University of Applied Sciences

HOCHSCHULE EMDEN·LEER

Module Handbook
Master's Study Program
Technical Management (M.Eng.)

University of Applied Sciences Emden/Leer
Faculty Technology
Division Mechanical Engineering

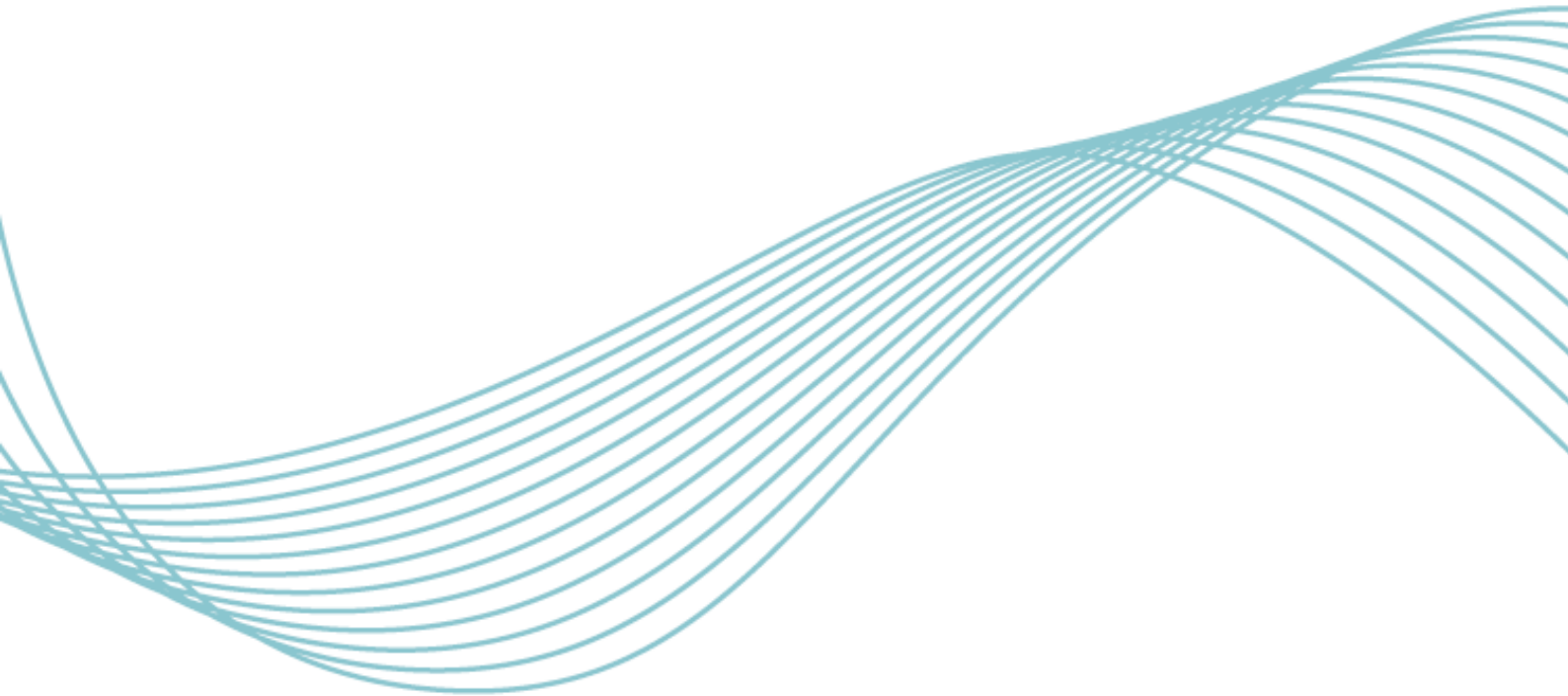
Master Degree Program

(Version: 2024)

Table of Content

Overview

Faculty	Technology
Division	Mechanical Engineering
Degree	Master of Engineering (M.Eng.)
Standard period of study	3 Semester
Total Workload	90 ECTS



Introduction

Technical Management is an accredited further education Master Program aiming at Bachelor degree students, preferably from the fields of mechanical engineering or science, who completed a minimum of one-year full time work experience. The program has a standard course duration of 3 semesters (1, 5 years) with a total workload of 90 ECTS. The awarded degree is 'Master of Engineering' (M.Eng.).

The Master's study program of Technical Management prepares students for the balancing procedure of managing both technical processes and laborer together with utilizing technical skills to provide the required environment for project achievements. Prospective students will strive for a successful career in leading positions, such as areas of project management, business administration or technological processes.

The program of Technical Management targets international students who aspire to a position in an international or multi-cultural context. In addition, increasing professional expertise enables students to enhance their career perspectives and their interpersonal development. Reliability and success with regard to technical processes and products is a major aspect during the study program.

The Master's program Technical Management pursues several objectives to enhance the professional expertise of students. Therefore, students are able to achieve additional qualifications in the following three main areas:

- Technical competences
- Professionalization; Expansion of social and personal competencies
- Business competences such as an introduction to the fundamentals of economy, law and diverse aspects of management

The introductory modules in the fields of professionalization and business are carried out on a master's level. The students of the study program have obtained a minimum work experience of one year, after completing their Bachelor studies. These studies were mainly related to topics in the engineering sphere, however, most of the students gained a first glance in management and business administration by elective subjects. Moreover, the professional work experience subsequently enhanced student's organizational and interpersonal view on entrepreneurial skills and working environment. The international profile of the students stays in close affiliation with the modules of the Master's Study Program Technical Management. The prerequisites and background of the students enable to follow the contents of the master's study and to keep up with the learning goals.

The introductory modules in the Business Administration/Management column (Business Modules) are conducted at Master's level. Students in the program have acquired at least one year of professional experience after completing their bachelor's degree. In addition to the social and professional competencies, personal competencies of the students are also important, which give the profile of the Technical Management program the master's level.

In lectures and seminars, students can directly apply and reflect on the skills and knowledge they have acquired to practical professional situations, problems and issues. Students gain practical experience in teams (Project report) as well as independently and learn to work on tasks in the fields of management, law and business administration and to solve problems under qualified guidance. The students' previous knowledge of the professional environment and the additional insights into economic, administrative, legal and social contexts of the professional field gained as a result can be incorporated into their studies and promote their personal and professional development.

The international profile of the students is closely related to the modules of the Master's program in Technical Management. The students' previous knowledge enables them to grasp the contents of the master's program and thus to follow the learning objectives.

Module structure Technical Management

Modules Master Technical Management			
Master Thesis & Colloquium	28 ECTS	30 ECTS	3. Semester
Introduction to Scientific Working	2 ECTS		

Technical Modules		Professionalization		Business Modules			
Computer Sciences* 5 ECTS	Technical Module** 5 ECTS	Introduction to Data Sciences* 5 ECTS	Professionalization Module** 5 ECTS	Business Management* 5 ECTS	Business Module** 5 ECTS	30 ECTS	2./1. Semester
Sustainability in Engineering* 5 ECTS	Technical Module** 5 ECTS	Communication& Culture* 5 ECTS	Professionalization Module** 5 ECTS	Marketing* 5 ECTS	Business Module** 5 ECTS	30 ECTS	1. / 2. Semester

Legend: * Mandatory module ****Compulsory elective module**

Technical Modules	Professionalization	Business Modules
• Computer Sciences • Sustainability in Engineering • Energy Sytems Engineering • Digitalization and Automation • Production Systems • Simulation of Production Systems • Project T • Current Topic T	• Introduction to Data Sciences • Communication & Culture • Sustainable Innovation Management • Advanced Project Management • Leadership & Negotiation • Quality Management • ERP- Systems • Project P • Current Topic P	• Business Management • Marketing • Controlling • International Commercial Law • Strategic Management • Project B • Current Topic B

General Definitions

Every module of Technical Management follows the principles below:

- English is the obligatory language of all modules and courses.
- One module has a time span of one semester and a successfully completed semester is rewarded with 30 ECTS.
- Every successfully completed module rewards students with 5 ECTS.
- The program has a modular structure, comprising mandatory and elective modules. These modules enable an interdisciplinary study in the fields of key qualifications, economics and technology.
- Generally, the order of modules is arbitrary and some of the elective courses are upon necessity. For particular courses the requirements of the module handbook are applicable. Thus, students are able to attend the offered courses each semester.
- By taking elective modules, individual specialization and deepening is possible. The scope of the mandatory modules is 30 credit points (ECTS). The modules from the compulsory elective area amount to 30 credit points (ECTS). In addition, there is the Master's thesis with colloquium amounting to 28 credit points (ECTS) in addition to the compulsory lecture Introduction to Scientific Working with 2 credit points (ECTS) amounting to a total of 30 credit points (ECTS). One credit point corresponds to 30 hours of work for the student.
- Courses not being part of the general curriculum of the study program Technical Management are available upon request. A participation above 60% leads to a selection of the course as an elective module.
- The modules from the first and second semesters do not build on each other in terms of content, so that it is possible to start studying in the summer or winter semester. In the summer semester the modules of the first semester are offered, in the winter semester the modules of the second semester. Students who begin their studies in the summer semester first hear the courses from the first semester. In the following semester, they hear the courses from the second semester. For students who begin their studies in the winter semester, the order is reversed.

Abbreviations

Abbreviations and forms of examination

(DV)	creation and documentation of computer programs
(K) (#)	written exam (processing time in time hours)
(M)	oral examination
(P)	project report
(R)	presentation
(H)	term paper
(S)	student research project
(PO)	portfolio exam
(PA)	examinations of other kind
(SWS)	semester hours per week

According to the General Part of the Master Examination Regulations (Part A)

2. Mandatory Modules

2.1 Introduction to Data Sciences (Summer semester)

Lecturer in charge:	M.Sc. Axel Wings
Form:	Lectures, exercises, case studies
Type:	Mandatory module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	term paper (H)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MBIDA

Competences

Data Science is an interdisciplinary subject that brings together the fields of computer science, mathematics and the respective application area. After this course, students understand how all three areas are equally considered. Students know the essential components of data analysis, also of Big Data analysis, and their tasks. They are familiar with the basic functions of the components. Students know the general structure of the components and can illustrate and apply the basic algorithms and methods. They are not only familiar with libraries, frameworks, modules and toolkits, but can also use and implement them in a concrete way. Thus, they develop a deeper understanding of the interrelationships and learn how essential tools and algorithms of data analysis work in the core.

Content

The basics of Linear Algebra, Statistics and Probability Theory are developed and applied in Data Science. The properties of data sets are introduced so that the students also have a deeper understanding of Big Data. The students are not only able to consider ethical issues in collection and use, but also know the basics of the Basic Data Protection Regulation DSGVO). Furthermore, various algorithms from the field of Data Science are introduced with their areas of application. Models, e.g. k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering are shown. Different methods of supervised, unsupervised and reinforcement learning will be discussed. The course includes an introduction to Python 3 and its ecosystem.

Literature

- Howard Anton, Chris Rorres, Anton Kaul: Elementary Linear Algebra, Applications Version, Wiley, 2019
- Chesterton, Scott: Machine Learning: This Book Includes Machine Learning for Beginners, Artificial Intelligence and Machine Learning for Business, Networking for Beginners, Independently Published, 2019
- Grus, Joel: Data Science from Scratch: First Principles with Python, 2016, O'Reilly
- Datenschutz-Grundverordnung (DSGVO)
- Härdle, Wolfgang Karl, Lu, Henry Horng-Shing, Shen, Xiaotong: Handbook of Big Data Analytics, Springer, 2018

Course

Lecturer	**Title**	**SWS**
M.Sc. Axel Wings	Introduction to Data Sciences	4

2.2 Communication & Culture (Summer semester)

Lecturer in charge:	Prof. Maria Krüger-Basener
Form:	Lecture and Seminar in combination
Type:	Mandatory module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	oral exam (Case Studies (M 30 min))
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MBIDA

Competences

Students know theories on cultures and intercultural communication and understand the historical genesis of communication differences. The students perceive cultural differences in communication for concrete situations and can reflect, adapt and optimize their own personal behaviour.

Students are capable to cope with cultural diversity in given communication settings with focus on business related situations.

Content

- Cultural Information: Germany in Comparison to selected students 'countries of origin: Values and norms in business and in everyday life
- Basics of interpersonal communication
- Development of international communication in the course of time
- Models and theories on international communication, also within international enterprises
- Communication in international teams
- International communication systems and virtual team work

Literature

- Glover, Jerry; Friedman, Harris L. (2015): Transcultural competence. Navigating cultural differences in the global community. First Edition
- Hall, Edward T.; Hall, Mildred Reed (1990): Understanding cultural differences. Yarmouth, Me.: Intercultural Press.
- Hofstede, Geert H.; Hofstede, Gert Jan; Minkov, Michael (2010): Cultures and organizations. Software of the mind: intercultural cooperation and its importance for survival. 3rd ed. New York: McGraw-Hill.
- Jandt, Fred Edmund (2013): An introduction to intercultural communication. Identities in a global community. 7th ed. Thousand Oaks, Calif.: Sage Publications.
- Moran, Robert T.; Abramson, Neil R.; Moran, Sarah V. (2014): Managing cultural differences. 9. ed. London, New York: Routledge.
- Samovar, Larry A.; Porter, Richard E.; McDaniel, Edwin R. (Hg.) (2014): Intercultural communication. A reader. 14th edition. Wadsworth.
- St. Amant, Kirk; Kelsey, Sigrid (2012): Computer-mediated communication across cultures. International interactions in online environments. Hershey, PA: Information Science Reference.

Course

Lecturer	Title	SWS
Prof. Maria Krüger-Basener	Communication & Culture	4

2.3 Computer Sciences (Winter semester)

Lecturer in charge:	Prof. Dr. Rüdiger Götting
Form:	Seminar form lecture, exercises
Type:	Mandatory module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	preparation and documentation of a Computer Program (DV)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MBIDA

Competences

By completing this course, students are able to implement complex project using standard libraries.
Moreover, the students understand standard paradigms in creating GUIs and implementing multi-thread applications. They comprehend object oriented paradigms and make use of standard methods in object oriented software-systems. The students are able to develop an application using an ide.

Content

The course contents might be summarized by four topics:

- Advanced concepts of a higher language
- Frameworks
- design patterns
- software development using an ide

Literature

- J. T. Streib, T. Soma: Guide to Java; Springer Verlag, 2014
- Lars Vogel: Eclipse IDE: Eclipse IDE based on Eclipse 4.2 and 4.3. vogella series.; 2013
- Lecture notes

Course

Lecturer	Title	SWS
Prof. Dr. Rüdiger Götting	Computer Sciences	4

2.4 Sustainability in Engineering (Summer semester)

Lecturer in charge:	Prof. Dr. Esther Held
Form:	Seminar form lecture, exercises
Type:	Mandatory module
Contact-Time (h):	30
Self-Study-Time (h):	120
Exam:	Portfolio exam (PO)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MBIDA

Competences

Students know the most common definitions of sustainability and can classify and evaluate their own actions as engineers with regard to the various dimensions of sustainability. In addition, they can carry out, interpret and evaluate simplified life cycle analyses for products. The engineers will be able in future to implement sustainable development using a general method but with specific tools.

Content

Sustainability concepts and strategies, evaluation of sustainability measures, Sustainable Development Goals, selected legislation in the area of sustainability and climate protection, circular economy, EcoAudit, life cycle analyses, sustainability indicators

Literature

- M.F. Ashby, Materials and Sustainable Development, 2. Edition, Butterworth-Heinemann, 2023
- Vorlesungsunterlagen

Course

Lecturer	Title	SWS
Prof. Dr. Esther Held	Sustainability in Engineering	2

2.5 Marketing (Summer semester)

Lecturer in charge:	n.n.
Form:	Lecture, exercise class
Type:	Mandatory module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	written exam (K1)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MBIDA

Competences

The students have a critical understanding of the most important theories, principles and methods of modern marketing and are able to identify, assess and solve issues with relevance to Marketing in unknown and complex contexts. To this end, they know how to use basic marketing tools such as the Ansoff matrix or the BCG product portfolio model. The underlying knowledge reflects the state-of-the-art in literature and research, and delves into selected fields of expertise. The students are able to critically discuss Marketing issues and to expand their knowledge base independently.

Content

The course is designed to be taught jointly in the Technical Management and Business Intelligence and Data Analytics programs, whose students usually have a technical and scientific bachelor's degree. For this reason, in addition to the teaching of general concepts, there is a consistent focus on business customer and industrial goods markets. The course will be held in English.

At the beginning, the role of marketing within a company is clarified as well as the importance of focusing all company activities on customers. Subsequently, purchasing behavior in the B2B (Business-to-Business) sector is explicitly considered. Principles and methods of market research are also discussed, with particular reference to modern methods of data collection and analysis. The basics of strategic marketing planning are conveyed as the guiding principles of the company's activities. This leads to a detailed examination of the elements of the marketing mix", i. e. the product, price, distribution and communication policy, each with selected special features for dealing with industrial markets.

Product policy is based on the concept of the product life cycle and also deals with innovation and product modification processes as well as the management of brands and product ranges. Pricing policy focuses on cost-, demand-, and competition-oriented pricing methods as well as price management over time. In communication policy, the entire set of classical and modern communication instruments is considered, while in distribution policy all alternatives of direct and indirect distribution channels are dealt with. The concept of the customer journey integrates both.

All contents are being illustrated by using up-to-date examples from both consumer and industrial goods markets. Exercises and short case studies allow for an application of learned contents to real life scenarios. At the end of the semester, a use-case supported introduction to a CRM system takes place in order to let the students experience structures and possibilities of such standard software in the company.

Literature

- Jobber, David: Principles and Practice of Marketing. McGrawHill, latest edition.

Course

Lecturer	Title	SWS
n.n.	Marketing	4

2.6 Business Management (Winter semester)

Lecturer in charge:	Prof. Dr. Olaf Passenheim
Form:	Lecture with case study and plenum presentation, block seminar business simulation game
Type:	Mandatory module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	written exam (K2)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MBIDA

Competences

The students know the basic steps and preparations required for the operational handling of domestic and foreign markets. The participants know the different forms of organization of companies and their advantages and disadvantages. In addition to analyzing the competitive environment, students also learn how to conduct internal analyses (personnel, supply chain ...). A special focus to deepen the knowledge of financial analyses (cost/performance accounting, balance sheets) for decision making. In the final section of the lecture, students apply the various sub-areas holistically in a business management game.
Graduates of the module will gain experience on teamwork and social skills through group work, which participants will be able to apply when taking on team responsibilities in the context of their professional activities.

Content

Based on the development of various management theories, it is shown how the tasks of management have changed in recent years. This forms the basic understanding for the transition to the different structure and process organizations within companies. Using a variety of practical examples, it is shown how and why companies regularly change their corporate organization. External and internal reasons have a significant influence on this change. External reasons can be, for example, changing legislation, new competitors or social demands for sustainability or responsibility. Strategy changes, new products or markets, sales development, changes in stakeholder requirements, financial decisions, etc. are the factors for an internal reorganization.

Business games are used to simulate the holistic tasks of corporate management. Business games are models of companies or their sub-areas. In business games, the participants take on the role of the management of a company. They have to make decisions as a team under time pressure and experience typical conflicts of targets first hand.

Literature

- Deresky, Helen: International Management: Managing Across Borders and Cultures, Text and Cases, Global Edition. Harlow: Pearson Education Limited, 2016.
- Skonieczny, Mariusz: The Basics of Understanding Financial Statements: Learn how to Read Financial Statements by Understanding the Balance Sheet, the Income Statement, and the Cash Flow Statement: Investment Publishing, 2012.
- Tracy, Axel: Balance Sheet Basics: From Confusion to Comfort: Createspace Independent Pub, 2013.

Course

Lecturer	Title	SWS
Prof. Dr. Olaf Passenheim	Business Management	4

2.7 Master Thesis and Colloquium

Lecturer in charge:	Prof. Dr. Elmar Wings
Form:	To a large extent independent development of a problem and supervision.
Type:	Mandatory module
Contact-Time (h):	90
Self-Study-Time (h):	810
Exam:	scientific report, Master thesis with Colloquium (S)
ECTS:	30

Competences

The students are able to work on a given problem. They are able to explore the current scientific literature independently and draw conclusions.
In doing so, they apply their acquired knowledge and develop goal-oriented solutions within the framework of their Master's thesis. They have in-depth knowledge in the field of project management and can apply this knowledge adequately in scientific projects.

Content

Current topics within the field of Technical Management including

- technical deepening or one of the deepening within the department of technical engineering
- Independent acquisition of a subject with the help of technical literature and other sources
- Layout of verbal presentations and written scientific papers with the potential for scientific publication.

Literature

- Guide to Writing a Seminar Paper; Gök, Robert
- Special literature concerning the topic

Course

Lecturer	Title	SWS
Prof. Dr. Kathrin Ottink	Introduction to Scientific Working	2
Lecturer of the study course	Master Thesis and Colloquium	

3. Mandatory Elective Modules

3.1 Advanced Project Management (According to demand, Winter semester)

Lecturer in charge:	Prof. Dr. Andreas Haja
Form:	lecture, group discussion, case studies
Type:	Mandatory elective module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	written exam (K2)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MMB, MBIDA

Competences

The students are able to plan and execute a technical project. They know the difference between classic and agile project management and are able to form a SCRUM team and independently allocate roles within it. The students are able to establish communication interfaces to other teams and to plan and execute a complex work process. Furthermore, they are able to present the project status and work results in a structured manner.

Content

Over the course of the semester, the students carry out an elaborate business game in the context of which an autonomous small robot is constructed in a team of approx. 6 students. The team is structured according to agile principles and the students learn how to apply the SCRUM method in practice. Furthermore, communication methods are practiced by requiring each team to cooperate with a partner team to solve a common task. In addition, skills for structuring projects, time and resource planning are taught. The lecture will conclude with a hands-on demonstration of the constructed small robots. During the lecture, the theoretical content will be taught, status reports of the teams will be discussed, and individual team coaching will be provided.

Keywords:

- Agile project management, SCRUM, time and resource planning, communicating project status, inter-team communication.

Literature

- A Guide to the Project Management Body of Knowledge (PMBOK® Guide) Sixth Edition and Agile Practice Guide

Course

Lecturer	Title	SWS
Prof. Dr. Andreas Haja	Advanced Project Management	4

3.2 Quality Management (Winter semester)

Lecturer in charge:	Prof. Dr. Monika Blattmeier
Form:	seminar form lectures presentations and papers (acquired by the students according to given conditions)
Type:	Mandatory elective module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	report (R) and oral exam (M)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MBIDA

Competences

Understanding the importance of Quality Management and estimating the potential of QM-oriented approaches. Understanding of QM philosophies and QM dominated thinking and becoming acquainted with QM methods and QM tools. Practice in team-oriented methods as well as deepening of comprehensive thinking. Furthermore, stabilization of structured, documented work approaches plus strengthening of customer-oriented work approach.

Content

- Introduction
- Development and History of QM
- QM philosophies
- ISO 9000 and extended Approaches
- QM Tools and Methods in R&D and Production
- Problem solving Tools
- Improvement Methods
- Management Tools

Literature

- Sommerhoff, B.: QM im Wandel: Personenzentriertes Innovations- und Qualitätsmanagement -München: Hanser, 2021
- Tarvin, P.: Leadership & Management of Machining - München: Hanser, 2016
- Gryna, F.M.: Juran's quality planning & analysis Boston (MA): McGraw-Hill, 2007
- Masing, W.: Handbuch des Qualitätsmanagements - 6. Auflage München: Hanser, 2014
- Linß, G.: Qualitätsmanagement für Ingenieure - München: Fachbuchverlag Leipzig in Hanser, 2011
- Pfeifer, T.: Quality management: strategies, methods, techniques - München: Hanser, 2002
- Hering, E.: Qualitätsmanagement für Ingenieure -5. Auflage- Berlin: Springer, 2003
- Juran, J.M.: Juran's Quality Handbook - 6th edition - New York (NY): McGraw-Hill, 2010
- DIN EN ISO 9000:2015 and related standards
- SA8000; SCC, OHSAS 18001
- actual developments and subjects: Internet

Course

Lecturer	Title	SWS
Prof. Dr. Monika Blattmeier	Quality Management	4

3.3 Sustainable Innovation Management (Winter semester)

Lecturer in charge:	Prof. Dr.-Eng. Armando W. Colombo
Form:	lecture
Type:	Mandatory elective module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	term paper and presentation (R)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MBIDA

Competences

Students will be able to explain the importance of innovation processes and work with international standards for innovation management. They are further able to understand or apply the typical innovation tools such as Technology Readiness Level (TRL), Hype Cycle and IP Management Systems.
Students are proficient in using creativity techniques and standardized methods and tools to generate, execute and manage innovation activities.
Students have gained experience in teamwork and presentation techniques during practical phases. The high proportion of self-learning is didactically underpinned by homework.

Content

An organization's ability to innovate is recognized as a key factor for sustained growth, economic viability, increased well-being and the development of society. In this sense, the innovation capabilities of an organization include the ability to understand and respond to changing conditions of its context, to pursue new opportunities and to leverage the knowledge and creativity of people within the organization in collaboration with external interested parties. This module is intended to transfer the background knowledge to students by establishing a coherent, consistent and common framework to: (a) understand the main terms, definitions, concepts and principles of innovation management; (b) learn how an innovation management system and other innovation management standards should be used, with focus on the ISO 56000, ISO 56002 and the Oslo Manual on Innovation; (c) facilitate communication and create awareness on how innovation activities should be planned and executed; (d) learn tools and methods to support innovation management (e.g. Hype Cycle, TRL and SRL definitions and applications, IP-Protection and Patenting Processes). In this context, the curriculum of the module provides the fundamental concepts and innovation management principles, describing why organizations should engage in innovation activities.
Innovation is one of the drivers of business success. The aim of this module is to provide practical knowledge about modern innovation techniques in the field of engineering.
This module provides knowledge about
- The phases in innovation projects
- Excellence, impact and implementation of innovation activities
- Innovation management: methods and tools
- Intellectual property management: patents and intellectual property protection

Literature

- Harvard Business Review: HBR's 10 Must Reads on Innovation; Harvard Business Review Press, 2013
- Dodgson, M. / Gann, D.: The Oxford Handbook of Innovation Management; Oxford University Press, 2014
- The Measurement of Scientific, Technological and Innovation Activities. The OSLO Manual 4th Edition. European Union, Print Catalogue number: KS-01-18-852-EN-C, ISBN 978-92-79-92581-8
- International Standard ISPO 56000, ISO 56002. Innovation Management (Fundamentals and Vocabulary). 2022.
- Günther Schuh, Christian Dölle: Sustainable Innovation - Nachhaltig Werte schaffen, Springer Verlag, 2021

Course

Lecturer	**Title**	**SWS**
Prof. Dr.-Eng. Armando W. Colombo	Sustainable Innovation Management	4

3.4 ERP- Systems (Summer semester)

Lecturer in charge:	Prof. Dr.-Ing. Agnes Pechmann
Form:	Lecture, practical exercises
Type:	Mandatory elective module
Contact Time (h):	60
Self-Study-Time (h):	90
Exam:	project report (P)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MBIDA

Competences

After attending the module, students are able to understand, follow and apply the basic functions of ERP systems. Different concepts and approaches for the technical and conceptual architecture of these systems are identified and evaluated for their practical use. Students will be able to specify business requirements for typical companies and how they are met by different systems.

Content

The following topics are provided in this module: computer sciences

- ERP-Basics
- Architecture of ERP-Systems
- Typical business processes in ERP-Systems focusing on production
- Applying an ERP-System in a company realistic environment (Serious Game ERPsim on basis of SAP S/4HANA)

Literature

- SAP S/4HANA Learning Material
- Literature recommendations will be provided on Moodle at the beginning of the semester.
- Participant's guide ERPsim

Course

Lecturer	Title	SWS
Prof. Dr.-Ing. Agnes Pechmann	ERP-Systems	4

3.5 Controlling (Winter semester)

Lecturer in charge:	Prof. Dr. Carsten Wilken
Form:	seminar form lecture, exercises
Type:	Mandatory elective module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	written exam (K2)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MBIDA

Competences

After having visited this lecture, students will be able to fulfill the main accounting-related tasks of Engineers in technical organizations, such as planning and control. Among others, they will be able to:

- Plan capital investments and evaluate investments proposals
- Submit yearly budgets for your area of responsibility and interpret reports about it
- In case of plan-to-actual deviations, analyze any reasons for this deviation
- Cost products and interpret product-costings.

In addition to this, the students will know how different costing-systems will affect key ratios of work and how that influences decision control. Thus, they will be able to use systems and values of internal accounting for decision making and decision control, and they will be able to evaluate existing procedures of companies.

Content

- Fundamentals of Accounting
- Accounting for decision making and control
- Values and reports of Accounting
- Planning of Capital Investments
- Budgeting
- Product Costing
- Cost Allocation
- Systems of Cost Accounting (Absorption Costing, Variable Costing, Standard Costing)
- Variance Analysis

Literature

- Horngren, C.; Datar, S.; Foster, G.; Rajan, M.; Ittner, C.: /Foster: Cost Accounting – A Managerial Approach
- Zimmerman, J.: Accounting for Decision Making and Control; McGraw Hill

Course

Lecturer	Title	SWS
Prof. Dr. Carsten Wilken	Controlling	4

3.6 International Commercial Law (Winter semester)

Lecturer in charge:	Dr. Bernd Bessau
Form:	lecture in seminar form
Type:	Mandatory elective module
Contact-Time (h):	36
Self-Study-Time (h):	114
Exam:	written exam (K2)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MBIDA

Competences

Students master the basics of legal thinking and discuss them using selected practical examples. They can reflect on the legal background of their own professional activities as engineers and managers as a prerequisite for successful cooperation with legal experts. They can also improve their communication skills.
Students will have an overview of general legal foundations, contract law, international contracts and insights into different legal systems. In order to support the high degree of self-learning didactically, the students have to work on a seminar paper on a field of law in the course of the course and present it in a presentation. There is a broad catalogue of topics for this purpose - e.g. insolvency law in a particular country, European insolvency law - similarly then for company law etc. This requires independent work on the chosen topic. As each student presents his or her topic, all participants will get a broad overview of International Commercial Law and there will be a series of comparisons of different legal systems.

Content

- Foundations of law (fundamental rights and freedoms, rule of law)
- Sources of law (agreement, statute, custom)
- Selected legal topics (due diligence, liability, standardization, proportionality, precaution, security, penalties)
- Hierarchy and interaction of national, European and international law
- Commercial law (EC/EU, WTO)
- Law of technology, technical installations
- Energy and sustainable development

Literature

- Case studies
- Lecture notes

Course

Lecturer	Title	SWS
Dr. Bernd Bessau	International Commercial Law	2

3.7 Negotiation & Leadership (According to demand, Summer semester)

Lecturer in charge:	n.n.
Form:	seminar is based on the assessment-center principle
Type:	Mandatory elective module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	oral exam (M)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MBIDA

Competences

The importance of leadership is recognized by the importance of effective management skills to maintain and enhance reputation. Management skills are required in addition to academic, research skills.

Students know the theoretical background of leadership and negotiation in the context of competencies. Students are able to work in a self-organized and reflexive manner and know their individual competencies. Graduates of the program know their strengths in both positive and stressful situations with a focus on management and negotiation situations and know how to develop and use them.

Content

The internationally acknowledge approach KODE® diagnostic system to systematically identify the individual competencies will be applied. KODE® is a procedural system with an international trademark (Germany, Austria, and Switzerland). In German, KODE® stands for Kompetenz-Diagnostik und -Entwicklung (The diagnosis and development of competencies). Its main emphasis is on the development of competencies. The assessment of the existing 'competencies in terms of certain requirements of everyday professional life' ('skills for ...') is a means for the purpose of developing and/or strengthening competencies. Competencies are the ability to act and react in a self-organized, creative way in the face of new, non-predictable, open situations.

Competencies are backed up by knowledge, constructed by values and norms, individualized by internalization, consolidated by experiences and realized on the basis of will.

Literature

- KODE diagnostic system
- Lecture notes

Course

Lecturer	Title	SWS
nn	Negotiation & Leadership	4

3.8 Strategic Management (Summer semester)

Lecturer in charge:	Prof. Dr. Olaf Passenheim
Form:	lecture with case study and discussion groups
Type:	Mandatory elective module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	term paper (H)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MBIDA

Competences

The importance of strategic management in a global context is brought into the students' focus. In rapidly changing markets with complex and dynamic settings, the strategy process is not only a success-oriented but also a sustainable and socially acceptable management approach. Students know the different approaches to developing a strategy. Independently and in groups, the participants can analyze strategic decisions in the context of the requirements of a global environment, identify strengths and weaknesses and make and defend their own (strategic) decisions.

Content

The course is divided into three parts: In the first part, the participants deal with issues of sustainable, responsible and competitive strategic positioning and profiling of companies and business units in a (global) market environment. They will understand various theoretical approaches and the implementation opportunities of strategic management in its international context. In the second part, students apply the learned process steps of a strategy development through case studies. Besides understanding and seeing the starting point of a strategic process, participants will analyze, discuss and evaluate different strategic options and their implementation as a management task. Additionally, students will discuss and consider the implications and influences of strategic decisions by the country and corporate culture. At the end of the semester, students will be able to develop their own small case study about a strategic issue.

Literature

- Supporting Case Studies (Harvard Business Cases)
- Porter, M.E.: What is Strategy; in: Harvard Business Review; Nov.-Dec. 1996; S. 61-78; 1996.
- Porter, M. E./ Kramer, M. R.: Creating Shared Value. How to reinvent capitalism - and unleash a wave of innovation and growth; in: Harvard Business Review, January-February 2011, S. 62-77.
- Mintzberg, H. / Ahlstrand, B. / Lampel, J.: Strategy Safari: A Guided Tour through the Wilds of Strategic Management. Free Press 2005
- Porter, M.: Competitive Strategy. Techniques for Analyzing Industries and Competitors, Simon & Schuster 2004

Course

Lecturer	**Title**	**SWS**
Prof. Dr. Olaf Passenheim	Strategic Management	4

3.9 Energy Systems Engineering (Winter Semester)

Lecturer in charge:	Prof. Dr. Christoph Jakiel
Form:	Seminar form lecture, exercises
Type:	Elective module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	Written **(**K2) exam
ECTS:	5
Prerequisite for participation:	**-**
Applicability of the module:	MBIDA

Competences

Students will be able to describe and analyze the various steps in the conversion of primary energy to electrical energy (and other final forms of energy). This includes understanding the classification of energy and the principles of energy conversion.

Further, they are able to select the appropriate conversion process or technical device (machine, power plant, etc.) depending on the source of energy available and the form of energy required. This includes knowledge of the main types of power plants and other energy conversion machines, as well as their core components.

For exemplary conversion processes, the students can also create calculation or simulation models and calculate performance and other characteristics, and on this basis analyze the processes in terms of efficiency and other technical, economic and ecological parameters and carry out basic optimizations.

Content

- Energy: terms and classification, primary forms and sources of energy.
- Principles of energy conversion, key figures and efficiency
- Cycle processes for energy conversion (basics)
- Heat engines and heat pump processes: Function, efficiency and performance figures, main components, optimization options.
- Examples of conventional and regenerative thermal power plants and heat pumps

Literature

- Michaelides, Efstathios E.: Alternative energy sources, Springer, 2012.
- Sarkar, Dipak K.: Thermal Power Plant – Design and Operation, Elsevier, 2021.
- Turns, Stephen R.: Thermodynamics – Concepts and Applications, Cambridge University Press, 2006.

Course

Lecturer	Title	SPPW
Prof. Dr. Christoph Jakiel	Energy Systems Engineering	4

Prerequisite for participation:

Applicability of the module: MTM

3.10 Digitalization and Automation (According to demand, Summer semester)

Lecturer in charge:	Prof. Dr.-Eng. Armando W. Colombo
Form:	lecture
Type:	Mandatory elective module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	oral Exam (M)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MII, MBIDA

Competences

Students will gain knowledge in the areas of applications in various manufacturing concepts, in the engineering of flexible and reconfigurable production and automation systems. Additionally, they will become acquainted with innovative digitalization and networking approaches and engineering methods for industrial eco-systems based on the Reference Architecture Model for Industry 4.0 (RAMI 4.0 – DIN SPEC 91345).
The course brings together diverse disciplines in a comprehensive manner, enabling students to develop a meaningful understanding of the complex associations and influences within a topic, thus project-based learning is an essential element.

Content

This session follows an integrated study approach; therefore, the students use and extend their knowledge in the areas:

- production-systems
- automation-systems
- information-systems in the production. The CIM Approach and related Technologies
- Digitalization and Networking of Industrial Productions-Ecosystems according to the Industry 4.0 Specifications

Literature

- A W Colombo et.al.: Industrial Cloud-Based Cyber-Physical Systems. The IMC-AESOP Approach. Springer Verlag 2014. https://link.springer.com/book/10.1007/978-3-319-05624-1
- A W Colombo et.al.: Digitalized and Harmonized Industrial Production Systems: The PERFoRM Approach. Taylor and Francis / CRC-Press 2019. https://doi.org/10.1201/9780429263316
- DIN SPEC 91345 (RAMI 4.0). Beuth Verlag 2017.

Course

Lecturer	Title	SWS
Prof. Dr.-Eng. A. W. Colombo	Digitalization and Automation	4

3.11 Production Systems (Winter semester)

Lecturer in charge:	Prof. Dr.-Ing. Thomas Schüning
Form:	seminar form lecture
Type:	Mandatory elective module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	written exam (K2)
ECTS:	5
Prerequisite for participation:	-
Applicability of the module:	MBIDA

Competences

Students acquire basic knowledge about the essential production strategies and manufacturing possibilities for the economical production of products in SMEs and industries. For defined production tasks they can use and evaluate the basic process systems and develop specific process chains. Students are able to select the production possibilities of tools / equipment and production units from an economic point of internal and external production.

Content

- Comparison of production systems for the manufacturing of technical products
- Development of process chains from planning to the finished product
- Selection of appropriate production facilities (e.g. forming, cutting, joining, heat treatment) to specific manufacturing tasks
- Learning about modern flexible manufacturing technologies (e.g. laser), production of prototypes, individual parts and regeneration of components by additive process
- Economic evaluation of the process over the entire process chain.

Literature

- Fritz, A. H., Schulze, G.: “Fertigungstechnik“, Springer Verlag
- Dubbel, H.: “Taschenbuch für den Maschinenbau“, Springer Verlag
- Eichler,J., Eichler H.J.:“Laser“ ,Springer Verlag

Course

Lecturer	Title	SWS
Prof. Dr.-Ing. Thomas Schüning	Production Systems	4

3.12 Simulation of Production Systems (According to demand, winter- summer semester)

Lecturer in charge:	Prof. Dr.-Ing. Agnes Pechmann
Form:	seminar, lecture, exercise
Type:	Mandatory elective module
Contact-Time (h):	60
Self-Study-Time (h):	90
Exam:	project report (P)
ECTS:	5
Prerequisite for participation:	ERP-Systems
Applicability of the module:	MBIDA

Competences

Students are able to capture data, energy and material flows in production systems or extract them from ERP-System, represent them in models and simulate them dynamically. Anylogic software is used for the simulation. Using concrete examples (e.g. Production Company Learning Factory Fischertechnik, Automated Classroom), students also learn to represent a (production) system with its resources, products and data and to label it according to current standards, e.g. RAMI 4.0.

Content

Identification of essential resources and flows (energy, material, data), creation of suitable models and their dynamic simulation (time-discrete / agent-based), data availability and provision for the simulation, introduction to the simulation software, simulation of an example environment.

Literature

- Bungartz, Hans-Joacheim et al.: Modellbildung und Simulation, eine anwendungsorientierte Einführung, Springer 2009, DIN SPEC 91345:2016-04
- Grigoryev, Ilya: AnyLogic 7 in Three Days: A quick Course in Simulation Modelling, 2014
- Kosturiak, Jan; Gregor, Milan: Simulation von Produktionssystemen, 1995 (Bibliothek Emden, Handapparat)

Course

Lecturer	Title	SWS
Prof. Dr.-Ing. Agnes Pechmann	Simulation of Production Systems	4

3.13 Project T, B, P (Winter-, Summer semester)

Lecturer in charge:	Degree program's coordinator
Form:	Solving of a problem independently under the guidance of a supervisor, presentation and discussion of the results, preparation of a project report
Type:	Mandatory elective module
Contact-Time (h):	30
Self-Study-Time (h):	120
Exam:	project report (P)
ECTS:	5

Competences

Students are able to independently solve a comprehensive problem in the field of technical management in a scientifically sound manner using the knowledge and techniques acquired.

Content

The topic/problem can be proposed by the examinee but has to be approved by the examiner/supervisor.

- questions from the field of technical management

Literature

- Project dependent literature

Course

Lecturer	Title	SWS
University lecturer of the study course	Project	4

3.14 Current Topic T, B, P(Winter-, Summer semester)

Lecturer in charge:	n.n.
Form:	Solving of a problem independently under the guidance of a supervisor, presentation and discussion of the results
Type:	Elective module
Contact-Time (h):	30
Self-Study-Time (h):	120
Exam:	Examination of another type (PA)
ECTS:	5

Competences

Students are able to independently solve a comprehensive problem from the field of technical management in a scientifically sound manner using the knowledge and techniques they have learned.
The students demonstrate that they are able to deal with the scientific literature on a specific issue in depth and can prepare it in a targeted and structured manner.
Students demonstrate that they have presentation and communication skills that enable them to present topics they have developed themselves in a clear and structured manner and to discuss their applicability to practice.

Content

Students work on a scientific-application-oriented problem. In lectures by the lecturers, the most important theories as well as current research results on a specific topic from the fields of technology, professionalization or business are presented. By reading scientific literature (self-study), students deepen their knowledge of theories and methods in the field and learn how to use scientific literature. At the end of the course, students will be able to establish a relationship between the research question and scientific theories and research results.

Literature

Slides, case studies, scientific literature

Course

Lecturer	Title	SWS
University lecturer of the study course	Current Topic	4