Fakultät für Maschinenbau

Module Handbook
for the Masters Program
Systems Engineering for Manufacturing

Modulhandbuch
für den Masterstudiengang
Systems Engineering for Manufacturing

zur
Studien- und Prüfungsordnung vom 01.02.2017
(Datum des Fakultätsratsbeschlusses)

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1 Einleitung

Dieses Modulhandbuch richtet sich an Studenten des Masterstudienganges "Systems Engineering for Manufacturing" vom 01.02.2017 (Datum des Fakultätsratsbeschlusses).

In diesem Masterstudiengang ist die Lehre fachübergreifend auf die Fachgebiete mit Relevanz für Produktionssysteme fokussiert. Damit werden Fähigkeiten zur standortübergreifenden Entwicklung neuer Produktionssysteme auf Basis der in ihnen zu fertigenden Produkte sowie zur Life Cycle Beherrschung von Produktionssystemen herausgebildet.
Der Studiengang adressiert die methodischen Grundlagen zur Entwicklung von Produktionssystemen nach dem Paradigma der Systems of Systems. Er vermittelt dabei zum einen die fachlichen Grundlagen zum Entwurf und zur Steuerung von Produktionssystemen und ermöglicht zum anderen die Identifikation und bewusste Nutzung der Abhängigkeiten zwischen den einzelnen Teilaspekten eines Produktionssystems. Zusätzlich werden sprachliche Kenntnisse vermittelt, die eine Anwendung des erlernten Wissens in internationalen Kontexten ermöglicht.

Das Lehrangebot im Studiengang "Systems Engineering for Manufacturing " umfasst neben anderen Umfängen den Pflicht-, den Wahlpflicht- und den freien Wahlbereich.

Der Pflichtbereich besteht aus Pflichtmodulen. Als Pflichtmodule werden alle Module bezeichnet, die nach Prüfungs- und Studienordnung für den erfolgreichen Abschluss des Studiums zwingend erforderlich sind. Kapitel 2 dieses Modulhandbuchs definiert alle Lehrveranstaltungen, die als Pflichtmodule dem Pflichtbereich des Studienganges zugehörig sind.

Der Wahlpflichtbereich besteht aus Wahlpflichtmodulen. Als Wahlpflichtmodule werden alle Module bezeichnet, die Studierende nach Maßgabe der Prüfungs- und Studienordnung aus dem Wahlpflichtbereich auszu-

1 Introduction

This module handbook is intended for the students participating in the masters program "Systems Engineering for Manufacturing" of 01.02.2017 (date of faculty decision).

This master's program provides interdisciplinary education in scientific fields relevant for engineering and use of production systems. It provides knowledge and skills related to the location crossing engineering of new production systems based on the products to be manufactured as well as to life-cycle management of production systems. The master’s program covers the methodical basis for the engineering of production systems exploiting the paradigm of systems of systems. It provides expertise for the engineering and control of production systems and enables the identification and meaningful application of dependencies between different parts and/or aspects of production systems.
In addition lingual skills are provided enabling the application of the gained knowledge within international contexts.

The curriculum of the masters program “Systems Engineering for Manufacturing” consists (among others) of compulsory, compulsory chosen, and free elective areas.

The compulsory area consists of compulsory modules. Compulsory modules are modules which are mandatory for the successful finalisation of the master’s program following Study and Examination Regulations. Section 2 of this module handbook subsumes all lectures belonging as compulsory modules to the compulsory area.

The compulsory chosen area consists of compulsory chosen modules. The compulsory chosen modules are named compulsory chosen if they are selectable by students out of the compulsory chosen lecture set.

wählen haben.
Der Wahlpflichtbereich ist in verschiedene fachspezifische Teilbereiche gegliedert. Die dabei wählbaren Fachbereiche sind die Fachbereiche:

- Mechanik
- Digitale Systeme
- Automation
- Logistik

Kapitel 3 dieses Modulhandbuchs definiert alle Lehrveranstaltungen, die als Wahlpflichtmodule dem Wahlpflichtbereich des Studienganges zugehörig sind.

Der freie Wahlbereich besteht aus freien Wahlmodulen. Als freie Wahlmodule werden alle Module bezeichnet, die Studierende nach Maßgabe der Prüfungs- und Studienordnung aus dem Lehrveranstaltungsangebot der Otto-von-Guericke-Universität Magdeburg auswählen können.

Kapitel 4 dieses Modulhandbuchs spezifiziert Anforderungen an alle Lehrveranstaltungen, die als freie Wahlmodule dem freien Wahlbereich zugeordnet werden können.

Kapitel 5 dieses Modulhandbuch spezifiziert alle Anforderungen an das Team- oder Einzelprojekt.

Kapitel 6 dieses Modulhandbuch spezifiziert alle Anforderungen an die Masterarbeit.

The compulsory chosen modules are arranged in the different scientific areas. The applicable areas are the following:

- Mechanics
- Digital systems
- Automation
- Logistics

Section 3 of this module handbook subsumes all lectures belonging as compulsory chosen modules to the compulsory chosen area.

The free elective area consists of free elective modules. As free elective modules are named all modules, students can select from the complete executed lecture set of the Otto-von-Guericke University following Study and Examination Regulations.

Section 4 of this module handbook defines requirements to all lectures possibly being accepted as free elective modules within the free elective area.

Section 5 of this module handbook defines requirements to the team or individual project.

Section 6 of this module handbook defines requirements to the master thesis.

2 Pflichtbereich

Der Pflichtbereich besteht aus den nachfolgend genannten Pflichtmodulen.
Entsprechend ist das erfolgreiche Absolvieren gemäß der Studien- und Prüfungsordnung für alle nachfolgend genannten Module für den erfolgreichen Abschluss des Studiums zwingend erforderlich.

2 Compulsory area

The compulsory area consists of the following compulsory modules.
For all modules named in the following it is necessary to successfully pass all modules following the Study and Examination Regulations for the successful finalization of the master's program.

2.1 Mechanics of Materials

Name of Modul	Mechanics of Materials
German title	Werkstoffmechanik
Teaching aims and content of the module	Teaching aims and competences to be gained: The course is devoted to the basics of material behavior modeling. The starting point is the experiment. In addition, the main features from materials science will be presented. Finally, the experimental observations and the materials science feature will be "translated" into mathematical equations.
	Contents: Elastic behavior of isotropic and anisotropic materials Inelastic behavior Damage Fracture
Type of lecture	Lectures; Seminars
Literature	J. Rösler, H. Harders, M. Bäker: Mechanical Behaviour of Engineering Materials, Teubner, Springer, 2003 D. Gross, Th. Seelig: Fracture Mechanics, Springer, Berlin, 2011 J. Lemaitre, J.-L. Chaboche: Mechanics of Solid Materials, Cambridge University, Press, Cambridge, 1994
Preconditions for attending	Engineering Mechanics, Materials Science
Usability of module	M-SEM
Prerequisites for the provision of ECTS	Attending of exercises Examination: oral
ECTS and marks	5 CP Grading according to the examination regulations
Efforts	2 hours per week lecture, 2 hours per week exercises
Frequency of provision	SS
Duration of module	1 semester
Responsible lecturer	Prof. Altenbach, FMB-IFME Additional instructors: apl. Prof. Naumenko, FMB-IFME

2.2 Systems engineering for Manufacturing Systems

Name of module	Systems engineering for Manufacturing Systems
German title	Systementwurf für Produktionssysteme
Teaching aims and content of the module	Teaching aims and competences to be gained: • Methods and processes for engineering and implementation of production systems and control systems embedded within them • Basics for mechatronical engineering of production systems • Basic knowledge and basic skills for application of object oriented methods for production system engineering • Basic knowledge related to description/modelling means for production systems and its application
	Contents: • Basic terms: Engineering problem, structures of production systems, control structures and control layers, design pattern, mechatronical unit • Engineering methodologies: VDI Guideline 2221, AutomationML reference process, VDI Guideline 2206, Munich model • Optimization of engineering processes: Modelling/Analysis of engineering processes, VDI Guideline 3695 • Object orientation and their applicability to mechatronical systems: Basic terms of object orientation, Description of mechatronical units by objects, Advantages and disadvantages of object orientation within the engineering of production systems, • Modelling means: UML, SysML • Data exchange using AutomationML
Type of lecture	Lecture and lecture accompanying exercises
Literature	See first lecture
Preconditions for attending	
Usability of module	M-SEM
Prerequisites for the provision of ECTS	Written exam Advanced provisions: Exercise credits
ECTS and marks	5 CP Marks following Study and Examination Regulations
Efforts	Presence times: 2 SWS lecture, 1 SWS exercises Self-reliant work: pre- and post-preparation of lectures, study of literature, execution of exercises
Frequency of provision	WS
Duration of module	1 Semester
Responsible lecturer	apl. Prof. Dr.-Ing. habil. Arndt Lüder, FMB-IMS

2.3 Material Handling Systems

Name of module	Material Handling Systems
German title	Materialhandlingsysteme
Teaching aims and content of the module	Teaching aims and competences to be gained: • Understanding of complex material handling systems and its parts of continuous and non-continuous conveyor units • Ability to calculte working cycles and through put rates for the arbitrary material handling systems • Ability to identify through put bottle necks of material handling systems with different arrival times. • Understanding of prediction possibilities for the availability and reliability of material handling systems
	Contents: • Introduction to the basic elements of material handling systems • Working cycle calculation for non-continuous conveyors • Through put calculation for systems with deterministic and stochastic arrival times • Availability and reliability calculation
Type of lecture	Lectures and tutorials
Literature	See first lecture
Preconditions for attending	Statistics, Physics, Engineering Mechanics
Usability of module	M-SEM
Prerequisites for the provision of ECTS	• Attendance at the lecture and tutorials • proof of achievements • Written exam
ECTS and marks	5 CP Marks following Study and Examination Regulations
Efforts	Presence times: 2 SWS lecture, 1 SWS exercises Self-reliant work: pre- and post-preparation of lectures, study of literature, execution of exercises
Frequency of provision	WS
Duration of module	1 Semester
Responsible lecturer	Prof. Katterfeld, FMB-ILM

2.4 Modelling and Simulation of Mechatronic Systems

Name of module	Modelling and Simulation of Mechatronic Systems
German title	Modellierung und Simulation Mechatronischer Systeme
Teaching aims and content of the module	Teaching aims and competences to be gained: • Programming with MATLAB • Basic of numerical simulation • Basics on modelling of mechatronical systems • Basics on simulation of mechatronical systems • Modelling and simulation with SIMULINK
	Contents: • Introduction to MATLAB programming • Introduction to numeric simulations using MATLAB and SIMULINK • Modelling of mechanical, electrical, and information processing systems using block diagrams • Step by step development of models • Simulation experiments using SIMULINK
Type of lecture	Lectures; Seminars; practicals in small groups
Literature	See LSF
Preconditions for attending	
Usability of module	M-SEM
Prerequisites for the provision of ECTS	Attending of practicals, passing of 3 attestations Examination: oral
ECTS and marks	5 CP Marks following Study and Examination Regulations
Efforts	1 hour per week lecture, 1 hour per week exercises, 1 hour per week practicals Review lecture notes and development of homework
Frequency of provision	WS
Duration of module	1 semester
Responsible lecturer	Jun. Prof. S.- Schmidt, FMB-IMS

2.5 Material Selection

Name of module	Material Selection
German title	Materialauswahl
Teaching aims and content of the module	Teaching aims and competences to be gained: • Basic knowledge of structures and properties of materials • Basics and advanced knowledge of the data base module CES (Cambridge Engineering Selector) • Fundamental knowledge of the working principles of material selection and material substitution • Advanced knowledge of materials selection for specific applications
	Contents: • Structure of materials • Properties of materials • Basics of material processing • data base content of the CES software package • functions and working principles of the CES software package • practical examples of material selection • practical examples of material substitution
Type of lecture	Lecture and lecture accompanying exercises
Literature	See first lecture
Preconditions for attending	
Usability of module	M-SEM
Prerequisites for the provision of ECTS	written exam
ECTS and marks	5 CP Marks following Study and Examination Regulations
Efforts	Presence times: 2 SWS lecture, 1 SWS exercises Self-reliant work: pre- and post-preparation of lectures, study of literature, execution of exercises
Frequency of provision	SS
Duration of module	1 Semester
Responsible lecturer	Prof. Thorsten Halle, FMB-IFW Additional instructors: Prof. Michael Scheffler, FMB-IFW

3 Wahlpflichtbereich

Der Wahlpflichtbereich besteht aus den Fachbereichen

- Mechanik
- Digitale Systeme
- Automation und Ergonomie
- Logistik

mit den nachfolgend genannten Wahlpflichtmodulen.

Gemäß Studien- und Prüfungsordnung müssen für einen erfolgreichen Studienabschluss aus dem Wahlpflichtbereich aus zwei Fachbereichen so viele Wahlpflichtmodule erfolgreich absolviert werden, dass die Summe in den einzelnen Fachbereichen 10 CP ergibt.

3 Compulsory chosen area

The compulsory chosen area consists of the scientific areas

- Mechanics
- Digital systems
- Automation and Ergonomics
- Logistics

with the following compulsory modules.

Following the Study and Examination Regulations it is mandatory to pass at least as much modules out of two of these areas that the sum of the CPs of the modules successfully passed in each of the selected scientific areas reaches 10 CPs.

3.1 Fachbereich Mechanik / Scientific area Mechanics

3.1.1 Simulation methods of dynamical systems

Name of module German title	Simulation methods of dynamical systems
	Simulationsmethoden dynamischer Systeme
Teaching aims and content of the module	Teaching aims and competences to be gained: • Detailed knowledge concerning modelling of dynamic systems • Comprehensive understanding concerning the solution of dynamic problems, time integration, eigenvalue analysis • Understanding of the general spatial description of dynamic systems (rigid and flexible) • Knowledge concerning model reduction • Consideration and assessment of nonlinearities in dynamical systems, understanding of the basic differences of linear and non-linear dynamic system • Insight into the non-linear modelling of bearing characteristics • Ability to evaluate and analyse the results of numerical simulations
	Contents: • Basics of vibration dynamics (oscillator with n degrees of freedom • Time integration methods, eigenvalue calculation method • Basics of spatial dynamics • Rigid and flexible multibody systems • Linear and non-linear dynamic systems, jump phenomena • Modelling and effects of nonlinear bearing characteristics • Working with different program systems like EMD or SIMPACK
Type of lecture	Lectures, exercises
Literature	See first lecture
Preconditions for attending	Recommended: Knowledge of mechanical vibrations, basics of machine dynamics
Usability of module	M-SEM
Prerequisites for the provision of ECTS	Examination: Written examination
ECTS and marks	5 CP Marks following Study and Examination Regulations
Efforts	Office hours: 2 SWS lectures, 2 SWS exercises Independent work: follow-up of the lecture, exercise self-employment
Frequency of provision	WS
Duration of module	One semester
Responsible lecturer	Jun.-Prof. Woschke, FMB-IFME Additional instructors: Dr. Daniel, Nitzschke, FMB-IFME

3.1.2 Engineering Design

Name of module	Engineering Design
German title	CAx-Grundlagen Industriedesign
Teaching aims and content of the module	Teaching aims and competences to be gained: • Under the umbrella of Engineering Design the development, calculation and design of Engineering Systems will be discussed. At necessary length, some important Machine Elements will be reviewed with relevance to the overall design process. The lectures will be in close relation to the homework and semester project • Knowledge: Students learn to engineer a complete system and understand and appreciate, what disciplines are needed to design an engineering system. The taught approach is independent from certain engineering branches. • Skills: The course provides various engineering design approaches, where all requirements, boundary conditions and expected outcomes are considered and evaluated to find the solution for an engineering task, that best fits the problem definition. • Competence: The students will be able to work in various engineering branches and is prepared to attack and solve an engineering design problem, work in a team of engineers with different, needed special experiences. The course will enable students to take leading functions in a team of engineers.
	Contents: • Introduction • Design problem definition • Fundamentals of creative thinking • Generation of alternative solutions • Fundamentals of technical systems and consequences for the design process • Product planning and clarification of the task • Listing the functional requirements and constraints • Establishing function structures • Methods for searching for solution principles to fulfill the functions • Selecting suitable combinations of solution principles • Evaluating concept variants • Principles of embodiment design • Design guidelines • Size ranges and modular products • Some Machine Elements will be discussed, respectively reviewed, within the outline of the above topics.
Type of lecture	The course will be carried out through lectures and laboratory/seminar sessions. Students will have to work on a defined lecture – accompanying individual semester project and a selected design project. Here students have to present their project at the different stages of their design. This work is usually done in a team of up to five students. Both projects must be presented and submitted in a project report. The team project might have to be presented to class and the presentation will be evaluated.
Literature	"PAHL/BEITZ: Engineering Design", 2nd or 3rd English Edition “Handbook of Mechanical Engineering” both Springer-Verlag (Berlin, Heidelberg, Tokyo, New York)
Preconditions for attending	
Usability of module	M-SEM

Prerequisites for the provision of ECTS	• The defined lecture project counts for 30% of the grade, the selected design project for another 30% and the final exam for 40% of the grade. • Important: The conditions of the design project MUST be met, in order to be admitted to the Final Exam! • All work has to be submitted in English. • Permitted items at the exam: All self written lecture notes, calculator and tables and standards
ECTS and marks	10 CP Marks according to Study and Examination Regulations
Efforts	Attendance times: 2 SWS lecture, 2 SWS exercises (per semester) Self-reliant work: Preparation and wrap-up of lectures, literature studies, projects
Frequency of provision	WS, SS
Duration of module	2 Semesters
Responsible lecturer	Prof. Dr.-Ing. Karl-Heinrich Grote

3.2 Fachbereich Digitale Systeme / Scientific area Digital systems

3.2.1 Finite Element Method

Name of module	Finite Element Method
German title	Finite Elemente Methode
Teaching aims and content of the module	Teaching aims and competences to be gained: The participants will gain experience in the use of the finite element method (FEM) as a computational method for solving complex systems of differential equations, which are essential in engineering problems. FEM is an effective tool for solving problems in structure and solid mechanics. The students will be taught in the proceeding of assembling the structure problem, its discretization and solving within the FEM. The students experience the exposure to finite element software like Ansys.
	Contents: • Fundamentals of the boundary value problem in solid mechanics • Variation calculus and weak form • FE discretization and shape functions • Isoparametric truss elements • Plane finite elements • Volume elements
Type of lecture	Lectures and exercises
Literature	
Preconditions for attending	Good skills in mechanics and mathematics
Usability of module	M-SEM
Prerequisites for the provision of ECTS	Passing the exam
ECTS and marks	5 CP Marks following Study and Examination Regulations
Efforts	Time of attendance: • Lecture: 2 SWS • Excercise: 2 SWS Self-study: • 2 h / week
Frequency of provision	WS
Duration of module	1 semester
Responsible lecturer	Jun.-Prof. Dr.-Ing. Daniel Juhre

3.2.2 CAX Basics

Name of module	CAx Basics
German title	CAx-Grundlagen
Teaching aims and content of the module	Teaching aims and competences to be gained: • Basic knowledge of computer-aided tools and systems in product development • Knowledge of product models for developing and modelling products • Learning general procedures for 3D modelling • Competences to familiarise quickly with CAx systems • Knowledge of product development interfaces • Basic knowledge of storage and archiving of product data and documents • Acquiring of basic comprehensions of Product Lifecycle Management (PLM)
	Contents: • Current situation in product development • Product development and computer assistance • Tools and systems of computer support • Components of a CAx system • CAx systems • Auxiliary functions in CAx • Product model definition • Types of product models • Procedures for 3D modelling • Archiving, interfaces, product data management • Product Lifecycle Management (PLM)
Type of lecture	Lectures and CAx exercises accompanying lectures
Literature	See introduction lecture
Preconditions for attending	
Usability of module	M-SEM
Prerequisites for the provision of ECTS	Oral exam on the lecture content, CAD exam (90 min) Advance provision: CAD test
ECTS and marks	5 CP Marks according to Study and Examination Regulations
Efforts	Attendance times: 2 SWS lecture, 2 SWS exercises Self-reliant work: Preparation and wrap-up of lectures, literature studies, working on CAD exercises
Frequency of provision	SS
Duration of module	1 Semester
Responsible lecturer	Dr.-Ing. Dipl.-Math. Michael Schabacker, FMB-IMK

3.3 Fachbereich Automation und Ergonomie / Scientific area Automation and Ergonomics

3.3.1 Industrial robots

Name of module	Industrial robots
German title	Industrieroboter
Teaching aims and content of the module	Teaching aims and competences to be gained: • Methods and processes for engineering and implementation of industrial robot controls • Basic knowledge related to structure and behaviour of industrial robots • Basic knowledge related to motion control of industrial robots • Basic knowledge related to technology and process control of industrial robots
	Contents: • Basics: o Terms and definitions o History of industrial robots o Use of industrial robots in production systems • Structure and functionalities o Principle structures and main components o Kinematical types and motion spaces o Frames and joints o Drives o Motion measurements o Effectors • Controls o Structure o Information flow o Software architecture • Control programming o Motion control o Programming methodologies o Programming with KRL (KUKA) o Integration in production systems • Application cases • Rules for robot application
Type of lecture	Lecture and lecture accompanying exercises
Literature	See first lecture
Preconditions for attending	
Usability of module	M-SEM
Prerequisites for the provision of ECTS	Written exam Advanced provisions: Exercise credits
ECTS and marks	5 CP Marks following Study and Examination Regulations
Efforts	Presence times: 2 SWS lecture, 1 SWS exercises Self-reliant work: pre- and post-preparation of lectures, study of literature, execution of exercises
Frequency of provision	WS
Duration of module	1 Semester
Responsible lecturer	apl. Prof. Dr.-Ing. habil. Arndt Lüder, FMB-IMS

3.3.2 Factory automation and ergonomics

Name of module	Factory automation and ergonomics
German title	Fabrikautomation und Ergonomie
Teaching aims and content of the module	Teaching aims and competences to be gained: • Provision of knowledge about methods and technologies for engineering and implementation of automated and manual production processes • Provision of knowledge about capabilities and limitations of the application of automation systems • Provision of knowledge about capabilities and limitations of the application of human beings • Provision of programming skills for programmable logic controllers • Provision of design skill related to human machine interfaces
	Contents: • Terms, aims, limitations, and basic structures • Reference process for production system engineering • Classification and identification of technical processes • Duties of automation systems • Duties of humans in production systems • Modelling of technical systems based on continuous and event-discrete models • Working system structures • Control architectures • Structure and behaviour of programmable logic controllers • Graphic and textual programming languages for programmable logic controllers • Human machine interfaces
Type of lecture	Lecture and lecture accompanying exercises, Implementation of a control project
Literature	K.H. John, M. Tiegelkamp: IEC 61131-3 - Programming Industrial Automation Systems, Springer, Berlin, 2014 L. Urbas, A. Krause, J. Ziegler: Process Control Systems Engineering, DIV Deutscher Industrieverlag, 2012. Lunze, J.: Automatisierungstechnik, Oldenbourg Verlag, 2. Auflage, 2008 W. Reisig: Understanding Petri Nets, Springer, Berlin, 2013 C. Schlick, R. Bruder, H. Luczak: Arbeitswissenschaft, Springer Verlag, 2010.
Preconditions for attending	
Usability of module	M-SEM
Prerequisites for the provision of ECTS	Written exam Advanced provisions: Successful development of a control project, exercise credits
ECTS and marks	5 CP Marks following Study and Examination Regulations
Efforts	Presence times: 2 SWS lecture, 1 SWS exercises Self-reliant work: pre- and post-preparation of lectures, study of literature, execution of exercises
Frequency of provision	SS
Duration of module	1 Semester
Responsible lecturer	apl. Prof. Dr.-Ing. habil. Arndt Lüder, FMB-IMS Additional instructors: Dr.-Ing. Sonja Schmicker, FMB-IAF

3.4 Fachbereich Logistik / Scientific area Logistics

3.4.1 Logistics Networks and Logistics Service Providers

Name of module German title	Logistics Networks and Logistics Service Providers
	Logistiknetzwerke und Logistikserviceprovider
Teaching aims and content of the module	Teaching aims and competences to be gained:: • Requirements in logistics networks • Holistic optimization of logistics networks • Advantages and drawbacks, limits of logistics networks • Data acquisition, SWOT analysis, scenario evaluation • Network planning in theory and practice
	Contents: • Logistics service market • Challenges in supply networks • Supply Chain Design, Planning, Execution, Controlling • Variant and inventory management • Logistics service providers as designers of supply networks • Network planning using the 4flow vista software • Scenario-based optimization of logistics networks • Best practices of industry, trade and logistics service providers
Type of lecture	Lectures and exercises with scripts and exercise guides, seminars and projects.
Literature	Lecture and exercise notes. Baumgarten; Darkow; Zadek (Hrsg.): Supply Chain Steuerung und Services; ISBN 3-540-44308-8
Preconditions for attending	
Usability of module	M-WLO, M-SEM
Prerequisites for the provision of ECTS	Minimum 75 percent attendance of lectures and exercises. Examinations by writing a term paper (Case study, simulation, presentation etc.) and by performance tests (90 min.)
ECTS and marks	5 CP Marks following Study and Examination Regulations
Efforts	Class hours: (42 h) Lectures: 2 SWS Exercises: 1 SWS Individual work:(108 h) Lecture revision, preparing and studying of exercises and writing the term paper
Frequency of provision	SS
Duration of module	1 semester, course can be offered en bloc. Module in English.
Responsible lecturer	Prof. Zadek FMB-ILM

3.4.2 Collaborative Management in Supply Networks

Name of module German title	Collaborative Management in Supply Networks
	Kollaboratives Management in Lieferantennetzwerken
Teaching aims and content of the module	Teaching aims and competences to be gained: • Information deficiencies in logistics networks • Coordination and controlling deficiencies in networks • Technical and power-political roles in networks • Approaches and rules of behavior • Solution-oriented negotiating / Contract negotiations
	Contents: • Challenges in collaborative management • Win-win-partnerships and their benefits • Cost-Benefit-Sharing • Culture of trust and rules • Collaborative IT-Tools for controlling supply networks • Key Performance Indicator System • Interactive role-playing • Best practices of industry, trade and logistics service providers
Type of lecture	Lectures and exercises with appropriate notes and instructions
Literature	Lecture and exercise notes. Baumgarten; Darkow; Zadek (Hrsg.): Supply Chain Steuerung und Services; ISBN 3-540-44308-8
Preconditions for attending	
Usability of module	M-WLO, M-SEM
Prerequisites for the provision of ECTS	Examinations by writing a term paper (Case study, simulation, presentation etc.) and scientific project
ECTS and marks	5 CP Marks following Study and Examination Regulations
Efforts	Class hours: (42 h) Lectures: 2 SWS Exercises: 1 SWS Individual work: (108 h) Lecture revision, preparing and studying of exercises and writing the term paper
Frequency of provision	SS
Duration of module	1 Semester, module can be offered en bloc in part or as a whole. Module in English.
Responsible lecturer	Prof. Zadek, FMB-ILM

4 Freier Wahlbereich

Der freie Wahlbereich besteht aus freien Wahlmodulen.
Gemäß Studien- und Prüfungsordnung müssen für einen erfolgreichen Studienabschluss aus dem freien Wahlbereich so viele Wahlmodule erfolgreich absolviert werden, dass in Summe 10 CP erreicht werden.

Als erstes freies Wahlmodul kann jedes in Kapitel 3 genannte Wahlpflichtmodul gewählt werden, das nicht zu einem der für den Wahlpflichtbereich gewählten Fachbereiche gehört.
Als zweites freies Wahlmodul kann jedes an der Otto-von-Guericke Universität gehaltene Modul mit mindestens 5 CP gewählt werden.

4 Free elective area

The free elective area consists of free elective modules.
Following the Study and Examination Regulations it is mandatory to pass at least as much modules that the sum of the CPs of the modules successfully passed reaches 10 CPs.

As first free elective module any module can be accepted, which is part of the scientific areas not selected for the compulsory chosen modules in Chapter 3.

As second free elective module any module with at least 5 CP of the module set of Otto-von-Guericke University can be accepted.

5 Team- oder Einzelprojekt

Name of module	Team or Individual Project1)
German title	Team- oder Einzelprojekt
Teaching aims and content of the module	Teaching aims and competences to be gained: After participation within this project students shall be qualified to execute projects goal-oriented and effectively. They shall be able to collect necessary knowledge and document and defend the results appropriately.
	Contents: The contents shall be defined based on running research projects or teaching activities of the Faculty of Mechanical Engineering. They shall be designed in a way to be integrated in the named activities.
Type of lecture	Project
Preconditions for attending	Basic knowledge in the related subjects
Usability of module	M-SEM
Prerequisites for the provision of ECTS	Project documentation, Presentation and Defense
ECTS and marks	5 CP Marks following Study and Examination Regulations 2)
Efforts	Independent project execution
Frequency of provision	Semester independent
Duration of module	Executiontime of usually 5 month Provision of a project definition with start and end date
Responsible lecturer	Project adviser from Faculty of Mechanical Engineering

1) The project can be executed as individual or as team project. Team projects are preferred. The number of participants within a team project is limited to 3.

2) The final grade is based on a weighted average with 70% weight for the project documentation and 30 % for project presentation and defense.

6 Master Thesis

Name of module German title	Master Thesis Masterarbeit
Teaching aims and content of the module	Subjects from all parts of the Faculty of Mechanical Engineering usually with an orientation towards scientific relevance The master thesis shall prove the capabilities of the student to independently deal with a scientific subject within a predefined period of time applying scientific methodologies.
Type of lecture	Scientific project, documentation and colloqium following the design guidelines as well as the guidelines for the execution and presentation of scientific works of the Faculty of Mechanical Engineering
Preconditions for attending	Certification of at least 40 CP from compulsory, compulsory chosen, and free elective areas as well as project
Preconditions for colloquium	Certification of all necessary 60 CP Existence of two assessments with at least mark „sufficient"
Usability of module	M-SEM
Prerequisites for the provision of ECTS	2 Assessments, Colloquium
ECTS and marks	30 CP Marks following Study and Examination Regulations
Efforts	Independent scientific project, documentation (thesis), presentation, defense It is recommended to execute the master thesis in cooperation with a company based on a company driven scientific problem.
Frequency of provision	Semester independent
Duration of module	5 month Provision of a master thesis subject definition with start and end date documented at Examinations Office of the Faculty of Mechanical Engineering
Responsible lecturer	Lecturer of the Faculty of Mechanical Engineering

Studienplan

		Umfang			1. Semester (WS)			2. Semester (SS)			3. Semester (WS)		
		V	S	P	CP	LN	PL	CP	LN	PL	CP	LN	PL
Pflichtbereich		**Σ 25 CP**											
Mechanics of Materials		2	2					5		M			
Systems Engineering for Manufacturing Systems		2	1		5		K						
Material handling Systems		2	1		5		K						
Modelling and Simulation of Mechatronic Systems		1	1	1	5		M						
Material Selection		2	1					5		K			
Wahlpflichtbereich		**Σ 20 CP**											
FB 1: Scientific area Mechanics	Simulation methods of dynamical systems				5		K						
	Engineering Design				5		K	5		K			
FB 2: Digital systems	Finite Element Method				5		K						
	CAx Basics							5		M			
FB 3: Automation and Ergonomics	Industrial robots				5		K						
	Factory automation							5		K			
FB 4: Logistics	Logistics Networks and Logistics Service Providers							5		K			
	Collaborative Management in Supply Networks							5		K			
Wahlbereich		**Σ 10 CP**											
Freies Modul 1					5		K/M						
Freies Modul 2								5		K/M			
Team- oder Einzelprojekt		**Σ 5 CP**											
Team- oder Einzelprojekt								5	W	W			
Masterarbeit		**Σ 30 CP**											
Masterarbeit incl. Kolloquium											30	W	W, KO
Masterstudiengang gesamt		**Σ 90 CP**											
					30			30			30		