

## Appendix A: Course Schedule

for the study programme Mechanical Engineering M.Sc.

Please note: The German version of this document is the legally binding version. The English translation provided here is for information purposes only.

First semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
2011	Multi-Body Simulation	MKS	2	0	1	1	0	6
2008	Computational Fluid Dynamics 2	CFD2	2	1	0	1	0	6
2007	Project Module 1	MPR1	0	4	0	0	0	6
9028	Elective Module	WM				0		6
9028	Elective Module	WM				0		6
Total CP:								30
Second semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
2003	Finite Elements 2	FE2	2	1	0	1	0	6
2006	Management Skills	MMK	2	2	0	0	0	6
2002	Project Module 2	MPR2	0	4	0	0	0	6
2009	System Simulation	SYS	2	2	0	0	0	6
2004	Tribology	TRI	2	1	0	1	0	6
Total CP:								30
Third semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
2033	Colloquium	MKO	0	0	0	0	0	6
2034	Master Thesis	MA	0	0	0	0	0	24
Total CP:								30

Abbreviations of the teaching forms:

L = lecture, ST = tuition in seminars, E = exercise, S = seminar, P = practical,

SSS = supervised self-study (all data in semester credit hours);

CP = credit points

W/S = winter/summer semester

Elective Modules Mechanical Engineering M.Sc.									
Module number	Module title	Module ID	W/S	L	ST	E	P/S	SSS	CP
2005	Automation Systems	AUS	W	2	1	0	1	0	6
2001	Fibre Composites	FVW	W	2	1	0	1	0	6
2047	Multiphysics Simulation	MPH	W	2	0	2	0	0	6

Appendix B:

# Module catalogue

for the study programme Mechanical Engineering (M.Sc.)

Automation Systems .....	12
Fibre Composites .....	13
Finite Elements 2 .....	15
Colloquium .....	16
Management Skills .....	17
Master Thesis .....	18
Multi-Body Simulation .....	19
Multiphysics Simulation .....	21
Computational Fluid Dynamics 2 .....	23
Project Module 1 .....	24
Project Module 2 .....	25
System Simulation .....	26
Tribology .....	28
Elective Module .....	29

Please note: The German version of this document is the legally binding version. The English translation provided here is for information purposes only.

Automation Systems							AUS	
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:			
2005	180 h	6	1st or 2nd sem.	Annual (Winter)	1 sem.			
1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	60	h
	Seminar lessons	30 students	1	SCH	15	h	30	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	30	h
	Supervised self-study	60 students	0	SCH	0	h	0	h
2	<b>Learning outcomes/competences:</b> Advanced knowledge of modern computer-aided measurement and automation systems. Students are qualified to identify and structure requirements for automation systems, to design and synthesise practical solutions, and to evaluate and critically compare their own and other people's solutions.							
3	<b>Contents:</b> Control engineering: Description and design of linear controls in the time domain (state space) and frequency domain (action plan algebra, Laplace transform). Nonlinear systems: Linearisation and harmonic balance. Theory of discrete-time and discrete-value systems Sensors and actuators: Process measurement technology. Electric drive technology, converters as actuators. Digital communication technology (bus systems). Formal design and description methods, especially Petri nets. Introduction to special languages for programming (PLC and Microcontroller) and hardware synthesis (VHDL).							
4	<b>Forms of teaching:</b> Lecture, seminar lessons and practical course							
5	<b>Participation requirements:</b>							
	Formal:	None						
	Content:	None						
6	<b>Forms of assessment:</b> Written examination or oral examination							
7	<b>Prerequisite for the award of credit points:</b> Module examination pass							
8	<b>Application of the module (in the following study programmes)</b> BioMechatronics (M.Sc.) and Mechanical Engineering (M.Sc.)							
9	<b>Importance of the grade for the final grade:</b> according to MRPO							
10	<b>Module coordinator:</b> Prof. Dr.-Ing. Sebastian Hoffmann							
11	<b>Other information:</b> Literature will be announced at the beginning of the course.							
12	<b>Language:</b> German							

Fibre Composites							FWW					
Identification number:	Workload:	Credits:	Study semester:		Frequency of the offer		Duration:					
2001	180 h	6	1st or 2nd sem.		Annual (Winter)		1 sem.					
1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study					
	Lecture	60 students	2	SCH	30	h	60	h				
	Seminar lessons	30 students	1	SCH	15	h	30	h				
	Exercise	20 students	0	SCH	0	h	0	h				
	Practical or seminar	15 students	1	SCH	15	h	30	h				
	Supervised self-study	60 students	0	SCH	0	h	0	h				
2	<p>Learning outcomes/competences:</p> <p>The students identify and evaluate the possibilities of implementing constructive lightweight construction through the use of fibre composites. They will learn about the special anisotropic mechanical properties and the special failure behaviour of fibre composites and can use this knowledge for an initial evaluation of the possible applications. Building on this, they learn the calculation methodology for fibre composite components and how to apply it to simple components. With the knowledge of the strength criteria, it is now possible for them to evaluate the use of fibre composites in practice. Furthermore, they learn about selected manufacturing processes and select special test methods that are important for fibre composite materials.</p>											
3	<p>Contents:</p> <ul style="list-style-type: none"> <li>- Characteristics of constructive lightweight design</li> <li>- Structure of fibre composites (fibre and matrix types)</li> <li>- Special properties and applications of fibre composite plastics</li> <li>- Micromechanics: mechanical behaviour of unidirectionally reinforced single layers</li> <li>- Macromechanics: mechanical behaviour of multilayer laminates</li> <li>- Classic laminate theory</li> <li>- Strength criteria for static, multi-axial loads</li> <li>- Fatigue behaviour of fibre composite plastics</li> <li>- Special features of joining technology and materials testing</li> <li>- Applications / Hybrid materials</li> </ul>											
4	<p>Forms of teaching:</p> <p>Lecture, seminar lessons and practical course</p>											
5	<p>Participation requirements:</p> <table border="1"> <tr> <td>Formal:</td> <td>None</td> </tr> <tr> <td>Content:</td> <td>None</td> </tr> </table>								Formal:	None	Content:	None
Formal:	None											
Content:	None											
6	<p>Forms of assessment:</p> <p>Written exam, project work or oral exam</p>											
7	<p>Prerequisite for the award of credit points:</p> <p>Module examination pass</p>											
8	<p>Application of the module (in the following study programmes)</p> <p>Mechanical Engineering (M.Sc.)</p>											
9	<p>Importance of the grade for the final grade:</p> <p>according to MRPO</p>											
10	<p>Module coordinator:</p> <p>Prof. Dr.-Ing. Thomas Kordisch</p>											

11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Finite Elements 2							FE2	
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:			
2003	180 h	6	1st or 2nd sem.	Annual (Summer)	1 sem.			
1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	60	h
	Seminar lessons	30 students	1	SCH	15	h	30	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	30	h
	Supervised self-study	60 students	0	SCH	0	h	0	h
2	Learning outcomes/competences: Students learn the theoretical and practical basics of the finite element method for analysing non-linear, thermal and dynamic behaviour							
3	Contents: Nonlinear materials, strain hardening models, contact modelling, thermal analysis, instability, time integration, modal analysis, fibre composite materials, fracture mechanics							
4	Forms of teaching: Lecture, seminar lessons and practical course							
5	Participation requirements:							
	Formal:	None						
	Content:	Finite elements elastostatics, machine dynamics						
6	Forms of assessment: Written examination or oral examination							
7	Prerequisite for the award of credit points: Module examination pass							
8	Application of the module (in the following study programmes) Mechanical Engineering (M.Sc.)							
9	Importance of the grade for the final grade: according to MRPO							
10	Module coordinator: Prof. Dr.-Ing. Paul Diekmann							
11	Other information: Literature will be announced at the beginning of the course.							
12	Language: German							

Colloquium							MKO					
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:							
2033	180 h	6	3rd sem.	each semester								
1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study					
	Lecture	60 students	0	SCH	0	h	180	h				
	Seminar lessons	30 students	0	SCH	0	h	0	h				
	Exercise	20 students	0	SCH	0	h	0	h				
	Practical or seminar	15 students	0	SCH	0	h	0	h				
	Supervised self-study	60 students	0	SCH	0	h	0	h				
2	<p>Learning outcomes/competences:  The colloquium complements the master thesis and is to be assessed independently. It serves to determine whether the candidate is capable of orally presenting and independently justifying the scientific topic of the master thesis, its subject-related foundations, its interdisciplinary connections and its non-subject-related references, as well as assessing its significance for practice.</p>											
3	<p>Contents:</p> <ul style="list-style-type: none"> <li>- Content of the thesis according to the topic</li> <li>- Disputation on the procedure in the preparation of the thesis and the questions that arose in the context of the thesis</li> </ul>											
4	<p>Forms of teaching:  Oral examination for the master thesis</p>											
5	<p>Participation requirements:</p> <table border="1" style="width: 100%;"> <tr> <td>Formal:</td> <td>None</td> </tr> <tr> <td>Content:</td> <td>Treatment of the master thesis</td> </tr> </table>								Formal:	None	Content:	Treatment of the master thesis
Formal:	None											
Content:	Treatment of the master thesis											
6	<p>Forms of assessment:  Oral examination</p>											
7	<p>Prerequisite for the award of credit points:</p>											
8	<p>Application of the module (in the following study programmes)  Electrical Engineering (M.Eng.), Mechanical Engineering (M.Sc.) and Optimisation and Simulation (M.Sc.)</p>											
9	<p>Importance of the grade for the final grade:  according to MRPO</p>											
10	<p>Module coordinator:  Prof. Dr.-Ing. Jens Haubrock</p>											
11	<p>Other information:  Literature will be announced at the beginning of the course.</p>											
12	<p>Language:  German</p>											

Management Skills							MMK	
Identification number:	Workload:	Credits:	Study semester:		Frequency of the offer		Duration:	
2006	180 h	6	1st or 2nd sem.		Annual (Summer)		1 sem.	
1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	60	h
	Seminar lessons	30 students	2	SCH	30	h	60	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h
2	<p>Learning outcomes/competences:  Students know and understand different management methods and can apply them to specific cases. They understand the connection between corporate goals, leadership culture and social mission. They have learned to analyse entrepreneurial measures from different perspectives. They can evaluate their own behaviour/perception more realistically. They can use methods to motivate employees and themselves, to work successfully in a team and to react sensibly in case of conflict or crisis. They can apply methods to deal sensibly with high task loads.</p>							
3	<p>Contents:  Strategic corporate planning, motivational theories, leadership methods, values in management, social, professional and methodological competence, general legal issues, occupational safety, environmental protection, energy and resource efficiency, sustainable economic activities, code of German references, intercultural management, global development and production strategies, project management, self-management, target tracking and controlling, balanced score card, technology excellence level, change management, conflict management, stress and time management, communication in the event of a crisis.</p>							
4	<p>Forms of teaching:  Lectures, case studies, exercises</p>							
5	Participation requirements:							
	Formal:	None						
	Content:	None						
6	<p>Forms of assessment:  Written examination, combination examination or oral examination</p>							
7	<p>Prerequisite for the award of credit points:  Module examination pass</p>							
8	<p>Application of the module (in the following study programmes)  Electrical Engineering (M.Eng.), Mechanical Engineering (M.Sc.) and Optimisation and Simulation (M.Sc.)</p>							
9	<p>Importance of the grade for the final grade:  according to MRPO</p>							
10	<p>Module coordinator:  Prof. Dr.-Ing. Bruno Hüsgen</p>							
11	<p>Other information:  Literature will be announced at the beginning of the course.</p>							
12	<p>Language:  German</p>							



Master Thesis						M.A.		
Identification number: 2034	Workload: 720 h	Credits: 24	Study semester: 3rd sem.	Frequency of the offer each semester	Duration: 20 weeks			
1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	720	h
	Seminar lessons	30 students	0	SCH	0	h	0	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h
2	<p>Learning outcomes/competences:</p> <p>With the master thesis, each candidate demonstrates that he/she is able to complete a practice-oriented task from his/her subject area within a specified period of time, both in its subject-specific details and in the interdisciplinary contexts, working independently and according to scientific methods.</p>							
3	<p>Contents:</p> <p>The master thesis is an independent scientific work from the subject area of the respective study programme with a description and explanation of its solution. It can also be determined by an empirical investigation or by conceptual or design tasks or by an evaluation of existing sources. A combination of these forms is possible.</p>							
4	<p>Forms of teaching:</p> <p>Written composition with faculty tutoring</p>							
5	Participation requirements:							
	Formal:	None						
	Content:	Coordinated topic from the student's special subject area						
6	Forms of assessment:							
7	Prerequisite for the award of credit points:							
8	<p>Application of the module (in the following study programmes)</p> <p>Electrical Engineering (M.Eng.), Mechanical Engineering (M.Sc.) and Optimisation and Simulation (M.Sc.)</p>							
9	<p>Importance of the grade for the final grade:</p> <p>according to MRPO</p>							
10	<p>Module coordinator:</p> <p>Prof. Dr.-Ing. Jens Haubrock</p>							
11	<p>Other information:</p> <p>Literature will be announced at the beginning of the course.</p>							
12	<p>Language:</p> <p>German</p>							

Multi-Body Simulation							MKS					
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:							
2011	180 h	6	1st or 2nd sem.	Annual (Summer)	1 sem.							
1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study					
	Lecture	60 students	2	SCH	30	h	60	h				
	Seminar lessons	30 students	0	SCH	0	h	0	h				
	Exercise	20 students	1	SCH	15	h	30	h				
	Practical or seminar	15 students	1	SCH	15	h	30	h				
	Supervised self-study	60 students	0	SCH	0	h	0	h				
2	<p>Learning outcomes/competences:  Students will be able to apply standardised methods for describing the kinematics and dynamics of mechanical and mechatronic systems, analyse the kinematics and dynamics of mechanisms with an MBS program system, interpret simulation results and compare them with the results of MBS simulation programmes.</p>											
3	<p>Contents:</p> <ul style="list-style-type: none"> <li>- Mechanisms (definition, examples)</li> <li>- Concepts in plane kinematics</li> <li>- Coordinate systems, generalised coordinates</li> <li>- Coercive conditions</li> <li>- Examples for the standardised description of mechanisms</li> <li>- Numerical solution of the kinematics</li> <li>- Equations of motion of dynamics under constraints</li> <li>- Lagrange multipliers</li> <li>- Force and control elements</li> <li>- Spatial systems</li> <li>- Euler parameters</li> <li>- Examples for the standardised description of spatial systems</li> </ul>											
4	<p>Forms of teaching:  Seminar lessons with exercises and practical training on the computer</p>											
5	<p>Participation requirements:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Formal:</td> <td>None</td> </tr> <tr> <td>Content:</td> <td>None</td> </tr> </table>								Formal:	None	Content:	None
Formal:	None											
Content:	None											
6	<p>Forms of assessment:  Written examination, combination examination, performance examination or oral examination</p>											
7	<p>Prerequisite for the award of credit points:  Module examination pass</p>											
8	<p>Application of the module (in the following study programmes)  BioMechatronics (M.Sc.), Mechanical Engineering (M.Sc.) and Optimisation and Simulation (M.Sc.)</p>											
9	<p>Importance of the grade for the final grade:  according to MRPO</p>											
10	<p>Module coordinator:  Prof. Dr.-Ing. Rolf Naumann</p>											
11	<p>Other information:  Literature will be announced at the beginning of the course. Literature:  Rill, G.: Schaeffer, T.: "Basics and methodology of multi-body</p>											

	Simulation”, Vieweg +Teubner Verlag, ISBN 978-3-8348-0888-2,2010. Haug, E.J.H: “Computer-Aided Kinematics and Dynamics of Mechanical Systems”, Volume 1. Basic Methods, Allyn And Bacon, ISBN 0-205-11669-8 (v.1) 1989.
12	Language: German

Multiphysics Simulation							MPH					
Identification number:	Workload:	Credits:	Study semester:		Frequency of the offer		Duration:					
2047	180 h	6	1st or 2nd sem.		Annual (Winter)		1 sem.					
1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study					
	Lecture	60 students	2	SCH	30	h	60	h				
	Seminar lessons	30 students	0	SCH	0	h	0	h				
	Exercise	20 students	2	SCH	30	h	60	h				
	Practical or seminar	15 students	0	SCH	0	h	0	h				
	Supervised self-study	60 students	0	SCH	0	h	0	h				
2	<p>Learning outcomes/competences:</p> <p>The students can describe various physical phenomena (e.g. from the fields of structural mechanics, heat transfer, electrodynamics, acoustics, ...) with the help of partial differential equations and identify the coupling terms in multi-physics problems. They know the methodological procedure for the modelling and numerical simulation of coupled partial differential equations and can use free and commercial simulation software to solve multiphysics problems in a target-oriented manner.</p>											
3	<p>Contents:</p> <ul style="list-style-type: none"> <li>- Definition of multiphysics via coupled partial differential equations</li> <li>- Treatment of typical couplings (e.g. electro-thermal WW, fluid-thermal WW, fluid-structure interaction, etc.) and their applications in practice</li> <li>- Numerical solution methods (especially FEM)</li> <li>- Best practice in modelling (CAD for simulation, appropriate discretisation, domain and boundary conditions, development of solution strategies, etc.)</li> <li>- Modelling and simulation using free and commercial simulation software</li> <li>- Application examples</li> </ul>											
4	<p>Forms of teaching:</p> <p>Lecture, seminar-style teaching with exercises on the computer</p>											
5	<p>Participation requirements:</p> <table border="1"> <tr> <td>Formal:</td> <td>None</td> </tr> <tr> <td>Content:</td> <td>None</td> </tr> </table>								Formal:	None	Content:	None
Formal:	None											
Content:	None											
6	<p>Forms of assessment:</p> <p>Project work</p>											
7	<p>Prerequisite for the award of credit points:</p> <p>Module examination pass</p>											
8	<p>Application of the module (in the following study programmes)</p> <p>Mechanical Engineering (M.Sc.) and Optimisation and Simulation (M.Sc.)</p>											
9	<p>Importance of the grade for the final grade:</p> <p>according to MRPO</p>											
10	<p>Module coordinator:</p> <p>Prof. Dr. rer. nat. Lars Fromme</p>											
11	<p>Other information:</p> <p>Literature will be announced at the beginning of the course.</p>											

12	Language: German
----	---------------------

Computational Fluid Dynamics 2							CFD2					
Identification number:	Workload:	Credits:	Study semester:		Frequency of the offer		Duration:					
2008	180 h	6	1st or 2nd sem.		Annual (Winter)		1 sem.					
1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study					
	Lecture	60 students	2	SCH	30	h	60	h				
	Seminar lessons	30 students	1	SCH	15	h	30	h				
	Exercise	20 students	0	SCH	0	h	0	h				
	Practical or seminar	15 students	1	SCH	15	h	30	h				
	Supervised self-study	60 students	0	SCH	0	h	0	h				
2	<p>Learning outcomes/competences:  The students have advanced knowledge in computational fluid dynamics (CFD). Students are able to simulate unsteady and turbulent flows and interpret the results. Students are familiar with current research topics in the field of CFD.</p>											
3	<p>Contents:  Expansion of the theoretical foundations: Balance equations of fluid mechanics, finite volume method, extension of the Navier Stokes equations by the energy equation, basics of turbulence, turbulence models. Commercial tools: Simulation of turbulent flows with a commercial CFD programme, such as STAR CCM+ or ANSYS CFX. Software development: Implementation of a simple CFD programme in a higher programming language for a non-isothermal laminar flow.</p>											
4	<p>Forms of teaching:  Lecture, seminar lessons and practical course</p>											
5	<p>Participation requirements:</p> <table border="1"> <tr> <td>Formal:</td> <td>None</td> </tr> <tr> <td>Content:</td> <td>Content of the lecture CFD 1 (1187)</td> </tr> </table>								Formal:	None	Content:	Content of the lecture CFD 1 (1187)
Formal:	None											
Content:	Content of the lecture CFD 1 (1187)											
6	<p>Forms of assessment:  Written examination</p>											
7	<p>Prerequisite for the award of credit points:  Module examination pass</p>											
8	<p>Application of the module (in the following study programmes)  Mechanical Engineering (M.Sc.)</p>											
9	<p>Importance of the grade for the final grade:  according to MRPO</p>											
10	<p>Module coordinator:  Prof. Dr. rer. nat. Martin Petry</p>											
11	<p>Other information:  Literature will be announced at the beginning of the course.</p>											
12	<p>Language:  German</p>											

Project Module 1						MPR1		
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:			
2007	180 h	6	1st or 2nd sem.	Annual (Summer)	1 sem.			
1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	0	h
	Seminar lessons	30 students	4	SCH	60	h	120	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h
2	Learning outcomes/competences: The students are able to work on scientific problems from the field of mechanical engineering within the framework of a project.							
3	Contents: Familiarisation with current research and development topics, project management, documentation and presentation of results.							
4	Forms of teaching: Seminar lessons							
5	Participation requirements:							
	Formal:	None						
	Content:	None						
6	Forms of assessment: Project work							
7	Prerequisite for the award of credit points: Module examination pass							
8	Application of the module (in the following study programmes) Mechanical Engineering (M.Sc.)							
9	Importance of the grade for the final grade: according to MRPO							
10	Module coordinator: Prof. Dr. rer. nat. Martin Petry							
11	Other information: Literature will be announced at the beginning of the course.							
12	Language: German							

Project Module 2						MPR2		
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:			
2002	180 h	6	1st or 2nd sem.	Annual (Winter)	1 sem.			
1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	0	h
	Seminar lessons	30 students	4	SCH	60	h	120	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h
2	Learning outcomes/competences: The students are able to work on scientific problems from the field of mechanical engineering within the framework of a project.							
3	Contents: Familiarisation with current research and development topics, project management, documentation and presentation of results.							
4	Forms of teaching: Seminar lessons							
5	Participation requirements:							
	Formal:	None						
	Content:	None						
6	Forms of assessment: Project work							
7	Prerequisite for the award of credit points: Module examination pass							
8	Application of the module (in the following study programmes) Mechanical Engineering (M.Sc.)							
9	Importance of the grade for the final grade: according to MRPO							
10	Module coordinator: Prof. Dr. rer. nat. Martin Petry							
11	Other information: Literature will be announced at the beginning of the course.							
12	Language: German							



Systems Simulation							SYS					
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:							
2009	180 h	6	1st or 2nd sem.	Annual (Summer)	1 sem.							
1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study					
	Lecture	60 students	2	SCH	30	h	60	h				
	Seminar lessons	30 students	2	SCH	30	h	60	h				
	Exercise	20 students	0	SCH	0	h	0	h				
	Practical or seminar	15 students	0	SCH	0	h	0	h				
	Supervised self-study	60 students	0	SCH	0	h	0	h				
2	<p>Learning outcomes/competences:</p> <p>The students know the basic methods for modelling (complex) technical systems and can apply these to new problems. They know how to prepare the models created and implement them on common system simulators, such as Matlab/Simulink. They can also plan simulation experiments systematically and carry them out in a targeted manner. Furthermore, they are able to assess the opportunities, limits and problems of a numerical simulation as well as analyse the results professionally.</p>											
3	<p>Contents:</p> <ul style="list-style-type: none"> <li>- Introduction (definitions, types of simulation, process models, goals)</li> <li>- Modelling methods (balance-space based, formalisms for mech./electr. syst., cross-disciplinary techniques, experimental modelling)</li> <li>- Model preparation for simulation (transfer to state representation, block diagram, linearisation, treatment of algebraic loops and structural singularities, descriptor form)</li> <li>- Simulation procedures (classification, selection criteria, num. problems)</li> <li>- Simulation experiments (planning, implementation and follow-up)</li> <li>- Application examples</li> </ul>											
4	<p>Forms of teaching:</p> <p>Lectures and computer seminars</p>											
5	<p>Participation requirements:</p> <table border="1" style="width: 100%;"> <tr> <td>Formal:</td> <td>None</td> </tr> <tr> <td>Content:</td> <td>None</td> </tr> </table>								Formal:	None	Content:	None
Formal:	None											
Content:	None											
6	<p>Forms of assessment:</p> <p>Term paper, written examination, combination examination, performance examination, project work, oral examination or examination during the course</p>											
7	<p>Prerequisite for the award of credit points:</p> <p>Module examination pass</p>											
8	<p>Application of the module (in the following study programmes)</p> <p>BioMechatronics (M.Sc.), Mechanical Engineering (M.Sc.) and Optimisation and Simulation (M.Sc.)</p>											
9	<p>Importance of the grade for the final grade:</p> <p>according to MRPO</p>											
10	<p>Module coordinator:</p> <p>Prof. Dr.-Ing. Klaus Panreck</p>											
11	<p>Other information:</p> <p>Literature will be announced at the beginning of the course.</p>											

12	Language: German
----	---------------------

Tribology							TRI					
Identification number:	Workload:	Credits:	Study semester:		Frequency of the offer		Duration:					
2004	180 h	6	1st or 2nd sem.		Annual (Winter)		1 sem.					
1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study					
	Lecture	60 students	2	SCH	30	h	60	h				
	Seminar lessons	30 students	1	SCH	15	h	30	h				
	Exercise	20 students	0	SCH	0	h	0	h				
	Practical or seminar	15 students	1	SCH	15	h	30	h				
	Supervised self-study	60 students	0	SCH	0	h	0	h				
2	<p>Learning outcomes/competences:</p> <p>The students recognise tribological relationships and their significance and gain an overview of the field of knowledge. They are able to analyse and evaluate tribosystems. From the determination of influencing factors, it is possible for the students to develop suitable measures for system optimisation with regard to friction and wear. They will be able to independently work out case studies and scientifically interpret and explain them in the context of tribology.</p>											
3	<p>Contents:</p> <p>Friction: Types and mechanisms of friction. Dry and media friction. Material, surface and movement influences.</p> <p>Wear and tear: Types and manifestations of wear. Damage mechanisms. Wear minimisation.</p> <p>Lubrication: Classification, characteristic values, lubrication methods.</p> <p>Measurement of friction, wear and lubricant parameters. Selected examples of tribological systems.</p>											
4	<p>Forms of teaching:</p> <p>Lecture, seminar lessons and practical course</p>											
5	<p>Participation requirements:</p> <table border="1"> <tr> <td>Formal:</td> <td>None</td> </tr> <tr> <td>Content:</td> <td>None</td> </tr> </table>								Formal:	None	Content:	None
Formal:	None											
Content:	None											
6	<p>Forms of assessment:</p> <p>Term paper, written examination, combination examination, performance exam or oral exam</p>											
7	<p>Prerequisite for the award of credit points:</p> <p>Module examination pass and course assessment</p>											
8	<p>Application of the module (in the following study programmes)</p> <p>Mechanical Engineering (M.Sc.)</p>											
9	<p>Importance of the grade for the final grade:</p> <p>according to MRPO</p>											
10	<p>Module coordinator:</p> <p>Prof. Dr.-Ing. Klaus Dürkopp</p>											
11	<p>Other information:</p> <p>Literature will be announced at the beginning of the course.</p>											
12	<p>Language:</p> <p>German</p>											

Elective Module						WM		
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:			
9028	180 h	6	1st sem.	Annual (Summer)	1 sem.			
1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students		SCH		h		h
	Seminar lessons	30 students		SCH		h		h
	Exercise	20 students		SCH		h		h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students		SCH		h		h
2	Learning outcomes/competences:							
3	Contents:							
4	Forms of teaching:							
5	Participation requirements:							
	Formal:							
	Content:							
6	Forms of assessment:							
7	Prerequisite for the award of credit points:							
8	Application of the module (in the following study programmes) Mechanical Engineering (M.Sc.)							
9	Importance of the grade for the final grade:							
10	Module coordinator: Prof. Dr. rer. nat. Martin Petry							
11	Other information:							
12	Language: German							