	<p>Content: Manufacturing technology of metals: Operation, performance characteristics, application areas of each of the following manufacturing processes:</p> <ul style="list-style-type: none"> <li>• Primary Forming</li> <li>• Shaping</li> <li>• Cutting</li> <li>• Joining</li> <li>• Coating</li> <li>• Material property alteration</li> </ul>
Reading list	<ul style="list-style-type: none"> <li>• Westkämper, E. (2001): Einführung in die Fertigungstechnik. Stuttgart: Teubner.</li> <li>• Fritz, A. H. / Schulze, G. (2006): Fertigungstechnik. Düsseldorf: VDI.</li> <li>• Schmid, D. et al. (2013): Industrielle Fertigung. Haan: Verlag Europa-Lehrmittel.</li> </ul>

Workload	Workload: 6 ECTS x 30 hrs = 180 hrs Class attendance: 6 SWS x 15 weeks = 90 hrs Preparation and follow-up, practical work, preparation for and completion of examination: 90 hrs
Media employed	Slides, blackboard, data projector, simulations, audience response techniques, educational videos, e-Learning platform of the university (Moodle)

## 10. Quantitative Methods I

"Quantitative Methods I"	
Code	BAE1150
Semester	2
Level	Preliminary level
Credits / ECTS	5
Contact hours per week	4
Related courses	BAE1054 Statistics 1 BAE1053 Operations Research 1
Recommended prerequisites	Restricted university entry qualification level in mathematics
Type and duration of examination (only in case of PLK/PLM)	PLK (90 mins) module examination
Language	German
Module coordinator	Prof Dr Bulander
Lecturer	Statistics 1: Prof Dr Bulander Operations Research 1: Prof Dr Dr Gohout, Dr Heinemeyer
Relation to curriculum	WI, WI INT – Compulsory subject in 2 <sup>nd</sup> semester
Teaching methodology	Lecture with practical work
Objectives / intended learning outcomes	<p>The students have a good understanding of descriptive statistical concepts and methods as well as linear programming and its applications. They can use the appropriate concepts and procedures and will, therefore, meet the prerequisite for other courses.</p> <p><b>Learning Objectives:</b> The students</p> <ul style="list-style-type: none"> <li>• can recognize and use descriptive statistic concepts and procedures</li> <li>• can identify and solve problems of linear programming</li> </ul>
Content	<p><b>Statistics 1:</b></p> <ul style="list-style-type: none"> <li>• Introduction to Statistics</li> <li>• Basic knowledge of descriptive statistics</li> <li>• Basics of evaluating univariate records: situation, scattering and kurtosis parameters</li> <li>• Evaluation of bivariate data records: correlation and regression calculation</li> </ul> <p><b>Operations Research 1:</b></p> <ul style="list-style-type: none"> <li>• Classification and development of OR</li> <li>• Basic model of linear programming</li> <li>• Graphical solution of an LP problem</li> <li>• Simplex algorithm and special cases</li> <li>• Duality</li> <li>• Post optimal analyses</li> <li>• Transportation problems</li> <li>• Assignment problem</li> </ul>
Reading list	<p><b>Statistics 1:</b></p> <ul style="list-style-type: none"> <li>• Specht, K. / Bulander, R. / Gohout, W. (2014): Statistik für Technik und Wirtschaft. 2<sup>nd</sup> updated and expanded edition, München: De Gruyter Oldenbourg.</li> </ul> <p><b>Operations Research 1:</b></p>

	<ul style="list-style-type: none"><li>Gohout, W. (2009): Operations Research. 4<sup>th</sup> expanded edition, München: Oldenbourg.</li></ul>
Workload	Workload: 5 ECTS x 30 hrs = 150 hrs Class attendance: 4 SWS x 15 weeks = 60 hrs Preparation and follow-up, practical work, preparation for and completion of examination: 90 hrs
Media employed	Slides, data projector, e-learning platform of the university (Moodle)

## II. Section 2 of study program

### 1. Electrical Engineering

"Electrical Engineering"	
Code	EEN2910
Semester	3
Level	Preliminary level
Credits / ECTS	5
Contact hours per week	4
Related courses	EEN2901 Introduction to Electrical Engineering
Recommended prerequisites	Knowledge in mathematics from section 1 of study program
Type and duration of examination (only in case of PLK/PLM)	PLK 90 mins
Language	German
Module coordinator	Prof Dr Greiner
Lecturer	Prof Dr Greiner, Dr Frank
Relation to curriculum	WI, WI INT – Compulsory subject in 3 <sup>rd</sup> semester
Teaching methodology	Lecture with practical work
Objectives / intended learning outcomes	<p>The students</p> <ul style="list-style-type: none"> <li>• recognize and understand basic electrical relationships</li> <li>• can analyze electrical tasks and solve them mathematically</li> </ul>
Content	Network theory, electrical and magnetostatic fields, basic concepts of alternating current
Reading list	<ul style="list-style-type: none"> <li>• Hagmann, G. (2013): Grundlagen der Elektrotechnik. Wiebelsheim: Aula.</li> <li>• Hagmann, G. (2013): Aufgabensammlung zu den Grundlagen der Elektrotechnik. Wiebelsheim: Aula-Verlag.</li> <li>• University of Colorado (Boulder): Interactive Simulations – PhET (Physics Education Technology). <a href="http://phet.colorado.edu/de/">http://phet.colorado.edu/de/</a></li> </ul>
Workload	<p>Workload: 5 ECTS x 30 hrs = 150 hrs            Class attendance: 4 SWS x 15 weeks = 60 hrs            Preparation and follow-up, practical work, preparation for and completion of examination: 90 hrs</p>
Media employed	Blackboard, overhead data projector, simulations, experiments, Peer instruction, audience response techniques

## 2. Quantitative Methods II

“Quantitative Methods II“	
Code	BAE2080
Semester	3
Level	Advanced level
Credits / ECTS	4
Contact hours per week	4
Related courses	BAE2023 Statistics 2 BAE2024 Operations Research 2
Recommended prerequisites	MNS1010 Mathematics, BAE1050 Quantitative Methods I
Type and duration of examination (only in case of PLK/PLM)	PLK (90 mins) module examination
Language	German
Module coordinator	Prof Dr Dr Gohout
Lecturer	Statistics 2: Prof Dr Dr Gohout, Dr Heinemeyer Operations Research 2: Prof Dr Dr Gohout, Dr Heinemeyer
Relation to curriculum	WI, WI INT – Compulsory subject in 3 <sup>rd</sup> semester
Teaching methodology	Lecture with practical work
Objectives / intended learning outcomes	The students <ul style="list-style-type: none"> <li>• are familiar with probability calculation</li> <li>• learn the quality criteria for estimators and use them</li> <li>• can do statistic tests</li> <li>• learn the important uses of networks</li> <li>• are acquainted with the most important method of network planning</li> <li>• learn static, dynamic and stochastic models for warehousing</li> </ul>
Content	The module consists of the following courses:  <b>Statistics 2:</b> Probability theory, theory of estimation, test theory  <b>Operations Research 2:</b> Networks, network planning, warehousing
Reading list	<b>Statistics 2:</b> <ul style="list-style-type: none"> <li>• Bamberg, G. / Baur, F. / Krapp, M. (2012): Statistik. München: Oldenbourg.</li> <li>• Rinne, H. (2008): Taschenbuch der Statistik. Thun et al.: Harri German.</li> <li>• Specht, K. / Bulander, R. / Gohout, W. (2014): Statistik für Technik und Wirtschaft. 2<sup>nd</sup> expanded edition, München: De Gruyter Oldenbourg.</li> </ul> <b>Operations Research 2:</b> <ul style="list-style-type: none"> <li>• Gohout, W. (2009): Operations Research. 4th expanded edition, München: De Gruyter Oldenbourg.</li> </ul>
Workload	Workload: 4 ECTS x 30 hrs = 120 hrs Class attendance: 4 SWS x 15 weeks = 60 hrs Preparation and follow-up, practical work, preparation for and completion of examination: 60 hrs
Media employed	Slides, blackboard, practical work

### 3. Computer Science II

"Computer Science II"	
Code	BAE2260
Semester	3
Level	Advanced level
Credits / ECTS	7
Contact hours per week	6
Related courses	BAE2035 IT Applications BAE2034 Laboratory Exercises in IT Applications BAE2231 Programming Project 2
Recommended prerequisites	Basic knowledge in relational database systems, as taught in the course BAE1034 „ Programming Project 1 “ in the 2 <sup>nd</sup> semester. Knowledge in elementary operational processes helpful, but not mandatory.
Type and duration of examination (only in case of PLK/PLM)	IT Applications: PLK (60 mins) Laboratory Exercises in IT Applications: UPL Programming Project 2: (PLL)
Language	English and German (laboratory tasks)
Module coordinator	Prof Dr Thimm
Lecturer	IT Applications: Prof Dr Thimm Laboratory Exercises in IT Applications: Prof Dr Thimm, laboratory engineer of ERP and Database Programming Laboratory Programming Project 2: Prof Dittmann, Prof Schätter
Relation to curriculum	WI INT – Compulsory subject in 3 <sup>rd</sup> semester
Teaching methodology	Lecture /laboratory tasks on computer, laboratory Project with lecture
Objectives / intended learning outcomes	<p>The students</p> <ul style="list-style-type: none"> <li>• get acquainted with the different types of business application systems, their basic functions and features</li> <li>• learn the repertoire of benefits for use of business information systems</li> <li>• are able to explain basic information technology concepts and approaches of business application systems</li> <li>• understand the complete order process in a company and its IT support through standard software</li> <li>• acquire practical basic knowledge of ERP systems (SAP ERP and ABAS Business Software)</li> <li>• learn the fundamental importance of internet applications for enterprises and the basics of content management systems</li> <li>• are able to design a website including a webshop for a company and implement a content management system</li> </ul>
Content	<p>The module consists of the following sub-modules:</p> <p><b>IT Applications – lecture (in English)</b> Business Application Systems - general principles, central business computing tasks, IT-business alignment, information as a competitive factor, classification of business processes, differences between standard software and customized software, characteristics and architecture of ERP systems</p> <p><b>Laboratory Exercises in IT Applications:</b> Case study for IT-based management of the procedural sequence of an order (from receipt to delivery) with the help of an</p>



	<p>ERP system (SAP ERP), creation of master data, input of all values of an order and order monitoring, order processing at a trading company using an SME-compatible ERP system (ABAS Business software)</p> <p><b>Programming Project 2:</b></p> <ul style="list-style-type: none"> <li>• Webdesign and conception of a web page</li> <li>• Content Management Systems</li> <li>• CMS system Joomla!</li> <li>• Project work with Joomla! - implementing a website for a company</li> </ul>
Reading list	<p><b>IT Applications (lecture):</b></p> <ul style="list-style-type: none"> <li>• Nickerson, R.C. (2001): Business &amp; Information Systems. 2<sup>nd</sup> edition, Upper Saddle River: Prentice Hall.</li> <li>• Laudon, K. / Laudon, J. (2014): Management Information Systems: Managing the Digital Firm. 14<sup>th</sup> edition, Boston et al.: Prentice Hall.</li> <li>• Laudon, K. / Laudon J. / Schoder, D. (2016): Wirtschaftsinformatik - Eine Einführung. 2016, München: Pearson.</li> <li>• Bocij, P. / Greasley, A. / Hickle, S. (2008): Business Information Systems: Technology, Development &amp; Management. 4<sup>th</sup> edition, Harlow: Pearson.</li> <li>• Turban, E. / Sharda, R. / Delen, D.: Decision Support and Business Intelligence Systems: International Edition. 9<sup>th</sup> edition, Upper Saddle River et al.: Prentice Hall.</li> </ul> <p><b>Laboratory Exercises in IT Applications:</b></p> <ul style="list-style-type: none"> <li>• Maassen, A. / Schoenen, M. / Werr, I. (2005): Grundkurs SAP R/3. 3<sup>rd</sup> edition, Wiesbaden: Vieweg.</li> <li>• Leibnitz Universität Hannover (2008): RRZN Handbuch–SAP R/3 Grundlagen, Einführung für Anwender. 4<sup>th</sup> edition, s.l.: Herdt.</li> <li>• Gadatsch, A. (2012): Grundkurs Geschäftsprozess-Management. Methoden und Werkzeuge für die IT-Praxis. 7<sup>th</sup> edition, Wiesbaden: Vieweg+Teubner.</li> </ul> <p><b>Programming Project 2:</b></p> <ul style="list-style-type: none"> <li>• Hoffmann, M. (2012): Modernes Webdesign. Gestaltungsprinzipien, Webstandards, Praxis. Bonn: Galileo Press.</li> <li>• Graf, H. (2012): Joomla! 3 - In 10 einfachen Schritten. s.l.: cocoate.</li> <li>• Schürmann, T. (2013): Praxiswissen Joomla! 3.0. Köln: O'Reilly.</li> <li>• Wösten, A. (2012): Joomla! 3 - Das umfassende Training, Video. Bonn: Galileo Press.</li> <li>• Lechner, B. K. (2014): GIMP - ab Version 2.8 - Für digitale Fotografie, Webdesign und kreative Bildbearbeitung. Köln: O'Reilly.</li> <li>• Stockmann, B. (2012): Gimp - Video-Training 2.8 Das umfassende Training, Video. Bonn: Galileo Press.</li> </ul>
Workload	<p>Workload: 7 ECTS x 30 hrs = 210 hrs  Class attendance: 6 SWS x 15 weeks = 90 hrs  Tasks for self-study, preparation for the examination: 120 hrs</p>
Media employed	<p>Lecture: digital slides, blackboard  Laboratory: worksheets on a case study  E-learning and videos for self-study, supplementary material available on the university's e-learning platform (Moodle)</p>

#### 4. Business Administration II

"Business Administration II"	
Code	BAE2290
Semester	3/4
Level	Advanced level
Credits / ECTS	8
Contact hours per week	6
Related courses	BAE2191 Financing and Investment BAE2291 Business Management BAE2292 Financial Control
Recommended prerequisites	Attendance of the course BAE1020 Business Administration
Type and duration of examination (only in case of PLK/PLM)	Financing and Investment and Business Management: PLK (60 mins) Financial Control: PLK (60 mins)
Language	German and English
Module coordinator	Prof Dr Binder
Lecturer	Financing and Investment: Prof Dr Wupperfeld Business Management: Prof Dr Hinderer Financial Control: Prof Dr Binder, Prof Schnell
Relation to curriculum	Financing and Investment WI, WI INT – Compulsory subject in 3 <sup>rd</sup> semester  Business Management WI INT – Compulsory subject in 3 <sup>rd</sup> semester  Financial Control WI INT – Compulsory subject in 4 <sup>th</sup> semester
Teaching methodology	Lecture with case studies and practical work
Objectives / intended learning outcomes	The students have a good knowledge of the modern operational and strategic leadership methodologies for financing, investment and strategic management as well as instruments of corporate management. They learn the importance of strategic management of a company, as well as methods and procedures for securing liquidity (finance) and profitability (financial control).
Content	<p><b>Financing and Investment:</b> The students get an in-depth understanding on how to work with all common tools and methods of efficient monetary use; i.e. the operational investment process and investment controlling on one hand, and fundraising / financing on the other hand. Special forms of financing such as financial investments and sale and lease-back arrangements are also looked into.</p> <p><b>Business Management:</b> Based on the derivation of a strategic objective for a company in the market, the following topics will be discussed as part of management studies: They are, in particular, the strategic implications in the management areas "products and markets", "human resources and personnel management", "organization" and strategic "financial control".</p> <p><b>Financial Control:</b> Instruments for ensuring profitability in financial control will be explained to expand the basic knowledge on cost accounting and performance accounting. The students learn the operation</p>

	and the instrument used in financial control. In addition to corporate planning (budgeting), these are, in particular, the indicators and performance measurement systems of corporate management.
Reading list	<p><b>Financing and Investment:</b></p> <ul style="list-style-type: none"> <li>• Olfert, K. / Reichel, C. (2009): Investition. Ludwigshafen: Kiehl.</li> <li>• Olfert, K. / Reichel, C. (2011): Finanzierung. Ludwigshafen: Kiehl.</li> </ul> <p><b>Business Management:</b></p> <ul style="list-style-type: none"> <li>• Dillerup, R. / Stoi, R. (2012): Strategische Unternehmensführung. 3<sup>rd</sup> edition, München: Vahlen.</li> <li>• Porter, M. (2009): Wettbewerbsstrategie. Methoden zur Analyse von Branchen und Konkurrenten. 10<sup>th</sup> edition, Frankfurt: Campus-Verlag.</li> </ul> <p><b>Financial Control:</b></p> <ul style="list-style-type: none"> <li>• Weber, J. / Schäffer U. (2014): Einführung in das Controlling. 14<sup>th</sup> edition, Stuttgart: Schäffer-Poeschel.</li> <li>• Horváth &amp; Partners (2009): Das Controllingkonzept. 7<sup>th</sup> edition, München: C.H.Beck.</li> </ul>
Workload	<p>Workload: 8 ECTS x 30 hrs = 240 hrs            Class attendance: 6 SWS x 15 weeks = 90 hrs            Preparation and follow-up, practical work, preparation for and completion of examination: 150 hrs</p>
Media employed	Slides, flip chart, online case studies

## 5. International Management

“International Management“	
Code	BAE2270
Semester	3 + 4
Level	Advanced level
Credits / ECTS	5
Contact hours per week	4
Related courses	BAE2271 Cultural Awareness BAE2272 International Business 1
Recommended prerequisites	<ul style="list-style-type: none"> <li>English skills: level B2 or C1 (CEFR)</li> <li>Basic knowledge in business administration</li> <li>For ISP students: no engineering background needed</li> </ul>
Type and duration of examination (only in case of PLK/PLM)	Cultural Awareness: PLH/PLL/PLK/PLP/PLR (60 mins) International Business 1: PLH/PLL/PLK/PLP/PLR (60 mins)
Language	English
Module coordinator	Prof Dr Kilian-Yasin
Lecturer	Cultural Awareness: Prof Dr Mahadevan International Business 1: Prof Dr Kilian-Yasin
Relation to curriculum	WI INT – Compulsory subject in 4 <sup>th</sup> /5 <sup>th</sup> semester
Teaching methodology	Lecture with interactive elements, seminar style course
Objectives / intended learning outcomes	<p>The students</p> <ul style="list-style-type: none"> <li>get acquainted with the basic theories and concepts of international trade</li> <li>know the basic theories and concepts of international corporate activities</li> <li>know the basic theories and concepts of international management in the professional field of industrial engineering</li> <li>are able to distinguish the different internationalization forms and strategies of companies</li> <li>can analyse foreign markets and industrial sites</li> <li>understand the role of supranational and international treaties and institutions for international business</li> <li>understand how the current balance of power has developed historically in the global economy</li> <li>can apply the acquired knowledge in practical cases of international corporate activities</li> <li>can find feasible solutions for complex problems and issues of international management in the area of industrial engineering</li> <li>reflect critically over cultural and ethical aspects of international corporate activities</li> </ul>
Content	<p><b>Cultural Awareness:</b></p> <ul style="list-style-type: none"> <li>Intercultural Basic Awareness</li> <li>Intercultural theories, concepts, models and practice</li> <li>Intercultural communication in the engineering field</li> </ul> <p><b>International Business 1:</b></p> <ul style="list-style-type: none"> <li>Introduction to international business and international management in Business Administration and Engineering</li> </ul>
Reading list	<b>Cultural Awareness:</b>

	<ul style="list-style-type: none"> <li>• Mahadevan, J. (2017), A Very Short, Fairly Interesting and Reasonably Cheap Book about Cross-Cultural Management, London: Sage.</li> </ul> <p><b>International Business 1:</b></p> <ul style="list-style-type: none"> <li>• Cairns, G. / Sliwa, M. (2008): A very short, fairly interesting and reasonably cheap book about International Business. London: Sage Publications.</li> <li>• Hill, C. W. L. (2011): International Business: Competing in the Global Marketplace. 8<sup>th</sup> edition, New York: McGraw Hill.</li> </ul>
Workload	<p>Workload: 5 ECTS x 30 hrs = 150 hrs            Class attendance: 4 SWS x 15 weeks = 60 hrs            Preparation and follow-up, practical work, preparation for and completion of examination: 90 hrs</p>
Media employed	<p>Cultural Awareness: interactive seminar style course            International Business 1: interactive lecture with case studies            Both e-learning supported</p>

## 6. Management Methods I

"Management Methods I"	
Code	BAE2280
Semester	3
Level	Professional academic level
Credits / ECTS	4
Contact hours per week	2
Related courses	BAE2280 Management Methods I
Recommended prerequisites	None
Type and duration of examination (only in case of PLK/PLM)	Management Methods I: PLL/PLR/PLH/PLK (60)
Language	German
Module coordinator	Prof Dr Kühn
Lecturer	Prof Dr Kühn
Relation to curriculum	WI INT – Compulsory subject in 3 <sup>rd</sup> semester
Teaching methodology	Seminar style course
Objectives / intended learning outcomes	<p>The students</p> <ul style="list-style-type: none"> <li>• learn the basics of project management</li> <li>• know the relevant standards, and in particular IPMA (Deutsche Gesellschaft für Projektmanagement e.V.) and PMI (Project Management Institute)</li> <li>• are familiar with the methods and techniques not only used in project management, but also in other areas including risk and quality management</li> <li>• are familiar with the methods and tools used to generate creative ideas and implement them visually</li> <li>• are able to apply the knowledge and methodological skills they have learned to concrete tasks</li> <li>• are in a position to work independently on a topic and conduct a project</li> <li>• can work in teams by taking different tasks within a team and, therefore, learning the different aspects of work including budget and time management</li> <li>• develop expertise for team analysis and team building, for achieving team objectives and for preventing and dealing with critical situations in a team</li> <li>• develop social skills</li> <li>• will have, after this course, a good grasp of project management standards required for implementation of projects in the future course of their studies</li> </ul>
Content	<ul style="list-style-type: none"> <li>• The students acquire a wide spectrum of instruments for modern project management that can also be used in various fields besides project management</li> <li>• By planning and conducting a complex project, the students get a deeper understanding of the theoretical information acquired during class and have a chance to apply it.</li> <li>• During the project, students have individual coaching whereby different roles are clarified i.e. the role of a project manager, the team and customers etc. Positive events as well as problematic situations are intensively studied with respect to professional project management.</li> </ul>

<p>Reading list</p>	<ul style="list-style-type: none"> <li>• Schulz, M. / Mikulaschek, W. (2011): Project Management – On Target Efficiency. Röthenbach: Resultance.</li> <li>• Patzak, G. / Rattay, G. (2012): Project Management – Guideline for the management of projects, project portfolios, programs and project-oriented companies. Wien: Linde.</li> <li>• GPM Germane Gesellschaft für Projektmanagement / Gessler, M. (Eds.) (2010): Kompetenzbasiertes Projektmanagement, Handbuch für die Projektarbeit, Qualifizierung und Zertifizierung – auf Basis der IPMA Competence Baseline Version 3.0., Nürnberg: GPM Germane Gesellschaft für Projektmanagement.</li> <li>• Project Management Institute (2013): A Guide to the Project Management Body of Knowledge (Pmbok Guide). 5<sup>th</sup> edition, Newtown Square: PMI.</li> <li>• Litke, H.-D. (Eds.) (2005): Projektmanagement – Handbuch für die Praxis – Konzepte – Instrument – Umsetzung. München: Hanser.</li> </ul>
<p>Workload</p>	<p>Workload: 4 ECTS x 30 hrs = 120 hrs            Class attendance: 2 SWS x 15 weeks = 30 hrs            Preparation and follow-up, practical work, preparation for and completion of examination: 90 hrs</p>
<p>Media employed</p>	<p>Slides, presentations, project work, interactive tasks, group work and discussions</p>

## 7. Production Engineering & Manufacturing

"Production Engineering & Manufacturing"	
Code	BAE2310
Semester	3 + 4
Level	Advanced level
Credits / ECTS	6
Contact hours per week	6
Related courses	MEN2171 Manufacturing Technology 2 MEN2172 Manufacturing Technology 2 Laboratory BAE2114 Production Engineering & Manufacturing 1 BAE2115 Production Engineering & Manufacturing 1 Laboratory BAE2112 Production Engineering & Manufacturing 2
Recommended prerequisites	<ul style="list-style-type: none"> <li>Completed pre-study internship</li> <li>MEN1281 Engineering Mechanics</li> <li>MEN1283 Introduction to Material Science</li> <li>MEN1271 Manufacturing Technology 1</li> </ul>
Type and duration of examination (only in case of PLK/PLM)	PLK Production (60 mins), PLK Manufacturing Technology (60 mins), 1 UPL for each laboratory
Language	German and English
Module coordinator	Prof Dr Saile
Lecturer	Manufacturing Technology 2: Prof Dr Frey Manufacturing Technology 2 Laboratory: Prof Dr Frey Production Engineering & Manufacturing 1: Prof Dr Saile Production Engineering & Manufacturing 1 Laboratory: Prof Dr Saile Production Engineering & Manufacturing 2: Prof Dr Oßwald
Relation to curriculum	Manufacturing Technology 2 Manufacturing Technology 2 Laboratory WI INT – Compulsory subject in 3 <sup>rd</sup> semester  Production Engineering & Manufacturing 1 Production Engineering & Manufacturing 1 Laboratory WI INT – Compulsory subject in 4 <sup>th</sup> semester  BAE2112 - Production Engineering & Manufacturing 2 WI INT – Compulsory subject in 4 <sup>th</sup> semester
Teaching methodology	Lecture with discussions, laboratory
Objectives / intended learning outcomes	The students <ul style="list-style-type: none"> <li>are acquainted with manufacturing processes of, amongst others, injection moulding, extrusion and thermoforming.</li> <li>are familiar with the basic design principles for developing a product in regard to desing for automated assembly</li> <li>are able to identify different function groups of automated assembly machines and select the appropriate assembly system based on the task</li> <li>are familiar with modern forms of organization of production processes and factory operations</li> <li>understand the importance of a production system in relation to the product characteristics and planning assumptions</li> <li>see the benefit of basic control circuits in both the technical and the organizational context of a production plant</li> </ul>
Content	<b>Manufacturing Technology 2:</b> <ul style="list-style-type: none"> <li>Processing methods for plastics</li> </ul>



	<ul style="list-style-type: none"> <li>• Properties of polymer materials, applications and potentials</li> <li>• Plastics processing technologies, machines and tools, production and material specific design</li> </ul> <p><b>Production Engineering &amp; Manufacturing 1:</b></p> <ul style="list-style-type: none"> <li>• Lean Production</li> <li>• Error prevention and error correction</li> <li>• Process and machine capability</li> <li>• Quick set-up concepts</li> <li>• Control engineering</li> <li>• Continuous improvement</li> </ul> <p><b>Production Engineering &amp; Manufacturing 2:</b></p> <ul style="list-style-type: none"> <li>• Production machines</li> <li>• Mechanical machine components</li> <li>• Sensors in production machines</li> <li>• Machine drives and actuators</li> <li>• Automation</li> <li>• Production metrology</li> <li>• Assembly</li> <li>• Hydraulics</li> <li>• CAD, CAM and computer simulation</li> <li>• Material transport and handling</li> <li>• Robotics</li> </ul>
Reading list	<p><b>Manufacturing Technology 2 and Laboratory:</b></p> <ul style="list-style-type: none"> <li>• Michaeli, W. (2010): Einführung in die Kunststoffverarbeitung. München: Hanser.</li> <li>• Saechtling, H. (2013): Kunststoff Taschenbuch. München: Hanser.</li> </ul> <p><b>Production Engineering &amp; Manufacturing 1:</b></p> <ul style="list-style-type: none"> <li>• Liker, J. (2014): Der Toyota Weg. München: FBV.</li> </ul> <p><b>Production Engineering &amp; Manufacturing 1 Laboratory:</b></p> <ul style="list-style-type: none"> <li>• Reinhold, C. (2005): Mess-, Steuerungs- und Regelungstechnik. Würzburg: Vogel.</li> </ul> <p><b>Production Engineering &amp; Manufacturing 2:</b></p> <ul style="list-style-type: none"> <li>• Konold, P. / Reger, H. (2013): Praxis der Montagetechnik. Wiesbaden: Vieweg + Teubner.</li> </ul>
Workload	<p>Workload: 6 ECTS x 30 hrs = 180 hrs          Class attendance: 6 SWS x 15 weeks = 90 hrs          Preparation and follow-up, practical work and examination, preparation for the examination: 90 hrs</p>
Media employed	<p>Lecture with discussion, laboratory tasks on machines and experimental constructions</p>

## 8. Logistics

“Logistics“	
Code	BAE2120
Semester	4
Level	Advanced level
Credits / ECTS	4
Contact hours per week	4
Related courses	BAE2121 Logistics 1 BAE2122 Logistics 2
Recommended prerequisites	None
Type and duration of examination (only in case of PLK/PLM)	PLK (60 mins) module examination, UPL
Language	German und English
Module coordinator	Prof Dr Peter
Lecturer	Logistics 1: Prof Dr Peter Logistics 2: Prof Dr Weyer
Relation to curriculum	WI, WI INT – Compulsory subject in 4 <sup>th</sup> semester
Teaching methodology	Lecture with discussion
Objectives / intended learning outcomes	<p>The students have a good grasp of the fundamental concepts of logistics in the areas of macro and micro logistics</p> <p>They are able to apply the knowledge and methodological skills they have learned to concrete tasks</p> <p>The students are able to create production processes and come up with strategies for an entire value chain</p> <p>The students become acquainted with the whole logistical business processes</p>
Content	<p><b>Logistics 1:</b></p> <ul style="list-style-type: none"> <li>• Logistics definitions, logistical thinking, importance and perspectives of procurement logistics</li> <li>• International procurement logistics, process organization in purchasing, sourcing strategies, supplier management, supplier selection and evaluation, supplier control</li> <li>• Interaction procurement and production logistics</li> <li>• Warehouse logistics, commissioning concepts</li> <li>• Distribution logistics, partial functions of distribution logistics</li> <li>• Macro logistics, traffic logistics</li> <li>• Transport logistics, international significance of different kinds of transportation systems, trade-offs in transportation decisions</li> </ul> <p><b>Logistics 2:</b></p> <ul style="list-style-type: none"> <li>• Logistics definitions</li> <li>• Logistical mindset</li> <li>• Importance and development of logistics</li> <li>• Logistics organizations</li> <li>• Importance of logistics in increasing company's value</li> <li>• Logistics costs and performances</li> <li>• Challenges and conflicts in logistics</li> <li>• Design and management principles of logistics</li> </ul>

	<ul style="list-style-type: none"> <li>• Production logistics, demarcation, responsibilities, processes, structure, production management</li> <li>inbound logistics (IBL), production material control (PMC), outbound logistics (OBL), warehouse logistics (WHL)</li> <li>• Distribution logistics, distribution policy, partial functions of distribution logistics, basic types of sales channels, business functions, creation of a distribution network</li> </ul>
Reading list	<p><b>Logistics 1:</b></p> <ul style="list-style-type: none"> <li>• Chopra, S.; Meindl, P. (2012): Supply Chain Management, 5th ed., Prentice Hall, Essex</li> <li>• Heizer, J.; Render, B. (2016): Operations Management, Global Edition, 11<sup>th</sup> ed., Pearson, London</li> <li>• Van Weele, A.J. (2014): Purchasing and Supply Chain Management, 6th ed., Cengage Learning, London</li> <li>• Mangan, J.; Lalwani, C.; Butcher, T.; Javadpour, R. (2011): Global Logistics &amp; Supply Chain Management, 2nd ed., Wiley &amp; Sons Publications, New York</li> <li>• Handfield, R. B., Monczka, R. M., Giunipero, L. C., &amp; Patterson, J. L. (2012). Sourcing and Supply Chain Management (5th ed.). Florence, KY: Cengage Learning.</li> </ul> <p>(The participants are asked to register on the e-learning platform (Moodle) for the course 'Logistics 1' and to download the recent version of the lecture notes as PDF.)</p> <p><b>Logistics 2:</b></p> <ul style="list-style-type: none"> <li>• Göpfert, I. (2013): Logistik: Führungskonzeption und Management von Supply Chains. 3<sup>rd</sup> updated and expanded edition, München: Vahlen.</li> <li>• Heinrich, M. (2013): Transport- und Lagerlogistik: Planung, Struktur, Steuerung und Kosten von Systemen der Intralogistik. 9<sup>th</sup> completely revised and updated edition, Wiesbaden: Vieweg+Teubner.</li> <li>• Kummer, S. et al. (2013): Grundzüge der Beschaffung, Produktion und Logistik – Logistik, Produktion, Beschaffung, Supply Chain Management. 3<sup>rd</sup> edition, München: Pearson.</li> <li>• Pfohl, H.-C. (2004): Logistikmanagement. 2<sup>nd</sup> edition, Berlin et al.: Springer.</li> <li>• Lecture notes</li> </ul> <p>(The participants are asked to register on the e-learning platform (Moodle) for the course 'Logistics 2' and to download the current version of the lecture notes as PDF.)</p>
Workload	<p>Workload: 4 ECTS x 30 hrs = 120 hrs            Class attendance: 4 SWS x 15 weeks = 60 hrs            Preparation and follow-up, practical work, preparation for and completion of examination: 60 hrs</p>
Media employed	PowerPoint , e-learning (Moodle)

## 9. International Technical Sales

"International Technical Sales"	
Code	BAE2320
Semester	4
Level	Advanced level
Credits / ECTS	4
Contact hours per week	4
Related courses	BAE2253 International Technical Sales 1 / Industrial Marketing BAE2252 International Technical Sales 2
Recommended prerequisites	Advanced English level (B2) Successful attendance of the modules: <ul style="list-style-type: none"> <li>• BAE1020 Business Administration I I and</li> <li>• BAE2290 Business Administration II</li> </ul>
Type and duration of examination (only in case of PLK/PLM)	PLK (60 mins) module examination
Language	German und English
Module coordinator	Prof Dr Wupperfeld
Lecturer	International Technical Sales 1: Prof Dr Wupperfeld International Technical Sales 2: Prof Dr Hinderer
Relation to curriculum	International Technical Sales 1 WI INT – Compulsory subject in 4 <sup>th</sup> semester  International Technical Sales 2 WI, WI INT – Compulsory subject in 4 <sup>th</sup> semester
Teaching methodology	Lecture with discussions
Objectives / intended learning outcomes	The students are familiar with the concepts and tools of marketing, and have an understanding of marketing as management concept in a company. They have an insight into the specific aspects of international marketing, industrial goods marketing and technical sales.
Content	<ol style="list-style-type: none"> <li>1. Introduction to marketing: definition of "marketing", marketing concepts especially for investment goods and technology companies</li> <li>2. Product policy</li> <li>3. Pricing policy</li> <li>4. Communication policy</li> <li>5. Distribution policy</li> <li>6. Aspects of the technical sales regarding the different business types in industrial goods marketing</li> </ol>
Reading list	<p><b>International Technical Sales 1:</b></p> <ul style="list-style-type: none"> <li>• Backhaus, K. / Voeth, M. (2014): Industriegütermarketing: Grundlagen des Business-to-Business Marketing. 10<sup>th</sup> edition, München: Vahlen.</li> <li>• Backhaus, K. / Voeth, M. (2010): Internationales Marketing. 10<sup>th</sup> edition, Stuttgart: Schäffer-Poeschel.</li> <li>• Kotler, P. / Keller, K. L. (2009): Marketing Management. 13<sup>th</sup> edition, Upper Saddle River: Pearson.</li> <li>• Nieschlag, R. / Dichtl, E. / Hörschgen, H. (2002): Marketing. 19<sup>th</sup> revised and amended edition, Berlin: Duncker &amp; Humblot.</li> </ul> <p><b>International Technical Sales 2:</b></p>

	<ul style="list-style-type: none"> <li>• Backhaus, K. / Voeth, M. (2010): Internationales Marketing. 10<sup>th</sup> edition, Stuttgart: Schäffer-Poeschel.</li> <li>• Kleinaltenkamp, M. / Plinke, W. (2002): Strategisches Business-to-Business Marketing. Berlin et al.: Springer.</li> <li>• Meffert, H. et al. (2007): Marketing: Grundlagen marktorientierter Unternehmensführung. Wiesbaden: Gabler.</li> <li>• Fritz, W. / Oelsnitz, D. (2006): Marketing - Elemente marktorientierter Unternehmensführung. 4<sup>th</sup> edition, Stuttgart: Kohlhammer.</li> </ul>
Workload	<p>Workload: 4 ECTS x 30 hrs = 120 hrs            Class attendance: 4 SWS x 15 weeks = 60 hrs            Preparation and follow-up, practical work, preparation for and completion of examination: 60 hrs</p>
Media employed	PowerPoint, blackboard, videos and print media for illustration

## 10. Sustainable Product Development

“Sustainable Product Development“	
Code	BAE2170
Semester	4
Level	Advanced level
Credits / ECTS	4
Contact hours per week	4
Related courses	BAE2171 Sustainable Product Development 1 BAE2172 Sustainable Product Development 1 Laboratory BAE2173 Sustainable Product Development 2
Recommended prerequisites	<ul style="list-style-type: none"> <li>• Good English skills</li> <li>• Basic knowledge in Material Science Basic knowledge in Research Methods and Academic Writing</li> </ul>
Type and duration of examination (only in case of PLK/PLM)	Sustainable Product Development 1 and 2: module examination PLK (60 mins) Sustainable Product Development 1 Laboratory: UPL
Language	English
Module coordinator	Prof Dr Woidasky
Lecturer	Sustainable Product Development 1: Prof Dr Woidasky Sustainable Product Development 1 Laboratory: Prof Dr Woidasky Sustainable Product Development 2: Prof Dr Woidasky
Relation to curriculum	WI INT – Compulsory subject in 4 <sup>th</sup> semester
Teaching methodology	Lecture with practical work, laboratory
Objectives / intended learning outcomes	<p>The students learn about standard processes in product development.</p> <p>They grasp the concept of sustainability and are able to apply it to solve industrial problems regarding products and processes.</p> <p>They can evaluate products and processes with respect to their environmental and sustainability impacts.</p> <p>They are able to create a scientific documentation on experiments.</p>
Content	<p><b>Sustainable Product Development 1 and 2:</b> Principles and history of sustainability, sustainability concept, principles of product development, development methodologies such as Stage-Gate, VDI 2221; legal requirements in product development, definition of "quality", functions, function models, quality function deployment, FMEA, design for X including design for recycling, lightweight construction; securing of raw materials, recycling rates, selected examples of recycling cycles; production and recycling of important materials (such as glass, PET, steel); life cycle analysis and simplified life cycle assessment, environmental impact categories, simplified life cycle analysis, eco labels, environmental approaches; reliability and durability: Basic concepts, obsolescence; introduction to standardization activities, development of norms</p> <p><b>Sustainable Product Development 1 Laboratory:</b></p>

	Selection of Product development process application, Product generation; Dismantling, evaluation of recyclability, sustainability assessment, materials science and materials testing
Reading list	<p><b>Sustainable Product Development 1:</b></p> <ul style="list-style-type: none"> <li>• Wimmer, W. / Züst, R. (2001): ECODESIGN Pilot. Dordrecht: Kluwer Academic Publishers.</li> <li>• Pahl, G. / Beitz, W. et al. (2013): Pahl/Beitz Konstruktionslehre. Berlin et al.: Springer.</li> <li>• Engeln, W. (2011): Methoden der Produktentwicklung. München: Oldenbourg.</li> <li>• Pfeifer, W. / Schmitt, T. (2007): Masing - Handbuch Qualitätsmanagement. München: Hanser.</li> <li>• Ponn, J. / Lindemann, U. (2011): Konzeptentwicklung und Gestaltung technischer Produkte. Berlin: Springer.</li> <li>• Bertsche, B. / Lechner, G. (2009): Zuverlässigkeit im Fahrzeug- und Maschinenbau. Berlin: Springer.</li> <li>• Ehrlenspiel, K. (2009): Integrierte Produktentwicklung. München: Hanser.</li> </ul> <p><b>Sustainable Product Development 1 Laboratory:</b></p> <ul style="list-style-type: none"> <li>• Ashby, M. (2013): Materials and the Environment. Waltham et al.: Butterworth Heinemann.</li> <li>• Eyerer, P. et al. (2008): Polymer Engineering. Berlin et al.: Springer.</li> <li>• Martens, H. (2012): Recyclingtechnik. Heidelberg: Spektrum.</li> </ul> <p><b>Sustainable Product Development 2:</b></p> <ul style="list-style-type: none"> <li>• Bertsche, B. (2008): Reliability in Automotive and Mechanical Engineering. Berlin: Springer.</li> </ul>
Workload	<p>Workload: 4 ECTS x 30 hrs = 120 hrs  Class attendance: 4 SWS x 15 weeks = 60 hrs  Preparation and follow-up, practical work, preparation for and completion of examination: 60 hrs</p>
Media employed	Slides, blackboard, tasks for individual and group work, keynote presentations, group and plenary discussions, feedback for lab reports

## 11. Operations Management

“Operations Management“	
Code	BAE2330
Semester	4
Level	Advanced level
Credits / ECTS	5
Contact hours per week	4
Related courses	BAE2331 Operations Management 1 BAE2332 Operations Management 1 Laboratory BAE2333 Operations Management 2
Recommended prerequisites	None
Type and duration of examination (only in case of PLK/PLM)	Operations Management 1 and 2: module examination: PLK (60 mins) Operations Management 1 Laboratory: UPL
Language	English
Module coordinator	Prof Dr Kühn
Lecturer	Operations Management 1: Prof Dr Kühn Operations Management 1 Laboratory: Prof Dr Kühn Operations Management 2: Prof Dr Weyer, Prof Dr Kühn
Relation to curriculum	WI INT – Compulsory subject in 4 <sup>th</sup> semester
Teaching methodology	Lecture, practical work, laboratory
Objectives / intended learning outcomes	<p>The students</p> <ul style="list-style-type: none"> <li>• are acquainted with the processes and methods in production planning and control and can apply them</li> <li>• know the importance of operational and strategic perspective in operations management as well as their mutual dependencies</li> <li>• recognize the interdependences between production and logistics</li> <li>• know current trends in operations management and understand logistical, organizational, technical and economic implications for the entire organisation</li> <li>• know the basics of ergonomics and health and safety at work and are in a position to use them</li> <li>• can apply methods of time management i.e. time tracking and predetermined time systems</li> <li>• are able to look at operations holistically, master essential techniques and apply them to real tasks.</li> </ul>
Content	<p><b>Operations Management I+II – Lectures with parallel practical work and laboratory units:</b></p> <p>Students understand methods and processes of operations management and production planning. They can apply them and are able to adopt the correct approach to solve problems. Students learn operational and strategic aspects of operations management and know their dependencies, as well as the interdependencies between product and service, and production and logistics.</p>
Reading list	<p><b>Operations Management and laboratory:</b></p> <ul style="list-style-type: none"> <li>• Heizer, J. / Render, B. (2014): Operations Management. New Jersey: Pearson Education.</li> </ul>



	<ul style="list-style-type: none"> <li>• Slack, N. et al. (2012): Operations and Process Management - principles and practice for strategic impact. New Jersey: Pearson Education.</li> <li>• Thonemann, U. (2011): Operations Management - Konzepte, Methoden und Anwendungen. München: Pearson Studium.</li> </ul>
Workload	<p>Workload: 5 ECTS x 30 hrs = 150 hrs            Class attendance: 4 SWS x 15 weeks = 60 hrs            Preparation and follow-up, practical work, preparation for and completion of examination: 90 hrs</p>
Media employed	Lecture, laboratory work, seminar style course, project work

## 12. Business Process Management

“Business Process Management“	
Code	BAE2340
Semester	4
Level	Advanced level
Credits / ECTS	4
Contact hours per week	4
Related courses	BAE2341 Business Performance Management BAE2342 Innovation Processes
Recommended prerequisites	BAE1021 Cost Accounting BAE2292 Financial Control
Type and duration of examination (only in case of PLK/PLM)	PLK (60 mins) module examination
Language	English
Module coordinator	Prof Dr Kölmel
Lecturer	Business Performance Management: Prof Dr Binder Innovation Processes: Prof Dr Kölmel
Relation to curriculum	Business Process Management WI INT – Compulsory subject in 4 <sup>th</sup> semester
Teaching methodology	Lecture with case studies and practical work
Objectives / intended learning outcomes	Students have a good knowledge of methods of modern process management, and know how to apply them in a process-oriented company.
Content	<p>Students learn the basic tools of process management that are needed to plan, monitor and control a business and to ensure the effectiveness and efficiency of a company (eg. process-oriented measurement, process-based reporting, process-based organization). Short case studies give them an insight into the application of process-oriented instruments.</p> <p>The management of innovation is part of the implementation of the corporate strategy and can relate, among other things, to products, services, production processes, organizational structures, and management processes. While product innovations generally aim to better satisfy the needs of customers, process innovations are mostly aimed at improving the effectiveness and efficiency of processes. Successful implementation of an idea to a product or business model requires a structured innovation process. This process must be initiated, controlled and monitored in a company.</p>
Reading list	<ul style="list-style-type: none"> <li>• Becker, J. / Kugeler, M. / Rosemann, M. (2008): Prozessmanagement – Ein Leitfadens zur prozessorientierten Organisationsgestaltung. 6<sup>th</sup> edition, Berlin: Springer.</li> <li>• Gaitanides, M. (2006): Prozessorganisation. Entwicklung, Ansätze und Programme des Managements von Geschäftsprozessen. 2<sup>nd</sup> edition, München: Vahlen.</li> <li>• Horváth &amp; Partners (2005): Prozessmanagement umsetzen. Stuttgart: Schäffer-Poeschel.</li> <li>• Mayer, R. (1998): Prozeßkostenrechnung – State of the Art; Prozeßkostenmanagement. 2<sup>nd</sup> edition, Stuttgart: n.p..</li> <li>• Lunau, S. / Staudter, C. et al. (2013): Design for Six Sigma+Lean Toolset. Mindset for Successful Innovations. Berlin et al.: Springer.</li> </ul>

Workload	Workload: 4 ECTS x 30 hrs = 120 hrs Class attendance: 4 SWS x 15 weeks = 60 hrs Preparation and follow-up, practical work, preparation for and completion of examination: 60 hrs
Media employed	Slides, flip chart, videos, online case studies, method sheets

### 13. Intensive Courses

“Intensive Courses“	
Code	INS3100
Semester	5
Level	Advanced level
Credits / ECTS	5
Contact hours per week	4
Related courses	BAE3045 Workshop International Management Skills ISS3251 Research Methods and Academic Writing
Recommended prerequisites	BAE1054 Statistics 1
Type and duration of examination (only in case of PLK/PLM)	Workshop International Management Skills: UPL Research Methods and Academic Writing: UPL
Language	German und English
Module coordinator	Prof Dr Martin
Lecturer	Workshop International Management Skills: Prof Dr Mahadevan Research Methods and Academic Writing: Prof Dr Martin, N.N.
Relation to curriculum	Workshop International Management Skills WI INT – Compulsory subject in 5 <sup>th</sup> semester  Research Methods and Academic Writing WI, WI INT – Compulsory subject in 5 <sup>th</sup> semester
Teaching methodology	Seminar style course
Objectives / intended learning outcomes	<p><b>Workshop International Management Skills:</b> The students</p> <ul style="list-style-type: none"> <li>• know the relevant theories and concepts of international management in the professional field of industrial engineering</li> <li>• can critically reflect on their own cultural background</li> <li>• work actively on the lifelong development of their intercultural competence at the cognitive, affective and action-oriented levels</li> <li>• can apply and develop skills of international management</li> </ul> <p><b>Research Methods and Academic Writing:</b> The students</p> <ul style="list-style-type: none"> <li>• have broad knowledge of various scientific approaches and their applications</li> <li>• understand the basic features of common research tools in industrial engineering and can apply them</li> <li>• are familiar with academic writing techniques and can confidently apply them</li> <li>• are able to present the results of academic work in accordance with the principles</li> </ul>
Content	<p><b>Workshop International Management Skills:</b></p> <ul style="list-style-type: none"> <li>• Reflection of intercultural experiences from the previous semester based on intercultural theories, concepts, models and practices</li> <li>• Application of skills to real-life case studies</li> </ul> <p><b>Research Methods and Academic Writing</b></p> <ul style="list-style-type: none"> <li>• Scientific theory and paradigms: positivism/constructivism</li> <li>• Planning research projects</li> <li>• Data collection methods</li> </ul>

	<ul style="list-style-type: none"> <li>• Academic writing and report structuring</li> </ul>
Reading list	<p><b>Workshop International Management Skills:</b></p> <ul style="list-style-type: none"> <li>• Mahadevan, J. (2017), A Very Short, Fairly Interesting and Reasonably Cheap Book about Cross-Cultural Management, London: Sage.</li> </ul> <p><b>Research Methods and Academic Writing</b> Will be announced / provided in the seminar.</p>
Workload	<p>Workload: 5 ECTS x 30 hrs = 150 hrs Class attendance: 4 SWS x 15 weeks = 60 hrs Preparation and follow-up, practical work, preparation for and completion of examination: 90 hrs</p>
Media employed	<p>PowerPoint, blackboard, videos and print media for illustration, interactive tasks</p>

## 14. Management Methods II

„Management Methods II“	
Code	BAE3270
Semester	6
Level	Professionally qualifying academic level
Credits / ECTS	4
Contact hours per week	2
Related courses	BAE3270 Management Methods II
Requirements according to the examination regulations	All examinations of section 1 of the study program must have been passed.
Recommended prerequisites	None
Type and duration of examination (only in case of PLK/PLM)	PLL/PLR/PLH/PLK (60)
Language	English
Module coordinator	Prof Dr Peter
Lecturer	Prof Dr Peter
Relation to curriculum	WI INT – Compulsory subject in 6th semester
Teaching methodology	Seminar style course
Objectives / intended learning outcomes	<p>The students</p> <ul style="list-style-type: none"> <li>• know the basics and the terminology of quality management</li> <li>• have extensive knowledge of the tasks involved in professional quality management activities in a business environment</li> <li>• can apply quality management models, norms and standards to practical business examples</li> </ul>
Content	<p>QM Norms and Tools (TQM, ISO9001, ISO TS 16949, EFQM, Six Sigma, 8D) Continual improvement processes Failure Mode and Effects Analysis (FMEA)</p>
Reading list	<ul style="list-style-type: none"> <li>• Fisher, R., Ury, W. L., &amp; Patton, B. (1991). <i>Getting to Yes: Negotiating Agreement Without Giving In</i>. New York, NY: Penguin.</li> <li>• Lewicki, R. J., Saunders, D. M., &amp; Barry, B. (2015). <i>Essentials of Negotiation</i> (6th ed.). New York, NY: McGraw-Hill.</li> <li>• Raiffa, H., Richardson, J., &amp; Metcalfe, D. (2002). <i>Negotiation Analysis: The Science and Art of Collaborative Decision Making</i>. Cambridge, MA: Belknap.</li> <li>• Thompson, L. L. (2009). <i>The Mind and Heart of the Negotiator</i> (4th ed.). Upper Saddle River, NJ: Pearson.</li> </ul>
Workload	<ul style="list-style-type: none"> <li>• Workload: 4 ECTS x 30 hrs. = 120 hrs.</li> <li>• Class attendance: 2 SWS x 15 weeks = 30 hrs.</li> <li>• Preparation and follow-up, practical work, preparation for and completion of examination: 90 hrs.</li> </ul>
Media employed	<ul style="list-style-type: none"> <li>• Slides, presentations, project work, educational videos, inter-active tasks, negotiation simulation, group work and group discussions</li> </ul>

## 15. Project Methods and Creativity

“Project Methods and Creativity“	
Code	BAE3250
Semester	6
Level	Professionally qualifying academic level
Credits / ECTS	8
Contact hours per week	4
Related courses	BAE3250 Project Methods and Creativity
Requirements according to the examination regulations	All examinations of section 1 of the study program must have been passed.
Recommended prerequisites	None
Type and duration of examination (only in case of PLK/PLM)	Project Methods and Creativity: PLL
Language	German
Module coordinator	Prof Dittmann
Lecturer	Project Methods and Creativity: Prof Dittmann, Mr Lutz (LB), Prof Schätter
Relation to curriculum	WI, WI INT – Compulsory subject in 6 <sup>th</sup> semester
Teaching methodology	Seminar style course
Objectives / intended learning outcomes	<p>The students</p> <ul style="list-style-type: none"> <li>• can work in teams and take responsibility for different tasks within a team as well as learning how to deal with budget and time constraints</li> <li>• develop competences in team analysis and team building, in achieving team objectives and for preventing and dealing with critical situations in a team</li> <li>• can present team results accurately to the appropriate addressee</li> <li>• can independently familiarize themselves with a topic and implement it into a project</li> <li>• can implement the technical and methodological knowledge they have previously acquired in a concrete task thereby broadening their skills</li> <li>• in addition have the ability to generate creative ideas and implement them visually</li> <li>• can plan and organize a project</li> </ul>
Content	<p>A project seminar is a seminar whereby a subject from different fields is tackled in several milestones with accompanying presentations and weekly project meetings such as:</p> <ul style="list-style-type: none"> <li>• Modeling and visualization of technical operational sequences or processes</li> <li>• Creation of CBT / e-learning units</li> <li>• Abstraction of business connections through modeling</li> <li>• Development and programming of interactive applications</li> <li>• Visualization of information in the day to day operation of a company (internal and external)</li> </ul>
Reading list	<ul style="list-style-type: none"> <li>• Jacobsen, J. (2013): Website Konzeption. s.l.: dpunkt.</li> <li>• Böhringer, J. / Bühler, P. / Schlaich, P. (2014): Kompendium der Mediengestaltung für Digital- und Printmedien. Berlin et al.: Springer.</li> </ul>

Workload	Workload: 8 ECTS x 30 hrs = 240 hrs Class attendance: 4 SWS x 15 weeks = 60 hrs Preparation and follow-up, practical work, preparation for and completion of examination: 180 hrs
Media employed	Weekly alternation of evaluated milestone presentations and project meetings



## 16. Electives

### s. III. Specialisations

30 ECTS have to be selected as follows:

2 electives from the WI INT A-E electives (each 12 ECTS) and

6 ECTS from courses which are listed in the electives catalog of the study program.

The modules/courses have to be selected in consultation with the study program director. Participation in the electives can be limited according to § 30 para. 5 sentence 1 LHG by resolution of the School of Engineering. See the notice board for further information.

## 17. Interdisciplinary Projects

“Interdisciplinary Projects“	
Code	BAE2210
Semester	7
Level	Advanced level
Credits / ECTS	4
Contact hours per week	4
Related courses	None
Requirements according to the examination regulations	All examinations of section 1 of the study program must have been passed.
Recommended prerequisites	Specific lectures for each project subject Successful completion of all examinations of section 2 of the study program, including the 6 <sup>th</sup> semester if possible
Type and duration of examination (only in case of PLK/PLM)	PLP
Language	German or English
Module coordinator	All professors of the Engineering and Management study program
Lecturer	All professors can be examiners
Relation to curriculum	WI, WI INT – Compulsory subject in 7 <sup>th</sup> semester
Teaching methodology	Project
Objectives / intended learning outcomes	<p>Students are able to work in a team of up to 5 members. They accomplish interdisciplinary tasks and solve problems related to industrial engineering in a systematic and scientific way. This includes, for example:</p> <ul style="list-style-type: none"> <li>• data collection and analysis</li> <li>• development and evaluation of solution concepts</li> <li>• implementation of a solution concept</li> <li>• documentation and subsequent presentation</li> </ul> <p>As part of the project work, students learn to compile results in a team and present them to the supervisor. In addition, they learn to deal with specific interdisciplinary issues and ways to solve them. This enables students to use contents learned previously on a professional level, and, to broaden communication and problem-solving ability on a personal level.</p>
Content	<p>Diverse interdisciplinary topics where students use their</p> <ul style="list-style-type: none"> <li>• economic and technical knowledge, skills and competences</li> <li>• use standard tools for project management and data analysis</li> <li>• plan, organise and carry out projects within a given timeframe</li> <li>• carry out independent research, data collection and analysis</li> <li>• document and present processes and results</li> </ul>
Reading list	Literature is chosen by the students.
Workload	Workload: 4 ECTS x 30 hrs = 120 hrs Class attendance = 0 SWS; preparation, literature research, working on the project in teams: 120 hrs
Media employed	Current literature, presentations, intensive individual supervision, final presentation

## 18. Internship

“Internship“	
Code	INS3082
Semester	5
Level	Advanced level
Credits / ECTS	25
Contact hours per week	100 days of attendance in a company
Related courses	None
Requirements according to the examination regulations	All examinations of section 1 of the study program must have been passed by the beginning of the 4 <sup>th</sup> semester.
Recommended prerequisites	None
Type and duration of examination (only in case of PLK/PLM)	PVL-PLT
Language	German or English
Module coordinator	The assignment of the internship supervisors can be found on the website of Engineering and Management in the category ‘internship’.
Lecturer	None
Relation to curriculum	WI, WI INT – Compulsory subject in 5 <sup>th</sup> semester
Teaching methodology	Practice/training
Objectives / intended learning outcomes	<p>Students have an opportunity to apply the knowledge acquired in their previous semesters in an industrial and economic setting. The activities and working methods of industrial engineers are experienced in everyday life and can be compared with the theoretical subject matter.</p> <p>Students enhance their experience with regard to methodological and social skills, learn technological, commercial and organizational contexts, are aware of and develop understanding for business processes. They learn to work together with other employees on specific tasks and projects in a team and to integrate into the corporate hierarchy.</p> <p>Students are able to reflect on what they have learned in theory and in practice and thus, get a clear picture of where they want to work in future. They, therefore, have a stronger motivation to pursue their studies. In addition, the practical experience and feedback allow them to choose a suitable topic for their thesis and their subsequent career. They are able to recognise their individual preferences and align their studies to them. The internship, therefore, paves the way for a good start in their career.</p>
Content	<p>The internship is an integrated part of the study program. It provides practical experience and knowledge, which supplement courses of the program. Students get an insight into the processes and structures of a company. Both technical and economic tasks are to be performed in the internship. Tasks that relate to both business and engineering would best serve the aim of this internship.</p> <p>Regular contact with the respective supervisor in the company ensures that students gain a satisfactory insight into the interconnection between the economic and technical operations through a qualified employee.</p>

	<p>The internship is an integrated part of the study program, therefore, the university regulates the internship and determines its contents. It should provide practical experience and knowledge, which supplement courses on the program.</p> <p>The internship covers at least 20 weeks (100 attendance days) in a company. The students are expected to write a detailed report about the internship which shows that the required content and activities have in fact been completed in a company.</p>
Reading list	Subject to the topic
Workload	25 ECTS x 30 hrs = 750 hrs = 100 days (7,5 hrs a day)
Media employed	Not applicable

## 19. Scientific Colloquium

“Scientific Colloquium“	
Code	COL4999
Semester	7
Level	Professionally qualifying academic level
Credits / ECTS	2
Contact hours per week	2
Related courses	None
Requirements according to the examination regulations	At the earliest after completion of the 5 <sup>th</sup> semester and after passing all examinations of the first four study semesters.
Recommended prerequisites	Successful attendance of the course ‘Research Methods and Academic Writing’ in the 5 <sup>th</sup> semester
Type and duration of examination (only in case of PLK/PLM)	UPL
Language	German or English
Module coordinator	All professors of the Engineering and Management study program
Lecturer	All full-time professors can be examiners
Relation to curriculum	WI, WI INT – Compulsory subject in 7 <sup>th</sup> semester
Teaching methodology	Individual colloquia, preparation for the thesis
Objectives / intended learning outcomes	While writing their thesis, students will learn to solve complex and wide-ranging problems methodologically, independently, and accurately. The essential elements of how to perform scientific work learnt during their studies can be applied and explored. Individual weaknesses are recognized and resolved in consultation with the supervising professor. The ability to critical self-reflection is encouraged.
Content	Depending on individual students, specific shortcomings that the student or his supervising professor recognize in the process of writing the thesis; broadening of methodological issues.
Reading list	Subject to the planned topic of the thesis
Workload	Workload: 2 ECTS x 30 hrs = 60 hrs Class attendance: 2 SWS x 15 weeks = 30 hrs Preparation and follow-up: 30 hrs
Media employed	Not applicable

## 20. Bachelor Thesis

"Bachelor Thesis"	
Code	THE4999
Semester	7
Level	Professionally qualifying academic level
Credits / ECTS	12
Contact hours per week	0
Related courses	None
Requirements according to the examination regulations	Registration of the Bachelor Thesis is permitted in the 6 <sup>th</sup> semester at the earliest as long as all examinations of the first four study semesters have been passed.
Recommended prerequisites	<ul style="list-style-type: none"> <li>• Successful attendance of the course 'Scientific Colloquium' COL4999</li> <li>• Successful attendance of the course 'Research Methods and Academic Writing' in the 5th semester</li> <li>• All examinations of section 2 of the study program should have been passed.</li> </ul>
Type and duration of examination (only in case of PLK/PLM)	PLT
Language	German or English
Module coordinator	All professors of the Engineering and Management study program
Lecturer	All professors and qualified lecturers can be primary examiners
Relation to curriculum	WI, WI INT – Compulsory subject in 7 <sup>th</sup> semester
Teaching methodology	None
Objectives / intended learning outcomes	<p>The thesis shows that students are able to independently solve problems using scientific tools. They are able to apply and use, methods and mindsets when solving mostly practical problems within a prescribed period.</p> <p>Complex thinking and factual connections enable holistic problem-solving through appropriate use of information. Thus, relevant literature must be researched, filtered and evaluated. The topic is considered systematically; Lines of arguments need to be built.</p> <p>Students choose scientific methods and procedures, use them and develop them further to solve the problem. The results are to be critically evaluated using the most recent research.</p> <p>The findings and results are clearly and scientifically displayed by the student in written form.</p>
Content	The Bachelor thesis is the first major scientific work for the students. The topic of the thesis is defined by the first supervisor in consultation with the students, and depends on the chosen field and the concrete problem respectively. It must be related to the field of industrial engineering in general, and the chosen course of study in particular. It should cover specialized topics or current issues in these areas. A suggestion or proposal for a topic mostly comes from a company where the student intends to write the thesis.
Reading list	Topic-specific literature, chosen by the students
Workload	12 Credits x 30 hrs = 360 hrs
Media employed	Not applicable

### III. Specialisations

In consultation with the director of study program, the students have to acquire 30 credits / ECTS (18 credits in the 6th semester and 12 credits in the 7th semester) from the electives offered in this study program: This means 2 elective modules each 12 credits from the electives A-E described below and 6 credits from courses from the electives catalog of the program.

#### A Sustainable Product Development

"Sustainable Product Development"	
Code	BAE4170
Semester	6 or 7
Level	Professionally qualifying academic level
Credits / ECTS	12
Contact hours per week	8
Related courses	BAE4171 Methods of Sustainable Product Development BAE4172 Sustainable Product Development 3 BAE4173 Value-Based Product Development BAE4174 Energy and Resource Efficiency
Requirements according to the examination regulations	All examinations of section 1 of the study program must have been passed.
Recommended prerequisites	<ul style="list-style-type: none"> <li>• Students must have passed the exam in module BAE2170 "Sustainable Product Development".</li> <li>• If there are more than 25 applicants (see planned group size), then the grade from the module "Sustainable Product Development" shall apply in selecting participants.</li> <li>• Very good command of English</li> <li>• Skills in creating reports and presentations</li> <li>• Knowledge in project management</li> <li>• Knowledge in production engineering and materials science</li> </ul>
Type and duration of examination (only in case of PLK/PLM)	Each PLH/PLL/PLK/PLP/PLR (60 mins)
Language	English
Module coordinator	Prof Dr Woidasky
Lecturer	Methods of Sustainable Product Development: Prof Dr Woidasky, Mr Ott (lecturer) Sustainable Product Development 3: Prof Dr Woidasky, Mr Ott (lecturer), Prof Dr Lang-Koetz Value-Based Product Development: Prof Dr Woidasky, Mr Ott (lecturer) Energy and Resource Efficiency: Prof Dr Fournier
Relation to curriculum	WI INT – Compulsory subject in 6 <sup>th</sup> /7 <sup>th</sup> semester
Teaching methodology	Seminar style course, project with lecture
Objectives / intended learning outcomes	<p>The students supplement and broaden the methods of product development and evaluation of sustainability learned in section 1 of their studies. They apply these methods in practice - preferably in cooperation with companies and focusing on issues related to corporate practice and present the results.</p> <p>Students are able to</p> <ul style="list-style-type: none"> <li>• to structure the product development process, to assign individual steps to specific activities and to pursue "Design for X" approaches</li> </ul>

	<ul style="list-style-type: none"> <li>• to apply methods of product development and quality assurance (amongst others, creativity methods, FMEA, QFD, modeling, cost management)</li> <li>• to describe and evaluate products and processes in terms of sustainability and cost aspects</li> </ul>
Content	<ul style="list-style-type: none"> <li>• Methods of PD: The Munich Product Concretization Model (MKM) or comparable approach such as SPALTEN</li> <li>• Sustainable PD 3: Development of a product, preferably in cooperation with external (business) partner</li> <li>• Value-based PD: Cost management in product development; life cycle costs</li> <li>• Energy management: system approach: energy and energy management; energy transition in Germany; energy efficient production and use of goods;</li> <li>• Lightweight design as a driver of innovation: improving energy efficiency and emissions of GHG;</li> <li>• Innovative energy efficient techniques in production, transport or storage of energy;</li> <li>• Material efficiency and circular economy</li> </ul>
Reading list	<p>The study documents (slide copies) will be provided to the students via the e-learning platform (Moodle).</p> <p><b>Methods of Sustainable Product Development:</b></p> <ul style="list-style-type: none"> <li>• Ulrich, K.T. / Eppinger, S.D. (2012): Product Design and Development. New York: McGraw-Hill.</li> <li>• Pahl, G. / Beitz, W. et al. (2007): Konstruktionslehre – Grundlagen erfolgreicher Produktentwicklung. Methoden und Anwendungen. Berlin et al.: Springer.</li> <li>• Gausemaier, J. et al. (2011): Produktinnovation – Strategische Planung und Entwicklung der Produkte von morgen. München: Hanser.</li> <li>• Warnecke, H.-J. / Bullinger, H.-J. (2003): Wirtschaftlichkeitsrechnung für Ingenieure. München: Hanser.</li> </ul> <p><b>Sustainable Product Development 3:</b></p> <ul style="list-style-type: none"> <li>• Ashby, M. (2013): Materials and the Environment. Oxford: Butterworth-Heinemann.</li> <li>• Wimmer, W. et al. (2010): Ecodesign. Dordrecht: Springer.</li> <li>• VDI-Richtlinie 2243: Recyclinggerechte Konstruktion (2002). Berlin: Beuth.</li> </ul> <p><b>Value-Based Product Development:</b></p> <ul style="list-style-type: none"> <li>• Ehrlenspiel, K. / Kiewert, A. / Lindemann, U. (2001): Kostengünstig Entwickeln und Konstruieren – Kostenmanagement bei der integrierten Produktentwicklung. Berlin et al.: Springer.</li> <li>• VDI-Richtlinie 2234: Wirtschaftliche Grundlagen für den Konstrukteur (1990). Berlin: Beuth.</li> <li>• VDI-Richtlinie 2235: Wirtschaftliche Entscheidungen beim Konstruieren (1987). Berlin: Beuth.</li> <li>• VDI-Richtlinie 2225: Technisch-wirtschaftliches Konstruieren (1998). Berlin: Beuth.</li> <li>• Nash, M. / Poling, S. (2008): Mapping the total value stream. New York: CRC Press.</li> </ul> <p><b>Energy and Resource Efficiency (depending on the topic):</b></p> <ul style="list-style-type: none"> <li>• Quaschnig, V. (2009): Erneuerbare Energien und Klimaschutz. München: Hanser.</li> </ul>



	<ul style="list-style-type: none"> <li>• Wietschel, M. et al. (2010): Energietechnologien 2050. Stuttgart: Fraunhofer Verlag.</li> <li>• Agentur für Erneuerbare Energien: Forschungsradar Energiewende. <a href="http://www.forschungsradar.de/startseite.html">http://www.forschungsradar.de/startseite.html</a></li> <li>• Danny Harvey, L.D. (2013): Energy efficiency and the demand for energy services. London et al.: Earthscan.</li> <li>• Pehnt, M. (2010): Energieeffizienz – Ein Lehr- und Handbuch. Wiesbaden: Springer.</li> <li>• Friedrich, H. E. (2013): Leichtbau in der Fahrzeugtechnik. Wiesbaden: Springer.</li> <li>• Weidema, B. P. et al. (2008): Carbon Footprint A Catalyst for Life Cycle Assessment?. In: Journal of Industrial Ecology, Volume 12, Issue 1, S. 3-6. <a href="http://onlinelibrary.wiley.com/doi/10.1111/j.1530-9290.2008.00005.x/full">http://onlinelibrary.wiley.com/doi/10.1111/j.1530-9290.2008.00005.x/full</a></li> <li>• Nguyen, H. / Stuchtey, M. / Zils, M. (2014): Remaking the industrial economy. <a href="http://www.mckinsey.com/insights/manufacturing/remaking_the_industrial_economy">http://www.mckinsey.com/insights/manufacturing/remaking_the_industrial_economy</a></li> </ul>
Workload	<p>Workload: 12 ECTS x 30 hrs = 360 hrs            Class attendance: 8 SWS x 15 weeks = 120 hrs            Preparation and follow-up, practical work, preparation for and completion of examination: 240 hrs</p>
Media employed	<p>Slides, blackboard, tasks for individual and group work, keynote presentations, group and plenary discussions, individual and group presentations</p>

## B Operations Management

“Operations Management“	
Code	BAE4150
Semester	6 or 7
Level	Professionally qualifying academic level
Credits / ECTS	12
Contact hours per week	8
Related courses	BAE4056 Supply Chain Management BAE4151 Quality and Improvement BAE4152 Future Oriented Production Concepts 1 BAE4153 Future Oriented Production Concepts 2
Requirements according to the examination regulations	All examinations of section 1 of the study program must have been passed.
Recommended prerequisites	Extensive prior knowledge from previous courses within the modules MEN1270 Manufacturing Technology, BAE2330 Operations Management and BAE2120 Logistics.
Type and duration of examination (only in case of PLK/PLM)	Each PLH/PLL/PLK/PLP/PLR (60 mins)
Language	English
Module coordinator	Prof Dr Kühn
Lecturer	Supply Chain Management: Prof Dr Peter Quality and Improvement: Prof Dr Oßwald Future Oriented Production Concepts 1: Prof Dr Kölmel Future Oriented Production Concepts 2: Prof Dr Wahl, Prof Dr Burkhardt
Relation to curriculum	WI INT – Compulsory subject in 6 <sup>th</sup> /7 <sup>th</sup> semester
Teaching methodology	Seminar style course, laboratory sessions, project work
Objectives / intended learning outcomes	Students are able to <ul style="list-style-type: none"> <li>• describe methods for analysis of logistics and production engineering processes as well as their characterizing parameters</li> <li>• understand the specific features of different manufacturing principles</li> <li>• optimize existing processes in production and logistics or plan them anew by systematically applying methods of quality management and continuous improvement systems</li> <li>• describe the phases of factory planning</li> <li>• independently implement a layout plan and a work place design under ergonomic aspects in a case study</li> <li>• comprehend relevant trends and new developments in terms of opportunities and risks, and their implications for operations management, and apply them accordingly</li> </ul>
Content	<p><b>Supply Chain Management:</b> Basics and definition of supply chain management, planning levels of supply chain management, supply chain strategy, supply chain planning, supply chain execution, coordination in supply chain, supply chain configuration in theory and practice.</p> <p><b>Quality and Improvement:</b> Concepts and methods of quality management with special relevance for production and logistics processes including factory planning; concepts and methods of continuous improvement systems.</p> <p><b>Future Oriented Production Concepts 1 und 2:</b></p>

	<p>Current developments in operations management will be discussed in depth. The students deal intensively with the topics as project work, preferably involving external business partners: Possible topics include production systems, cyber physical systems, internet of things and product service systems:</p>
<p>Reading list</p>	<p><b>Supply Chain Management:</b></p> <ul style="list-style-type: none"> <li>• Bretzke, W.-R. (2010): Logistische Netzwerke. 2., wesentlich bearbeitete und erweiterte Auflage, Berlin et al. 2010.</li> <li>• Chopra, S., Meindl P. (2007): Supply Chain Management - Strategy, Planning &amp; Operations, 3<sup>rd</sup> edition, New Jersey 2007.</li> <li>• Managan, J. at all ( 2008): Global Logistics and Supply Chain Management, 2008.</li> <li>• Pfohl, H.-C. (2010): Logistiksysteme. 8., neu bearbeitete und aktualisierte Auflage, Heidelberg 2010.</li> <li>• Simchi-Levi, D. at all (2000): Designing and Managing the Supply Chain – Concepts, Strategies, and Case Studies, Boston, 2000.</li> <li>• Vahrenkamp, R. (2007): Logistik: Management und Strategien. 6., überarbeitete und erweiterte Auflage. München 2007.</li> <li>• Werner, H. (2008): Supply Chain Management – Grundlagen, Strategien, Instrumente und Controlling, 3. Auflage, Wiesbaden 2008.</li> </ul> <p><b>Quality and Improvement:</b> Will be announced in the syllabus.</p> <p><b>Future Oriented Production Concepts 1:</b></p> <ul style="list-style-type: none"> <li>• Petri Helo, Angappa Gunasekaran, Anna Rymaszewska, Designing and Managing</li> <li>• Industrial Product-Service Systems, Springer 2017</li> <li>• Vogel-Heuser, B., Lindemann, U. und Reinhart, G. (2014): Innovationsprozesse zyklusorientiert managen: Verzahnte Entwicklung von Produkt-Service Systemen. Vieweg+Teubner: Berlin, Heidelberg.</li> <li>• Mannweiler, C., Aurich, J.C. und Clement, M.H. (2010): Produkt-Service Systeme: Gestaltung und Realisierung. Springer: Berlin, Heidelberg.</li> <li>• Spiller, M. et al. (2013): Dienstleistungsmodellierung: Product-Service Systems und Produktivität. Gabler: Wiesbaden.</li> </ul> <p><b>Future Oriented Production Concepts 2:</b> Will be announced in the syllabus.</p>
<p>Workload</p>	<p>Workload: 12 ECTS x 30 hrs = 360 hrs Class attendance: 8 SWS x 15 weeks = 120 hrs Preparation and follow-up, practical work, preparation for and completion of examination: 240 hrs</p>
<p>Media employed</p>	<p>Lecture, laboratory work, seminar style course, project work</p>

### C International Technical Sales

“International Technical Sales “	
Code	BAE4130
Semester	6 / 7
Level	Professionally qualifying academic level
Credits / ECTS	12
Contact hours per week	8
Related courses	BAE4035 International Marketing BAE4032 Researching Global Markets BAE4036 International Technical Sales 3 BAE4037 Marketing Simulations
Requirements according to the examination regulations	All examinations of section 1 of the study program must have been passed.
Recommended prerequisites	Successful attendance of <ul style="list-style-type: none"> <li>• BAE2253 „International Technical Sales 1“</li> <li>• BAE2252 „International Technical Sales 2“</li> </ul>
Type and duration of examination (only in case of PLK/PLM)	Each PLH/PLL/PLK/PLP/PLR (60 mins)
Language	German and English
Module coordinator	Prof Dr Hinderer
Lecturer	International Marketing: Prof Dr Wupperfeld Researching Global Markets: Prof Dr Wupperfeld International Technical Sales 3: Prof Dr Hinderer Marketing Simulations: Prof Dr Hinderer
Relation to curriculum	WI INT – Compulsory subject in 6 <sup>th</sup> /7 <sup>th</sup> semester
Teaching methodology	Seminar style courses
Objectives / intended learning outcomes	The students know the fundamental concepts of marketing in the areas of international marketing, market research and development, and technical sales. They learn the basics of this subject area and are able to apply the knowledge and methodological skills they have learned to real tasks. Moreover, the students are able to understand and create business processes along the entire value chain. They know the customer-specific processes and learn how to implement them in the context of interdisciplinary projects together with companies. In addition, the students develop alternative marketing specific solutions to selected practical projects.
Content	<p><b>International Marketing:</b> Cultural environment of global marketing, international business activities and multinational market groups, corporate context of marketing</p> <p><b>Researching Global Markets:</b> Market research (field research, desk research); innovation management and customer-oriented development of new products for global markets</p> <p><b>International Technical Sales 3:</b> International industrial goods and services marketing, product design and pricing for international markets, global communications policy and personal sales, international distribution systems, development of marketing strategies for companies in international markets based on well-founded market research</p>

	<p><b>Marketing Simulations:</b>          Simulations of realistic cases in the light of market-oriented management. Designed as a business simulation in which the participants make their own marketing decisions. In the process, all marketing mix elements in specific business situations within a simulated market with competing companies shall apply. Participants must explain and justify their specific marketing decisions to a critical audience. In addition, campaigns and a current marketing relevant topic should be developed in the business context.</p>
<p>Reading list</p>	<p><b>International Marketing:</b></p> <ul style="list-style-type: none"> <li>• Usunier, J. (2000): Marketing Across Cultures. 4<sup>th</sup> edition, Harlow: Prentice Hall.</li> <li>• Backhaus, K. / Büschken, J. / Voeth, M. (2003): internationales marketing, Stuttgart: Schäffer-Poeschel.</li> <li>• Backhaus, K./ Büschken, J. / Voeth, M. (2005): international marketing. Basingstoke: Palgrave MacMillan.</li> <li>• Usunier, J. (2004): Marketing international: développement des marchés et management multiculturel. 2<sup>nd</sup> edition, Paris: Vuibert.</li> </ul> <p><b>Researching Global Markets:</b></p> <ul style="list-style-type: none"> <li>• Backhaus, K. (2006): Multivariate Analysemethoden: eine anwendungsorientierte Einführung. 11<sup>th</sup> revised edition, Berlin et al.: Springer.</li> <li>• Gaul, W. (1994): Marktforschung und Marketing-Management: computerbasierte Entscheidungsunterstützung. 2<sup>nd</sup> revised edition, München: Oldenbourg.</li> <li>• Köglmayr, H.-G. / Wupperfeld, U. (1998): Der Euro in Marketing und Vertrieb. Landsberg/Lech: Verlag Moderne Industrie.</li> <li>• Kotler, P. / Keller, K. L. / Bliemel, F. (2007): Marketing-Management: Strategien für wertschaffendes Handeln. 12<sup>th</sup> updated edition, München: Pearson.</li> <li>• Nieschlag, R. / Dichtl, E. / Hörschgen, H. (2002): Marketing. 19<sup>th</sup> revised and amended edition, Berlin: Duncker &amp; Humblot.</li> <li>• Meffert, H. (1992): Marketingforschung und Konsumentenverhalten. 2<sup>nd</sup> completely revised and expanded edition, Wiesbaden: Gabler.</li> <li>• Meissner, H.-G. (1982): Forschungskonzepte und -methoden im internationalen Marketing. In: Lück, W. / Trommsdorff, V. (Eds.): Internationalisierung der Unternehmung als Problem der Betriebswirtschaftslehre. Berlin: E. Schmidt.</li> </ul> <p><b>International Technical Sales 3:</b></p> <ul style="list-style-type: none"> <li>• Backhaus, K. / Voeth, M. (2014): Internationales Marketing. 11<sup>th</sup> edition, Stuttgart: Schäffer-Poeschel.</li> <li>• Kotler, P. / Keller, K. L. / Bliemel, F. (2007): Marketing-Management: Strategien für wertschaffendes Handeln. 12<sup>th</sup> updated edition, München: Pearson.</li> <li>• Meffert, H. et al. (2007): Marketing: Grundlagen marktorientierter Unternehmensführung. 10<sup>th</sup> revised and expanded edition, Wiesbaden: Gabler.</li> <li>• Nieschlag, R. / Dichtl, E. / Hörschgen, H. (2002): Marketing. 19<sup>th</sup> revised and amended edition, Berlin: Duncker &amp; Humblot.</li> <li>• Porter, Michael E. (1989): Globaler Wettbewerb: Strategien der neuen Internationalisierung. Wiesbaden: Gabler.</li> </ul> <p><b>Marketing Simulations:</b></p>

	<ul style="list-style-type: none"> <li>• Kotler, P. (2012): Marketing Management. 2<sup>nd</sup> Europ. Edition. München: Pearson.</li> <li>• Meffert, H. et al. (2015): Marketing: Grundlagen marktorientierter Unternehmensführung. 12<sup>th</sup> revised and expanded edition, Wiesbaden: Springer-Gabler.</li> <li>• Wöhe, G. (2011): Einführung in die Betriebswirtschaftslehre. 24<sup>th</sup> edition, München: Vahlen.</li> <li>• Backhaus, K. / Voeth, M. (2010): Internationales Marketing. 10<sup>th</sup> edition, Stuttgart: Schäffer-Poeschel.</li> </ul>
Workload	<p>Workload: 12 ECTS x 30 hrs = 360 hrs            Class attendance: 8 SWS x 15 weeks = 120 hrs            Preparation and follow-up, practical work, preparation for and completion of examination: 240 hrs</p>
Media employed	Presentation, workshops, project reports and documentation

## D International Management

“International Management“	
Code	BAE4180
Semester	6 or 7
Level	Professionally qualifying academic level
Credits / ECTS	12
Contact hours per week	8
Related courses	BAE4184 International Business 2 BAE4183 Intercultural Engineering BAE4181 International Management BAE4182 Specific Challenges in International Management
Requirements according to the examination regulations	All examinations of section 1 of the study program must have been passed.
Recommended prerequisites	For all courses successful attendance of <ul style="list-style-type: none"> <li>• INS3100 Intensive courses</li> <li>• INS3082 Internship</li> </ul> For Intercultural Engineering: successful attendance of <ul style="list-style-type: none"> <li>• BAE2271 Cultural Awareness</li> </ul> For International Business 2: successful attendance of <ul style="list-style-type: none"> <li>• BAE2272 International Business 1</li> </ul> ISP students can participate without having attended the previous courses.
Type and duration of examination (only in case of PLK/PLM)	Each PLH/PLL/PLK/PLP/PLR (60 mins)
Language	English
Module coordinator	Prof Dr Mahadevan
Lecturer	International Management: Prof Dr Martin Specific Challenges in International Management: Prof Dr Martin / Prof Dr Mahadevan / Prof Dr Kilian-Yasin Intercultural Engineering: Prof Dr Mahadevan International Business 2: Prof Dr Kilian-Yasin
Relation to curriculum	WI INT – Compulsory subject in 6 <sup>th</sup> /7 <sup>th</sup> semester
Teaching methodology	Seminar style course, project
Objectives / intended learning outcomes	<p><b>International Business 2:</b> The students</p> <ul style="list-style-type: none"> <li>• have in-depth theoretical knowledge and methodological skills for international industrial engineering</li> <li>• have an in-depth understanding of specific problems of international business and can discuss and present them using the appropriate theories and methods</li> <li>• can, culturally and ethically, make responsible decisions to complex problems in international business engineering</li> </ul> <p><b>Intercultural Engineering:</b> The students</p> <ul style="list-style-type: none"> <li>• can apply intercultural theories, concepts and models for the analysis of case studies on interaction across cultural boundaries</li> <li>• understand the difference between the macro, meso and micro level of culture</li> </ul>

	<ul style="list-style-type: none"> <li>• can perform and evaluate an ethnographic group research project, present it competently, addressing the relevant issues and target group using different media, and discuss it in written form at an academic level</li> </ul> <p><b>International Management:</b> The students</p> <ul style="list-style-type: none"> <li>• know common approaches and methods of problem analysis and their applications in an international context</li> <li>• know the typical issues of management tasks in an international setting and are able to apply current approaches to tackle them.</li> </ul> <p><b>Specific Challenges in International Management:</b></p> <ul style="list-style-type: none"> <li>• Students apply their expertise and methods to international industrial engineering in a project.</li> </ul>
Content	<p><b>International Business 2:</b></p> <ul style="list-style-type: none"> <li>• Interactive analysis and discussion of case studies on international industrial engineering</li> <li>• Compiling and writing own case study on a current process in the context of international industrial engineering</li> <li>• Broadening their expertise and knowledge of methods of International Business 1</li> <li>• Writing an academic paper in the subject area of international industrial engineering</li> </ul> <p><b>Intercultural Engineering:</b></p> <ul style="list-style-type: none"> <li>• Management of cultural complexity between professional cultures, organizational cultures and society cultures</li> <li>• Diversity competence in everyday life and profession</li> <li>• Broadening intercultural theories, concepts and models and their application in practical cases in the engineering work environment</li> <li>• Use of ethnographic methods on specific micro-cultures</li> <li>• Management of emic meanings</li> </ul> <p><b>International Management:</b></p> <ul style="list-style-type: none"> <li>• Considerations and evaluation of investment opportunities abroad</li> <li>• Socio-economic considerations of business environments and recognition of potential problem areas</li> <li>• Methods for classification of business sectors and products in global markets</li> <li>• Structure of learning organizations for the increase in competitiveness</li> <li>• HR management and policy in international business</li> </ul> <p><b>Specific Challenges in International Management:</b></p> <ul style="list-style-type: none"> <li>• Current topics of subject area</li> </ul>
Reading list	<p><b>International Business 2:</b></p> <ul style="list-style-type: none"> <li>• Crane, Andrew and Matten, Dirk (2016). Business ethics: managing corporate citizenship and sustainability in the age of globalization. Oxford: Oxford University Press</li> <li>• Deresky, Helen (2017, 09<sup>th</sup> edition). International Management. Managing Across Borders and Cultures. Essex: Pearson</li> <li>• Hill, C. (2009): International Business (International Edition). New York: McGraw Hill.</li> <li>• Frynas, J. G. / Mellahi, K. (2011). Global Strategic Management. Oxford: Oxford University Press.</li> </ul>



	<p><b>Intercultural Engineering:</b></p> <ul style="list-style-type: none"> <li>• Mahadevan, J. (2017), A Very Short, Fairly Interesting and Reasonably Cheap Book about Cross-Cultural Management, London: Sage.</li> </ul> <p><b>International Management:</b></p> <ul style="list-style-type: none"> <li>• Will be announced in the seminar.</li> </ul> <p><b>Specific Challenges in International Management:</b></p> <ul style="list-style-type: none"> <li>• Will be announced in the seminar.</li> </ul>
Workload	<p>Workload: 12 ECTS x 30 hrs = 360 hrs            Class attendance: 8 SWS x 15 weeks = 120 hrs            Preparation and follow-up, practical work, preparation for and completion of examination: 240 hrs</p>
Media employed	<p>Blackboard, slides, presentations, project work / service learning, educational videos, learning portfolio, presentations, interactive tasks, negotiation simulation, group work and discussions</p>

## E Business Process Management

“Business Process Management“	
Code	BAE4190
Semester	6 + 7
Level	Professionally qualifying academic level
Credits / ECTS	12
Contact hours per week	8
Related courses	BAE4191 Product Service Systems 1 BAE4192 Business Process Modeling BAE4193 Process-Based Organizations/Future of Management BAE4194 Product Service Systems 2
Requirements according to the examination regulations	All examinations of section 1 of the study program must have been passed.
Recommended prerequisites	Successful completion of section 1 of the study program
Type and duration of examination (only in case of PLK/PLM)	Each PLH/PLL/PLK/PLP/PLR (60 mins)
Language	English
Module coordinator	Prof Dr Kölmel
Lecturer	Product Service Systems 1: Prof Dr Kölmel Business Process Modeling: Prof Dr Bulander Process-Based Organizations/Future of Management: Prof Dr Kölmel Product Service Systems 2: Prof Dr Kölmel
Relation to curriculum	WI INT – Compulsory subject in 6 <sup>th</sup> /7 <sup>th</sup> semester
Teaching methodology	Product Service Systems 1: Blended learning and lecture Business Process Modeling: Lecture, blended learning and computer tasks in the laboratory Process-Based Organizations/Future of Management: Blended learning and development of independent approaches to a solution Product Service Systems 2: Capstone project
Objectives / intended learning outcomes	Training the mindset and behavioral concepts of "Business Process Management", e.g. design and modeling of business processes of global companies and building international network and cooperation, design and organization of competitive businesses.
Content	The growing importance of combining products and services (product-service systems, PSS) brings about the need for significant changes in the development processes of companies. The design and implementation of solutions, the so-called product service systems (PSS), takes place in an extended value network consisting of production and service networks of the manufacturer in cooperation with the customer. The companies, thus, face a medium-term challenge to complete the strategic transformation from proper product-oriented manufacturer to customer-oriented full-service providers. In this module practical management support systems for planning, development, configuration and customized implementation of PSS will be worked out in an extended value network. In addition, the necessary methods of organizational design and of acquiring the necessary skills are shown. The individual approaches, on one hand, deal with the theoretical foundations and methods for lifecycle management of PSS, on the other hand, they provide case studies of companies that have implemented the concepts in

	<p>practice. Process-based organizational models are addressed concurrently. A company is modeled according to continuous business processes in a process organization. The model of process organization is, therefore, a system of activities that are on a continuous power flow that are associated with each other and are in a clearly defined sequence relationship. The processes are based on customers so as to create value for the customer and the company - customer-oriented all-round processing. Business Process Management includes concepts, methods and tools which help organizations to define, implement, measure and improve their continuous processes. The key concepts of business process management are described, whereby the modeling of processes is done with the graphical notation "Business Process Model and Notation" (BPMN). Practical tasks on BPMN process modeling tool are done on the computer, thus, broadening the acquired knowledge.</p>
Reading list	<p><b>Product Service Systems 1 and 2:</b></p> <ul style="list-style-type: none"> <li>• Vogel-Heuser, B. / Lindemann, U. / Reinhart, G. (2014): Innovationsprozesse zyklensorientiert managen: Verzahnte Entwicklung von Produkt-Service Systemen. Berlin et al.: Vieweg+Teubner.</li> <li>• Mannweiler, C. / Aurich, J.C. / Clement, M.H. (2010): Produkt-Service Systeme: Gestaltung und Realisierung. Berlin et al.: Springer.</li> <li>• Spiller, M. et al. (2013): Dienstleistungsmodellierung: Product-Service Systems und Produktivität. Wiesbaden: Gabler.</li> </ul> <p><b>Business Process Modeling:</b></p> <ul style="list-style-type: none"> <li>• Allweyer, T. (2005): Geschäftsprozessmanagement. Witten: W3I-Verlag.</li> <li>• Allweyer, T. (2009): BPMN 2.0. 2<sup>nd</sup> edition, Norderstedt: Books on Demand.</li> <li>• Freund, J. / Rücker, B. (2014): Praxishandbuch BPMN 2.0. 4<sup>th</sup> edition, München et al.: Carl Hanser.</li> <li>• Freund, J. / Rücker, B. (2014): Real-Life BPMN. Using BPMN 2.0 to Analyze, Improve, and Automate Processes in Your Company. 2<sup>nd</sup> edition, CreateSpace Independent Publishing Platform.</li> <li>• Gadatsch, A. (2013): Grundkurs Geschäftsprozess-Management. 7<sup>th</sup> edition, Wiesbaden: Vieweg+Teubner.</li> <li>• Schmelzer, H. / Sesselmann, W. (2013): Geschäftsprozess Management in der Praxis. 8<sup>th</sup> edition, München: Hanser.</li> </ul> <p><b>Process-Based Organizations/Future of Management</b></p> <ul style="list-style-type: none"> <li>• Osterwalder, A. et al. (2014): Value Proposition Design: How to Create Products and Services Customers Want. Hoboken: Wiley.</li> <li>• Brown, D. / Harvey, D. (2005): An Experiential Approach to Organization Development. New Jersey: Pearson/Prentice Hall.</li> </ul>
Workload	<p>Workload: 12 ECTS x 30 hrs = 360 hrs          Class attendance: 8 SWS x 15 weeks = 120 hrs          Preparation and follow-up, practical work, preparation for and completion of examination: 240 hrs</p>
Media employed	<p>Slides, flip chart, videos, online case studies, method sheets, computer tasks in the laboratory, blended learning, capstone project, reversed classroom</p>