

Module Manual Master International Industrial Engineering

Methods

| Course |
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| Innovation and Technology Management |
| Methods of Quality Management in an International Environment |
| International Technical Sales Management |
| Life Cycle and Services Management |

Abbreviations:

sem. = semester

SS = summer semester; WS = winter semester

SWS = credit hours per week

ECTS = credits according to the European Credit Transfer System

IWI = International Industrial Engineering; SET = Simulation and Experimental Engineering; ME = Mechanical Engineering

| Innovation and Technology Management | | | | | | |
|--|---|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 17001 17002 | 180 h | 60 h | 120 h | Sem. 2 | SS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| a) Lecture 2 SWS b) Exercise 1 SWS c) Practical Training 1 SWS | | 6 ECTS | Master IWI | | | |
| 1 | Learning outcomes / competences The students <ul style="list-style-type: none"> • have learned about global challenges of innovation process management, • know steps and phases of standardised innovation processes and the contents of technology management, • know the basic theories of individual, team and corporate creativity, • are able to apply methods to generate and identify ideas as well as screen new technologies, • are able to evaluate potentials of new technologies, • are able to analyse and understand interactions between R&D, production and market, • can apply methods to forecast and estimate technology impacts on existing business models, • are able to apply methods to develop, implement and control innovation processes. | | | | | |
| 2 | Contents <ul style="list-style-type: none"> • Definition of innovation, creativity, technology and customer needs • Identification of latent customer needs (e.g. Jobs-to-be-done Theory, Design Thinking) • Innovation culture and management in global organisations • Methods to generate ideas (e.g. creativity techniques) • Industrial standards for global innovation process management (e.g. Stage-Gate Model) • Introduction into current innovation fields • Structuring and execution of an international innovation project (by way of example) • Methods to identify technology potentials and to manage risk of new technologies • Prototyping as a way of communication and experimentation • Diffusion theory and attributes influencing product adoption | | | | | |
| 3 | Forms of teaching <ul style="list-style-type: none"> • Lecture (a) • Exercises (b) • Practical examples, practical case study, group work (c) | | | | | |
| 4 | Recommended prerequisites <ul style="list-style-type: none"> • None | | | | | |
| 5 | Types of examination <ul style="list-style-type: none"> • Practical work in groups with presentation (=50 %) • Written assignment (= 50 %) | | | | | |

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| 6 | <p>Requirements for award of credits</p> <p>Passed examination</p> |
| 7 | <p>Person responsible for the module</p> <ul style="list-style-type: none"> • Prof. Dr. Carsten Deckert |
| 8 | <p>Language of instruction</p> <ul style="list-style-type: none"> • English |
| 9 | <p>Further information / references</p> <ul style="list-style-type: none"> • Lecture script • Burgelman, R. A., Christensen, C.M., Wheelwright, S.C. (2009). Strategic Management of Technology and Innovation (5th ed.). Boston: McGraw-Hill. • Deckert, C. (2015). Tensions in Creativity. Using the Value Square to Model Individual Creativity. WP 2/2015. CBS Working Paper Series, ISSN 2195-6618. • Deckert, C. (2016). Tensions in Corporate Creativity. Using the Value Square to Model Organizational Creativity. WP 1/2016. CBS Working Paper Series, ISSN 2195-6618. • Deckert, C. (2016). On the Originality-Effectiveness-Duality of Creativity. Business Creativity and the Creative Economy. 2(1), 70-82. DOI: 10.18536/bcce.2016.10.2.1.07 • Deckert, C. (2017). Tensions in Creative Products: Using the Value Square to Model Functional Creativity. International Journal of Creativity & Problem Solving. 27 (2), 71-93. • Deckert, C. (2017). Creative Heuristics. A Framework for Systematic Creative Problem Solving. Working Paper 01/2017. CBS Working Paper Series, ISSN 2195-6618. • Deckert, C. (2019). Tensions in Team Creativity. Using the Value Square to Model Team Climate for Creativity. Working Papers in Industrial Engineering, No. 1. Hochschule Düsseldorf. • Puccio, G.J., Mance, M., Murdock, M.C. (2011). Creative Leadership. Skills that Drive Change (2nd ed.). Thousand Oakes: SAGE Publications. • Sawyer, R.K. (2012). Explaining Creativity: The Science of Human Innovation. New York: Oxford University Press. • Schilling, M. (2017). What's your best innovation bet? Harvard Business Review. 86-93. |

| Methods of Quality Management in an International Environment | | | | | | |
|--|---|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 17101 | 180 h | 60 h | 120 h | Sem. 2 | WS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| a) Lecture 2 SWS b) Exercise 2 SWS | | 6 ECTS | Master IWI | | | |
| 1 | Learning outcomes / competences The students are able to <ul style="list-style-type: none"> • apply the main methods of quality management and assess the results, • handle the variety of quality tools and systems, assess them critically and apply them in a targeted manner, • promote the international focus of the quality management system, • assess international normative quality systems such as DIN ISO 9000 and following, ISO/TS16949, VDA 6.1 regarding their relevance in production, • assess strategic international quality tools such as EFQM Excellence Model, TQM, Quality Awards, quality control processes, Six Sigma etc. for professional practice. | | | | | |
| 2 | Contents <ul style="list-style-type: none"> • Development and different aspects of quality management • The seven essential tools for quality management • Methods of quality management in global product development and production, quality gates • Requirement comprehension and analysis, Kano model, quality function deployment, fault tree analysis, event tree analysis • Failure mode and effects analysis • Reliability of technical systems • HAZOP procedure • Quality-related costs • Quality management in an international environment • Global case studies | | | | | |
| 3 | Forms of teaching <ul style="list-style-type: none"> • Lecture, exercise, unassisted application of methods • Critical discussion of practical cases and presentations | | | | | |
| 4 | Recommended prerequisites <ul style="list-style-type: none"> • Basic understanding of technical matters | | | | | |
| 5 | Types of examination written examination (duration: 120 min.) Scope and extend will be announced at the beginning of the semester (module examination). | | | | | |
| 6 | Requirements for award of credits <ul style="list-style-type: none"> • Passed module examination | | | | | |

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| 7 | Person responsible for the module <ul style="list-style-type: none">• Prof. Dr. Joachim Binding |
| 8 | Language of instruction <ul style="list-style-type: none">• German |
| 9 | Further information / references <ul style="list-style-type: none">• Lecture slides on Moodle Recommended literature (latest edition): <ul style="list-style-type: none">• Linß, Qualitätsmanagement für Ingenieure, Hanser |

| International Technical Sales Management | | | | | | |
|---|--|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 17201 | 180 h | 60 h | 120 h | Sem. 1 | SS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| a) Lecture 2 SWS b) Exercise 2 SWS | | 6 ECTS | Master IWI | | | |
| 1 | Learning outcomes / competences | | | | | |
| | <p>The students</p> <ul style="list-style-type: none"> • understand basic sales principles and processes in an international context, • are able to analyse and describe customer needs, • are able to develop different sales strategies with regards to intercultural differences (selected countries or regions) • are able to develop and evaluate sales solutions according to customer needs, • are able to run sales meetings with international customers, • are able to create, implement and monitor (multinational) sales plans | | | | | |
| 2 | Contents | | | | | |
| | <ul style="list-style-type: none"> • Principles of international sales management • Planning and research of sales activities • Stimulating customer interest • Defining customer pain and critical business issues • Describing customer diagnosis • Creating visions biased by new products • Generating sales plans and monitoring international sales activities | | | | | |
| 3 | Forms of teaching | | | | | |
| | <ul style="list-style-type: none"> • Lecture (a) • Practical exercises and case studies (b) • External lecturers (esp. for cultural impacts on sales strategies) | | | | | |
| 4 | Recommended prerequisites | | | | | |
| | <ul style="list-style-type: none"> • None | | | | | |
| 5 | Types of examination | | | | | |
| | <ul style="list-style-type: none"> • Team project presentation (duration: 30 min.). Scope and extend will be announced at begin of the semester. <p>OR</p> <ul style="list-style-type: none"> • Written examination (duration: 90 min.) <p>The applicable type of examination will be announced at the beginning of the semester.</p> | | | | | |
| 6 | Requirements for award of credits | | | | | |
| | <ul style="list-style-type: none"> • Passed examination | | | | | |
| 7 | Person responsible for the module | | | | | |
| | <ul style="list-style-type: none"> • Prof. Dr.-Ing. Jörg Niemann | | | | | |

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| 8 | Language of instruction <ul style="list-style-type: none">• English |
| 9 | Further information / references <ul style="list-style-type: none">• Lecture script• Eades, The New Solution Selling: The Revolutionary Sales Process That is Changing the Way People Sell, Hardcover, 2003• Eades, The Solution Selling Fieldbook: Practical Tools, Application Exercises, Templates and Scripts for Effective Sales Execution, Paperback, 2005• Care/Bohling, Mastering Technical Sales: The Sales Engineer's Handbook, Artec House, 2014 |

| Life Cycle and Services Management | | | | | | |
|--|---|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 17301 | 180 h | 60 h | 120 h | Sem. 1 | WS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| a) Lecture 2 SWS b) Exercise 1 SWS c) Practical Training 1 SWS | | 6 ECTS | Master IWI | | | |
| 1 | Learning outcome / competences | | | | | |
| | <p>The students</p> <ul style="list-style-type: none"> • know the importance of global life cycle management for products and services, • know the methods of global service management in an international environment, • know instruments and international standards for the development and provision of services in an industrial environment, • are able to conceptualise a life cycle management system for products and services with a global orientation, • know strategies for a successful obsolescence management of global products, • know cultural specifics relevant for the provision of services in selected, foreign cultures, • can develop, apply and assess concepts and instruments in service management. | | | | | |
| 2 | Contents | | | | | |
| | <ul style="list-style-type: none"> • Importance and advantages of life cycle services for multinational industrial corporations • Analysis of the service portfolio regarding its impact on industrial corporations in an international context • Obsolescence management of products and services • Methods to manage and control the service provision • Importance and development of service level agreements on the product life cycle • Importance of services in product life cycle management | | | | | |
| 3 | Forms of teaching | | | | | |
| | <ul style="list-style-type: none"> • Lecture (a) • Practical exercises (b) • Practical development and application of tools to manage service provision (c) | | | | | |
| 4 | Recommended prerequisites | | | | | |
| | <ul style="list-style-type: none"> • None | | | | | |
| 5 | Types of examination | | | | | |
| | <ul style="list-style-type: none"> • Team project presentation (duration: 30 min.) Scope and extend will be announced at begin of semester. <p>OR</p> <ul style="list-style-type: none"> • Written examination (duration: 90 min.) <p>The applicable type of examination will be announced at the beginning of the semester.</p> | | | | | |

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| 6 | <p>Requirements for award of credits</p> <ul style="list-style-type: none"> • Passed module examination |
| 7 | <p>Person responsible for the module</p> <ul style="list-style-type: none"> • Prof. Dr.-Ing. Jörg Niemann |
| 8 | <p>Language of instruction</p> <ul style="list-style-type: none"> • German (or English) |
| 9 | <p>Further information / references</p> <ul style="list-style-type: none"> • Lecture slides (as PDF) <p>Recommended literature (latest edition):</p> <ul style="list-style-type: none"> • Peppels, Service Management, Oldenbourg, 2012 • Luczak, Service Management mit System, Erfolgreiche Methoden für die Investitionsgüterindustrie, Springer • Westkämper, Einführung in die Organisation der Produktion, Springer, Berlin • Westkämper, Product Life Cycle. Grundlagen und Strategien, Springer, Berlin • Saaksvuori/Immonen, Life Cycle Management, Springer, 2008 • Niemann et al, Design of sustainable product life cycles, Springer, 2009 • Niemann, Die Service Manufaktur, Shaker, 2016 • ITIL Lifecycle suit, 2011 |

Specialisation – choose 1

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| Course |
| Specialisation: Production and Innovation |
| Product and Change Management |
| Production Optimisation Methods |
| Operations Management |
| Specialisation: Energy and Environmental Technology |
| Heating and Cooling – Renewable Energies, Combustion, Heat and Mass Transfer |
| Electrical Power – Conversion, Storage, Distribution |
| Environment – Noise Protection, Measurement Technology Air |
| Specialisation: Environmental and Process Technology |
| Computer-Aided Process and Process Plant Design |
| Energy and Environmental Process Optimisation |
| Environment – Noise Protection, Measurement Technology Air |

Specialisation: Production and Innovation

| Product and Change Management | | | | | | |
|---------------------------------------|--|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 27001 | 180 h | 60 h | 120 h | Sem. 1/2 | WS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| a) Lecture 2 SWS b) Exercise 2 SWS | | 6 ECTS | Master IWI | | | |
| 1 | Learning outcomes / competences | | | | | |
| | <p>The students are able to</p> <ul style="list-style-type: none"> • assess the importance of the functions and tasks of product management, relative to other managerial subsystems and business management, • explain the main instruments of product and engineering change management, • identify the opportunities and risks of launching a new product and indicate possible courses of action for risk management and limitation of liability, • apply the concept on practical cases in mechanical engineering. | | | | | |
| 2 | Contents | | | | | |
| | <ul style="list-style-type: none"> • Product management as a corporate structuring tool for planning, organisation, implementation and controlling of product innovation • Concept, success factors and specifics of a new product • Strategic and operative R&D controlling • Intellectual property rights, patent management, utility patents, design patents, brands, protection against product piracy • Brand theory, strategies for the success of a brand, branding, trademark protection • Product assortment analysis, product assortment planning, objectives of specific product assortment decisions • Contribution margin (single-stage/multi-stage), product-specific profit and loss statement, life cycle costing • Quality policies, process-based quality standards (ISO 9001 and following) vs product-based certification • Product validation, product approval, importance of testing, liability risks (bases of claims, liability of the different organs of a corporation), rights in case of a complaint or reclamation • Quality assurance agreements (QAA), supplier audits • Key figure systems, balanced scorecard • Changes due to innovation vs changes due to mistakes • Avoiding and advancing changes, understanding the impact and planning the changes, efficient engineering change management | | | | | |
| 3 | Forms of teaching | | | | | |
| | <ul style="list-style-type: none"> • Lecture using projector and overhead slides (a) • Seminar-like instruction, group work and exercises (b) | | | | | |
| 4 | Recommended prerequisites | | | | | |
| | <ul style="list-style-type: none"> • Bachelor's degree in a related subject | | | | | |

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| 5 | <p>Types of examination</p> <ul style="list-style-type: none"> • Written project work (subjects will be announced during the semester) (= 50 %) <p>AND</p> <ul style="list-style-type: none"> • oral examination (duration: 15–20 min.) (= 50 %) <p>OR</p> <ul style="list-style-type: none"> • written examination (duration: 90 min.), no aids <p>The applicable type of examination will be announced at the beginning of the semester in the first session.</p> |
| 6 | <p>Requirements for award of credits</p> <ul style="list-style-type: none"> • Passed module examination |
| 7 | <p>Person responsible for the module</p> <ul style="list-style-type: none"> • Prof. Dr. Dieter Riedel |
| 8 | <p>Language of instruction</p> <ul style="list-style-type: none"> • German |
| 9 | <p>Further information / references</p> <ul style="list-style-type: none"> • Lecture slides (as PDF) <p>Recommended literature (latest edition):</p> <ul style="list-style-type: none"> • Pepels, Produktmanagement Produktinnovation – Markenpolitik – Programmplanung – Prozessorganisation, Munich, Oldenbourg • Hofbauer/Sangl, Professionelles Produktmanagement, Erlangen, Publicis Publishing • Matys, Praxishandbuch Produktmanagement, Frankfurt/Main, Campus • Kairies, Professionelles Produktmanagement für die Investitionsgüterindustrie, Renningen expert • Abele et al, Wirksamer Schutz gegen Produktpiraterie im Unternehmen, Frankfurt am Main, VDMA • Muschalle/Schutze, Die Haftung des Geschäftsführers, Stuttgart, Schäffer-Poeschel • Lindemann/Reichwald, Integriertes Änderungsmanagement, Berlin Heidelberg, Springer • Riedel, Standortverteiltes Änderungsmanagement, Wiesbaden, DUV/Gabler |

| Production Optimisation Methods | | | | | | |
|--|--|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 27011 | 180 h | 60 h | 120 h | Sem. 1 | SS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| a) Lecture 2 SWS b) Exercise 1 SWS c) Practical Training 1 SWS | | 6 ECTS | Master IWI | | | |
| 1 | Learning outcomes / competences | | | | | |
| | The students are able to | | | | | |
| | <ul style="list-style-type: none"> explain and assess the advantages of standardised global production systems (holistic production systems), assess selected – globally used – production optimisation methods regarding their applicability and choose the most suitable one in a given situation, apply and implement selected methods independently in operations in an industrial environment, provide methodical trainings for their peers and have thus acquired training and moderation competences, assess current production strategies (opportunities and risks, forms of organisation), suggest and choose the most suitable one for production performance planning. | | | | | |
| 2 | Contents | | | | | |
| | <ul style="list-style-type: none"> Setup and contents of holistic production systems Approaches in lean management in production or lean production Technical and economic key figures in corporate production Production strategies Strategic and operative implementation of selected methods in production (e.g. SMED, value stream mapping, digital logistics planning, OEE analyses, lean office, 5S, design thinking, Six Sigma) Preparing and conducting practical training seminars Developing and conducting training sessions on selected methods Recording and evaluating key figures relevant for production | | | | | |
| 3 | Forms of teaching | | | | | |
| | <ul style="list-style-type: none"> Problem-based form of study in groups | | | | | |
| 4 | Recommended prerequisites | | | | | |
| | <ul style="list-style-type: none"> Bachelor's Degree Fundamentals of production planning and organisation | | | | | |
| 5 | Types of examination | | | | | |
| | <ul style="list-style-type: none"> Successful project work in groups Presentation of results. Scope and extend will be announced at the beginning of the semester. | | | | | |
| 6 | Requirements for award of credits | | | | | |
| | <ul style="list-style-type: none"> Passed module examination | | | | | |
| 7 | Person responsible for the module | | | | | |
| | <ul style="list-style-type: none"> Prof. Dr.-Ing. Jörg Niemann | | | | | |

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| 8 | Language of instruction <ul style="list-style-type: none">• German |
| 9 | Further information / references <ul style="list-style-type: none">• Lecture slides (as PDF) on lecturer's website• Gütl, Methoden zur Optimierung der Produktion, Hamburg, Bachelor und Master Publishing, 2014• Westkämper, Einführung in die Organisation der Produktion, Berlin Heidelberg, Springer, 2006• May, Schriftenreihe Operational Excellence, Hochschule Ansbach, e.g.• Koch, OEE für das Produktionsteam. Das vollständige OEE-Benutzerhandbuch – oder wie Sie die verborgene Maschine entdecken• Teeuwen/Schaller, 5S. Die Erfolgsmethode zur Arbeitsplatzorganisation |

| Operations Management | | | | | | |
|---|---|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 27021 27022 | 180 h | 60 h | 120 h | Sem. 1 | WS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| a) Seminar 2 SWS b) Practical Training 2 SWS | | 6 ECTS | Master IWI | | | |
| 1 | <p>Learning outcomes / competences</p> <p>The students have gained fundamental working knowledge of the operations side of a business. They have learned that operations management is a blend of topics, e.g. accounting, industrial engineering, management, management science and statistics, including the use of state-of-the-art tools such as enterprise resource planning (ERP) systems.</p> <p>The students are able to apply fundamental terms and methods to manage production and service processes.</p> <p>They are able to identify, quantify and optimise production planning and operation scheduling systems with emphasis on ERP.</p> | | | | | |
| 2 | <p>Contents</p> <p>Products and services are omnipresent every day, e.g. during grocery or clothes shopping, phone calls, in restaurants or when travelling by plane. Customers expect the products and services to</p> <ul style="list-style-type: none"> • match their needs, • be offered at a reasonable price and • be applicable according to their time preference. <p>A company can only guarantee a customer-orientated supply by planning and steering production and service processes adequately. The course Operations Management teaches fundamental terms and methods for managing production and service processes. It places great emphasis on analytical models supporting identification, quantification and optimisation of modes of action. The course also focuses on:</p> <ul style="list-style-type: none"> • demand forecasting, • location planning, • process design, • inventory management, • production planning and operation scheduling with emphasis on ERP, • supply chain management. <p>The exclusive language of instruction is English.</p> | | | | | |
| 3 | <p>Forms of teaching</p> <ul style="list-style-type: none"> • Seminar-like lecture (a) • Practical exercises (b) | | | | | |
| 4 | <p>Recommended prerequisites</p> <ul style="list-style-type: none"> • Fundamentals of business administration, cost and activity accounting • Fundamentals of an ERP system | | | | | |

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| 5 | <p>Types of examination</p> <ul style="list-style-type: none"> a) Written examination (duration: 120 min.) (= 50 %) b) Practical work on exercises with written assignment and/or presentation (= 50 %) The applicable type of examination will be announced at the beginning of the semester. |
| 6 | <p>Requirements for award of credits</p> <ul style="list-style-type: none"> • Passed examination • Passed practical work |
| 7 | <p>Person responsible for this module</p> <ul style="list-style-type: none"> • Prof. Dr. Carsten Deckert |
| 8 | <p>Language of instruction</p> <ul style="list-style-type: none"> • English |
| 9 | <p>Further information / references</p> <ul style="list-style-type: none"> • Reading lists and assignments (as PDF) on Moodle • Lecture Script <p>Recommended literature</p> <ul style="list-style-type: none"> • Chopra/Meindl, Supply Chain Management. Strategy, Planning, and Operation, 5th edn, Harlow, Pearson, 2013 • Heizer/Render, Operations Management, 10th edn, Pearson, 2011 • Simchi-Levi/Kaminsky/Simchi-Levi, Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies, 3rd edn, New York, McGraw-Hill, 2007 • Slack/Chambers/Johnston, Operations Management, 6th edn, Pearson, 2010 • Stevenson, Operations Management, 12th edn, McGraw Hill Higher Education, 2014 |

Specialisation: Energy and Environmental Technology

| Heating and Cooling – Renewable Energies, Combustion, Heat and Mass Transfer | | | | | | |
|---|--|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 21001 | 180 h | 60 h | 120 h | Sem. 1 | SS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| a) Lecture 2 SWS b) Exercise 2 SWS | | 6 ECTS | Master SET, IW1 | | | |
| 1 | Learning outcomes / competences | | | | | |
| | <p>The students are able to</p> <ul style="list-style-type: none"> describe energy-efficient device and system solutions for technical plants producing heating and cooling from renewable energies and assess the properties and specifics of such solutions, assess the structure and hydraulics of plants, i.e. identify typical weak points in planning and implementation and suggest energy-efficient alternatives, analyse and assess practical operations using measurement data and distinguish between properties relevant for practice and results from measurements in the laboratory, apply their knowledge to specific applications abroad, especially in emerging and developing countries. <p>Furthermore the attendees can analyse</p> <ul style="list-style-type: none"> engineering problems in heat and mass transfer involving two-phase flows with phase change and the combustion of liquid and solid fuels and have knowledge on the firing systems on such fuels. | | | | | |
| 2 | Contents | | | | | |
| | <ul style="list-style-type: none"> Heating and cooling using renewable energies and efficiency technologies <ul style="list-style-type: none"> Solar technology: larger solar systems for apartment buildings, building heating and process heating, (thermal and electric) solar cooling (reversible) heat pumps and refrigerating machines: cycles, geothermics, passive cooling Biomass: boiler, cogeneration Heat and cold storage: technologies, hydraulic integration Heat and cold distribution, heat and cold transfer Energy-efficient overall concepts for different fields of application (best practice examples) Engineering relevance of two-phase flows, classification of two-phase flows, phase change, condensation and evaporation Heat and mass transfer in two-phase or multi-component flows Combustion of liquid fuels, combustion of solid fuels | | | | | |
| 3 | Forms of teaching | | | | | |
| | <ul style="list-style-type: none"> Lecture (a) Discussion and independent elaboration (b) Seminar-like instruction, presentations (c) | | | | | |
| 4 | Recommended prerequisites | | | | | |
| | <ul style="list-style-type: none"> Prerequisites according to the relevant examination regulations; bachelor's degree in mechanical engineering (or in a relevant discipline) Relevant knowledge from the fields of renewable energies and efficiency technologies on a bachelor's programme level Thermodynamics. Heat Transfer. Technical Combustion. Fluid Dynamics. | | | | | |

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| 5 | <p>Types of examination</p> <ul style="list-style-type: none"> Written examination (multiple choice) (duration: 90 min.) or oral examination (duration: 30 min.) The applicable type of examination will be announced at the beginning of the semester. |
| 6 | <p>Requirements for award of credits</p> <ul style="list-style-type: none"> Passed module examination / passed examination |
| 7 | <p>Person responsible for the module</p> <p>Prof. Dr.-Ing. Mario Adam, Prof. Dr.-Ing. Ali Cemal Benim</p> |
| 8 | <p>Language of instruction</p> <p>German and English</p> |
| 9 | <p>Further information / references</p> <ul style="list-style-type: none"> Lecture slides (as PDF) on Moodle <p>Recommended literature (latest edition):</p> <ul style="list-style-type: none"> Quasching, Regenerative Energiesysteme, Hanser Wesselak/Schabbachm, Regenerative Energietechnik, Springer Peuser et al, Solare Trinkwassererwärmung mit Großanlagen – praktische Erfahrungen, Bine Fisch et al, Solarstadt – Konzepte, Technologien, Projekte, Kohlhammer Bollin et al, Solare Wärme für große Gebäude und Wohnsiedlungen, Fraunhofer IRB Ochsner, Wärmepumpen in der Heizungstechnik: Praxishandbuch für Installateure und Planer, C.F. Müller Reichert (ed), Wärmepumpen – Stand der Technik, C.F. Müller Bockelmann et al, Erdwärme für Bürogebäude nutzen, Fraunhofer IRB Urbanek, Kältespeicher, Oldenbourg Schramek (ed), Taschenbuch für Heizung- und Klimatechnik, Oldenbourg Baehr/Stephan, Wärme- und Stoffübertragung, Springer, 2008 Incropera/DeWitt/Bergman/Lavine, Fundamentals of Heat and Mass Transfer, Wiley, 2011 Dolezal, Dampferzeugung: Verbrennung, Feuerung, Dampferzeuger, Springer, 1985 |

| Electrical Power – Conversion, Storage, Distribution | | | | | | |
|---|---|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 21011 | 180 h | 60 h | 120 h | Sem. 2 | WS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| a) Lecture 2 SWS b) Exercise 2 SWS | | 6 ECTS | Master SET, IWI | | | |
| 1 | Learning outcomes / competences | | | | | |
| | <p>The students are able to</p> <ul style="list-style-type: none"> understand and assess technical and economic interdependencies between energy carriers, energy conversion systems, energy storage systems and energy distribution systems, solve complex tasks to determine balances and factors improving performance and efficiency as well as check plausibility, dimension processes for thermal power plants and their components, discuss deviations from common results. | | | | | |
| 2 | Contents | | | | | |
| | <ul style="list-style-type: none"> Centralised and decentralised power supply National supply structures Distribution systems and grids Storage technologies, grid connection and development potentials Layout of power plants Designing power plant components (steam generators, turbines, ...) Dimensioning power plants according to the demand Grid stability | | | | | |
| 3 | Forms of teaching | | | | | |
| | <ul style="list-style-type: none"> Lecture (a) Seminar-like instruction and exercises (b) | | | | | |
| 4 | Recommended prerequisites | | | | | |
| | <ul style="list-style-type: none"> In-depth knowledge of the fundamentals of thermodynamics, electrical power engineering and power plant engineering | | | | | |
| 5 | Types of examination | | | | | |
| | <ul style="list-style-type: none"> Written examination (duration: 120 min.) or oral examination (duration: 30 min.) Partial examination in the form of a presentation or written assignment possible The applicable type, scope and extend of examination will be announced at the beginning of the semester. | | | | | |
| 6 | Requirements for award of credits | | | | | |
| | <ul style="list-style-type: none"> Passed module examination | | | | | |
| 7 | Person responsible for the module | | | | | |
| | <ul style="list-style-type: none"> Prof. Dr.-Ing. Franziska Schaubé | | | | | |
| 8 | Language of instruction | | | | | |
| | <ul style="list-style-type: none"> German and English | | | | | |

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| 9 | <p>Further information / references</p> <ul style="list-style-type: none">• All course documentation (lecture slides, exercises, mock examinations) on Moodle <p>Recommended literature (latest edition):</p> <ul style="list-style-type: none">• Kuegeler/Phlippen, Energietechnik, Springer Vieweg (standard reference) |
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| Environment – Noise Protection, Measurement Technology Air | | | | | | |
|---|--|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 21021 21022 | 180 h | 60 h | 120 h | Sem. 1/2 | WS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| a) Lecture 2 SWS b) Exercise 2 SWS | | 6 ECTS | Master SET, IWI | | | |
| 1 | Learning outcomes / competences | | | | | |
| | <p>The students</p> <ul style="list-style-type: none"> • have in-depth knowledge of air pollutant and noise measurement by official authorities, • have in-depth knowledge of measurement systems for air pollutants and noise used in research, • have learned how to familiarise with specific methods to measure air pollutants and solve measurement tasks independently, • have learned how to analyse research assignments in environmental metrology and solve them using state-of-the-art measurement technology, • know the physical basics and practical limitations of immission and simulation models for air pollutants and noise, • are able to assess measures for noise control. | | | | | |
| 2 | Contents | | | | | |
| | <ul style="list-style-type: none"> • Measurement methods used in practice in accordance with legal provisions for measuring air pollutants • Innovative measurement methods used and further developed in the environmental metrology laboratory at the Faculty of Mechanical and Process Engineering • Measurement and assessment of noise over time and frequencies • Measurement of meteorological parameters in addition to and for the assessment of air pollutant and noise immission • Advanced particulate measurement • Immission and simulation models • Legal basis, norms and regulations • Current research work at the environmental metrology laboratory at the faculty | | | | | |
| 3 | Forms of teaching | | | | | |
| | <ul style="list-style-type: none"> • Lecture, seminar-like instruction, exercises in project groups | | | | | |
| 4 | Recommended prerequisites | | | | | |
| | <ul style="list-style-type: none"> • Bachelor's degree | | | | | |
| 5 | Types of examination | | | | | |
| | <ul style="list-style-type: none"> • Partial examination 1: written examination (duration: 60 min.) • Partial examination 2: oral examination (duration: 30 min.) | | | | | |
| 6 | Requirements for award of credits | | | | | |
| | <ul style="list-style-type: none"> • Passed module examination | | | | | |

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| 7 | Person responsible for the module <ul style="list-style-type: none"> • Prof. Dr. Konradin Weber, Prof. Dr. Frank Kameier |
| 8 | Language of instruction <ul style="list-style-type: none"> • German or English according to agreement |
| 9 | Further information / references <ul style="list-style-type: none"> • Material and publications of the environmental metrology laboratory at the faculty • Werner/Klein/Weber, Laser in der Umweltmesstechnik, Springer • Schrimmer/Kuttler/Löbel/Weber, Lufthgiene und Klima, VDI • Baumbach, Luftreinhaltung, Springer • Maute, Technische Akustik und Lärmschutz, Carl Hanser • Sinambari/Sentpali, Ingenieurakustik: Physikalische Grundlagen und Anwendungsbeispiele, Springer Fachmedien, Wiesbaden |

Specialisation: Environmental and Process Technology

| Computer-Aided Process and Process Plant Design | | | | | | |
|---|---|--------------------------|--|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 21101 | 180 h | 60 h | 120 h | Sem. 1 | SS | 1 sem. |
| Courses a) Lecture 2 SWS b) Exercise 2 SWS | | Credits 6 ECTS | Allocation to study programmes Master SET, IWI | | | |
| 1 | Learning outcomes / competences The students <ul style="list-style-type: none"> • have developed a fundamental understanding of the potential and limitations of process simulation models and programs, • can split a given process-related task into modules and develop a suitable production line, • are able to determine physical properties and thermodynamic substance data in a suitable manner in a given substance system, • can simulate selected unit operations (e.g. rectification, chemical reactor), • have developed a fundamental understanding of the potential and limitations of integrated tools to design process plants, • can transfer selected unit operations into an intelligent 3D model using a planning tool. | | | | | |
| 2 | Contents <ul style="list-style-type: none"> • Introduction to the simulation of industrial process plants • Introduction to a simulation software • Unit operations • Process flow diagram • Substance data calculation using thermodynamic models • Modelling using selected examples • Interconnection of single models • Introduction to process plant design using integrated planning tools • Data transmission and further processing in tool modules • Virtual reality – application in process plant design | | | | | |
| 3 | Forms of teaching <ul style="list-style-type: none"> • Seminar-like instruction • Designing and conducting simulations on the computer independently • Operating a virtual reality application on the computer independently | | | | | |
| 4 | Recommended prerequisites <ul style="list-style-type: none"> • Bachelor's degree in process engineering, particularly thermal process engineering, chemical process engineering, process plant design | | | | | |
| 5 | Types of examination <ul style="list-style-type: none"> • Oral examination (duration: 30 min.) or written examination (duration: 120 min.) on the contents mentioned above The applicable type of examination will be announced at the beginning of the semester. | | | | | |

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| 6 | <p>Requirements for award of credits</p> <ul style="list-style-type: none"> • Passed module examination |
| 7 | <p>Person responsible for the module</p> <ul style="list-style-type: none"> • Prof. Dr.-Ing. Walter Müller, Prof. Dr.-Ing. Martin Nachtrodt |
| 8 | <p>Language of instruction</p> <ul style="list-style-type: none"> • German |
| 9 | <p>Further information / references</p> <ul style="list-style-type: none"> • Documents relevant for the assignment available on Moodle <p>Recommended literature:</p> <ul style="list-style-type: none"> • Schuler, Prozesssimulation, VCH Weinheim • Sattler/Kasper, Verfahrenstechnische Anlagen, VCH Weinheim • Dörner, Virtual und Augmented Reality (VR/AR), Springer |

| Energy and Environmental Process Optimisation | | | | | | |
|--|--|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 21111 | 180 h | 60 h | 120 h | Sem. 2 | WS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| a) Lecture 2 SWS b) Exercise 2 SWS | | 6 ECTS | Master SET | | | |
| 1 | Learning outcomes / competences | | | | | |
| | <p>The students are able to</p> <ul style="list-style-type: none"> • calculate the energetic optimisation of evaporation processes by thermocompression, • calculate the efficiency of the use of waste heat using the ORC method, • calculate the minimal amount of heat to feed into or discharge from a process plant using the PINCH analysis method, • design process plants according to the optimal heat exchange, • apply energy management systems (EMAS) to industrial processes, • calculate CO₂ balances. | | | | | |
| 2 | Contents | | | | | |
| | <ul style="list-style-type: none"> • Calculation of mass and energy balances of industrial processes • Conducting PINCH analyses on simple processes • Application of energy management systems • Assessment of evaporation systems • Heat recovery systems • ORC systems • Heat storage systems • Emissions from chemical unit operations • CO₂ balancing | | | | | |
| 3 | Forms of teaching | | | | | |
| | <ul style="list-style-type: none"> • Experimental lecture (a) • Seminar-like instruction and exercises (b) | | | | | |
| 4 | Recommended prerequisites | | | | | |
| | <ul style="list-style-type: none"> • Thermodynamics | | | | | |
| 5 | Types of examination | | | | | |
| | <ul style="list-style-type: none"> • Written examination (duration: 120 min.) Scope and extend will be announced at the beginning of the semester. | | | | | |
| 6 | Requirements for award of credits | | | | | |
| | <ul style="list-style-type: none"> • Passed module examination | | | | | |
| 7 | Person responsible for the module | | | | | |
| | <ul style="list-style-type: none"> • Prof. Dr. Karl-Erich Köppke (a) and (b) | | | | | |
| 8 | Language of instruction | | | | | |
| | <ul style="list-style-type: none"> • German | | | | | |

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| 9 | Further information / references <ul style="list-style-type: none">• Lecture presentations• BREF Energy Efficiency, European Commission |
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| Environment – Noise Protection, Measurement Technology Air | | | | | | |
|---|--|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 21021 21022 | 180 h | 60 h | 120 h | Sem. 1/2 | WS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| a) Lecture 2 SWS b) Exercise 2 SWS | | 6 ECTS | Master SET, IWI | | | |
| 1 | Learning outcomes / competences | | | | | |
| | <p>The students</p> <ul style="list-style-type: none"> • have in-depth knowledge of air pollutant and noise measurement by official authorities, • have in-depth knowledge of measurement systems for air pollutants and noise used in research, • have learned how to familiarise with specific methods to measure air pollutants and solve measurement tasks independently, • have learned how to analyse research assignments in environmental metrology and solve them using state-of-the-art measurement technology, • know the physical basics and practical limitations of immission and simulation models for air pollutants and noise, • are able to assess measures for noise control. | | | | | |
| 2 | Contents | | | | | |
| | <ul style="list-style-type: none"> • Measurement methods used in practice in accordance with legal provisions for measuring air pollutants • Innovative measurement methods used and further developed in the environmental metrology laboratory at the Faculty of Mechanical and Process Engineering • Measurement and assessment of noise over time and frequencies • Measurement of meteorological parameters in addition to and for the assessment of air pollutant and noise immission • Advanced particulate measurement • Immission and simulation models • Legal basis, norms and regulations • Current research work at the environmental metrology laboratory at the faculty | | | | | |
| 3 | Forms of teaching | | | | | |
| | <ul style="list-style-type: none"> • Lecture, seminar-like instruction, exercises in project groups | | | | | |
| 4 | Recommended prerequisites | | | | | |
| | <ul style="list-style-type: none"> • Bachelor's degree | | | | | |
| 5 | Types of examination | | | | | |
| | <ul style="list-style-type: none"> • Partial examination 1: written examination (duration: 60 min.) • Partial examination 2: oral examination (duration: 30 min.) | | | | | |
| 6 | Requirements for award of credits | | | | | |
| | <ul style="list-style-type: none"> • Passed module examination | | | | | |

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| 7 | <p>Person responsible for the module</p> <ul style="list-style-type: none"> • Prof. Dr. Konradin Weber, Prof. Dr. Frank Kameier |
| 8 | <p>Language of instruction</p> <ul style="list-style-type: none"> • German or English according to agreement |
| 9 | <p>Further information / references</p> <ul style="list-style-type: none"> • Material and publications of the environmental metrology laboratory at the faculty • Werner/Klein/Weber, Laser in der Umweltmesstechnik, Springer • Schrimmer/Kuttler/Löbel/Weber, Lufthgiene und Klima, VDI • Baumbach, Luftreinhaltung, Springer • Maute, Technische Akustik und Lärmschutz, Carl Hanser • Sinambari/Sentpali, Ingenieurakustik: Physikalische Grundlagen und Anwendungsbeispiele, Springer Fachmedien, Wiesbaden |

R&D Projects

| Course |
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| Study Project 1 incl. Project Seminar (Research & Development) |
| Engineering Conferences |
| Master's Thesis incl. Colloquium |

| Study Project incl. Project Seminar (Research & Development) | | | | | | |
|---|---|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 30011 | 180 h | 30 h | 150 h | Sem. 2 | SS/WS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| Seminar 2 SWS | | 6 ECTS | Master SET, IWI, ME | | | |
| 1 | Learning outcomes / competences | | | | | |
| | The students can apply and extend the methodical and specialised technical knowledge acquired during their studies. They have faced interdisciplinary questions, goal and deadline-oriented work in teams and, thus, strengthening of their social competences, promotion of structured, cross-disciplinary thinking, rhetoric and presentation. | | | | | |
| 2 | Contents | | | | | |
| | Either independent work on a specific, motivating task with a practical orientation from the fields of production, process, energy or environmental technology; or an interdisciplinary task in groups. Special emphasis is on <ul style="list-style-type: none"> • teamwork, • the necessity of obtaining data and documents by themselves and • the obligation of presenting the results in written and oral form. | | | | | |
| 3 | Forms of teaching | | | | | |
| | Introductory presentation and explanations, self-study, teamwork, regular supervision and discussion with the lecturer | | | | | |
| 4 | Recommended prerequisites | | | | | |
| | Subject-related bachelor's degree as well as courses relevant to the specific project from the fields of process, energy and/or environmental technology, management techniques, production | | | | | |
| 5 | Types of examination | | | | | |
| | Written documentation of the project work, presentation, oral examination | | | | | |
| 6 | Requirements for award of credits | | | | | |
| | Participation in the project and successful presentation of the results | | | | | |
| 7 | Person responsible for the module | | | | | |
| | Various | | | | | |
| 8 | Language of instruction | | | | | |
| | German and English | | | | | |
| 9 | Further information / references | | | | | |
| | Relevant literature depending on the task will be recommended. | | | | | |

| Engineering Conferences | | | | | | |
|---------------------------------|--|--------------------------|--|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 30031 | 180 h | 60 h | 120 h | Sem. 3 | WS/SS | 1 sem. |
| Courses Seminar 4 SWS | | Credits 6 ECTS | Allocation to study programmes Master SET, IWI, ME | | | |
| 1 | Learning outcome / competences The students <ul style="list-style-type: none"> • understand how scientific and engineering conferences work, • know what to do to submit their own work to an international conference, • can employ common techniques of producing a scientific paper, • can identify relevant work of other researchers in relation to their own work and extract similarities and distinctions, • can digest, condense, select and express information relevant to produce a thread of their own research work, • can assess a scientific paper in oral form or as a poster. | | | | | |
| 2 | Contents <ul style="list-style-type: none"> • Group work on selected conference papers, to train the technical understanding, recognition of structure, distillation of core content and critical review • Exercises in writing up scientific or technical work • Exercises in scientific (poster and oral) presentation, using modern technical means • Discussion and assessment of scientific presentations • Tutorials and exercises in online search for relevant information in connection with publishing research at an international conference • Mock conference with poster session and short oral presentations | | | | | |
| 3 | Forms of teaching <ul style="list-style-type: none"> • Seminar | | | | | |
| 4 | Recommended prerequisites <ul style="list-style-type: none"> • None | | | | | |
| 5 | Types of examination <ul style="list-style-type: none"> • Submission of a scientific paper, participation in review process, poster preparation and presentation | | | | | |
| 6 | Requirements for award of credits <ul style="list-style-type: none"> • Completed paper and poster, successful short oral presentation of the poster • Attendance at the following mandatory sessions: introduction and registration, conference session day, poster presentation day | | | | | |
| 7 | Person responsible for the module <ul style="list-style-type: none"> • Prof. Dr.-Ing. Thomas Zielke, Prof. Dr.-Ing. Matthias Neef | | | | | |
| 8 | Language of instruction <ul style="list-style-type: none"> • English | | | | | |

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| 9 | <p>Further information / references</p> <p>Recommended literature:</p> <ul style="list-style-type: none">• Alley, The craft of scientific presentations. Critical steps to succeed and critical errors to avoid, 2nd edn, New York, Springer, 2013• Alley, The craft of scientific writing. 4th edn, New York, Springer, 2014• Cargill/O'Connor, Writing scientific research articles. Strategy and steps, 2nd edn, Chichester, Wiley-Blackwell, 2013• Hofmann, Scientific writing and communication. Papers, proposals, and presentations, 2nd edn, New York, Oxford University Press, 2014• Holst, Scientific Paper Writing – A Survival Guide, CreateSpace Independent Publishing Platform, Bergen, 2015 <p>List of important, popular conferences within the scope of our courses:</p> <ul style="list-style-type: none">• http://icpr-eame.com• CIRP Conference on Industrial Product Service Systems• ISES Solar World Congress• Solar Heating and Cooling for Buildings and Industry conference (SHC)• ASME Turbo Expo (https://www.asme.org) <p>IEEE engineering publications: http://ieeexplore.ieee.org</p> |
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| Master's Thesis | | | | | | |
|------------------------|--|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 80001 | | | | Sem. 3 | WS/SS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| | | 21 ECTS | Master ME, IWI, SET | | | |
| 1 | Learning outcomes / competences | | | | | |
| | The students are able to work on a complex problem from their field – independently and in a professional manner, in accordance with scientific methods, within a prescribed period of time. | | | | | |
| 2 | Contents | | | | | |
| | The thesis serves to work on a scientific assignment, within a prescribed extent and period of time (16 weeks). The subject of the thesis can be of theoretical or experimental nature and can originate from any teaching or research field of the faculty. | | | | | |
| 3 | Forms of teaching | | | | | |
| | None | | | | | |
| 4 | Recommended prerequisites | | | | | |
| | The students must have successfully passed all modules, except the ones scheduled for the last semester. | | | | | |
| 5 | Types of examination | | | | | |
| 6 | Requirements for award of credits | | | | | |
| | None | | | | | |
| 7 | Person responsible for the module | | | | | |
| | Dean | | | | | |
| 8 | Lecturer | | | | | |
| | Various supervisors | | | | | |
| 9 | Further information / references | | | | | |
| | Alternatively, the students can write their theses in the research department of an industrial enterprise or in another scientific organisation of the professional field, if the thesis can be sufficiently supervised. | | | | | |

| Colloquium | | | | | | |
|----------------------|--|-------------------|---------------------------------------|-----------------|-------------------|-----------------|
| Module number | Workload | Attendance | Self-study | Semester | Offered in | Duration |
| 80011 | | | | Sem. 3 | SS/WS | 1 sem. |
| Courses | | Credits | Allocation to study programmes | | | |
| | | 3 ECTS | Master ME, IWI, SET | | | |
| 1 | Learning outcomes / competences | | | | | |
| | The candidates are able to present the results of their theses incl. technical principles, interdisciplinary correlations and non-technical references orally, justify the theses independently, defend them against objections and assess its importance for the practical application. | | | | | |
| 2 | Contents | | | | | |
| | The colloquium is an oral examination complementing the thesis. The examiners of the thesis jointly conduct and evaluate the colloquium. The colloquium can include a short presentation by the student on the thesis contents and results. | | | | | |
| 3 | Forms of teaching | | | | | |
| | None | | | | | |
| 4 | Recommended prerequisites | | | | | |
| | Examiners' confirmation that they graded the thesis with the minimum passing grade or better. | | | | | |
| 5 | Types of examination | | | | | |
| | The colloquium is an oral examination (duration: 45 min.). | | | | | |
| 6 | Requirements for award of credits | | | | | |
| | None | | | | | |
| 7 | Person responsible for the module | | | | | |
| | Dean | | | | | |
| 8 | Lecturer | | | | | |
| | Various supervisors | | | | | |
| 9 | Further information and references | | | | | |
| | None | | | | | |

Compulsory Elective Modules

| Course |
|---|
| Compulsory Elective Module 1 (to choose from list of elective modules) |
| Compulsory Elective Module 2 or Study Project 2 (to choose from list of elective modules) |