technische universität
dortmund

MMT
Master of Science in Manufacturing Technology

Module description
April 2016

TU Dortmund University
Dortmund, Germany

Master of Science in
Manufacturing Technology

Dear prospective MMT student,

With this brochure, we would like to give you the opportunity to inform yourself in detail about the curriculum of the international master's degree program in Manufacturing Technology (MMT) offered by TU Dortmund University, Germany.

You will find a complete overview of the two-year course program including detailed module descriptions and further useful information.

Should any questions remain unanswered, feel free to contact the MMT Office (see contact details below). We will be glad to help.

Your MMT Office

MMT Office
Institute of Forming Technology
and Lightweight Construction

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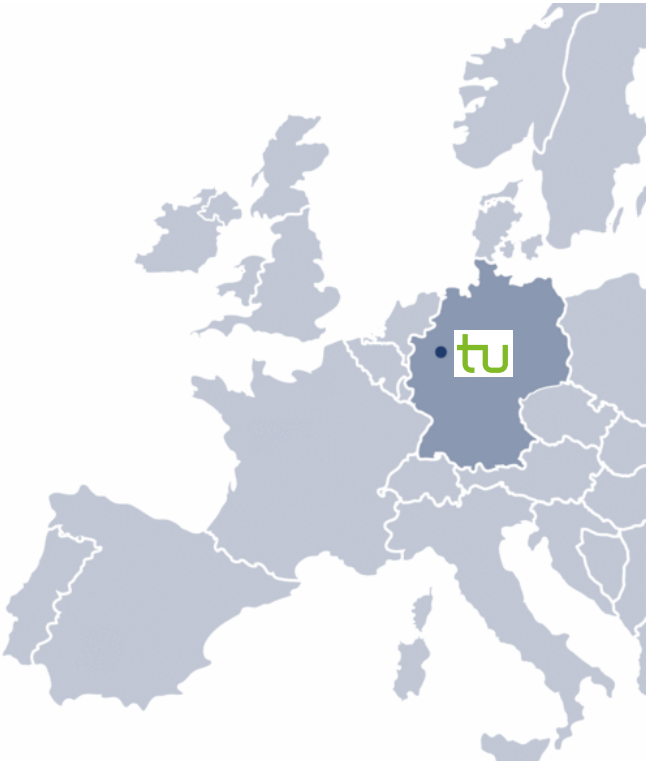

MMT Program Structure

	1st Semester	2nd Semester	3rd Semester	4th Semester
Compulsory Module 1	Module 1: Machining Technology 10 CP			
Compulsory Module 2	Module 2: Materials Technology 10 CP			
Compulsory Module 3	Module 3: Forming Technology 10 CP			
Elective Module 1	Elective 1 – Part 1 5 CP	Elective 1 – Part 2 5 CP		
Elective Module 2	Elective 2 – Part 1 5 CP	Elective 2 – Part 2 5 CP		
Elective Module 3	Elective 3 – Part 1 5 CP	Elective 3 – Part 2 5 CP		
Laboratory Work			Laboratory Work 10 CP	
Project Work			Project Work 10 CP	
Interdisciplinary qualification			Interdisciplinary 10 CP	
Master's Thesis				Master's Thesis 30 CP
Credit Points	30	30	30	30
Total CP				120

Listed below are the elective modules, from which students have to choose to gain a total of 30 credits. Please mind that the range of elective modules may change.

Module 4:	Automation and Robotics
Module 5:	Simulation Methods in Solid Mechanics
Module 8:	Advanced Simulation Techniques in Metal Forming
Module 9:	Measurement Engineering
Module 10:	Fatigue Behaviour
Module 17:	Machining Process Simulation
Module 18:	High Dynamic Testing of Materials
Module 19:	Plastics Processing Technology
Module 20:	Topics in Manufacturing Technology

On the following pages, all compulsory and elective modules are described in further detail.

Abbreviations used:
L = Lecture
E = Exercise
P = Practical Work
SWS = Semesterwochenstunden (contact hours per week per semester)

Module 1: Machining Technology					
Master Program: Manufacturing Technology (MMT)					
Cycle annual	**Duration** 2 semesters	**Section of Study** 1st/2nd semester	**Credits** 10	**Workload** 300 h	

1	**Module Structure**				
	No.	**Element/Course**	**Type**	**Credits**	**SWS**
	1	Machining Technology I	L(2,5)+E(1)	5	3.5
			40h in course, 110h self-study		
	2	Machining Technology II	L(2,5)+E(1)	5	3.5
			40h in course, 110h self-study		
2	**Language of the course** English				
3	**Content** Element 1 covers topics like machining processes, dry and MQL machining and process planning. These are discussed in detail with respect to machining processes with both defined and undefined cutting edge. Element 2 focuses on process evaluation under consideration of process reliability especially with regard to the use of process resources. The flow of information parallel to the machining processes as well as strategies for process control and for the simulation of production in industrial machining environments are discussed. Furthermore, management and logistics for cutting tools are presented.				
4	**Competence** The module provides students with detailed knowledge of different, industrially relevant machining processes. Furthermore, social as well as the communication skills will be imparted and improved. Additional aims of this module are the development of team spirit and the idea of network oriented thinking.				
5	**Examination** Examination details are presented at the beginning of the lecture.				
6	**Form of the Examination and Ratings**				
	☐Module examination		☒ Partial performances (two partial performances)		
7	**Prerequisites** None				
8	**Module Type and Usability of the Module** Compulsory module				
9	**Representative of the Module**		**Responsible Faculty**		
	Prof. Dr.-Ing. Dirk Biermann		Faculty of Mechanical Engineering (7)		

Module 2: Materials Technology (MMT)

Master Program: Manufacturing Technology (MMT)

Cycle	**Duration**	**Section of Study**	**Credits**	**Workload**
annual	2 semesters	1st/2nd semester	10	300 h

1 Module Structure

No.	**Element/Course**	**Type**	**Credits**	**SWS**
1	Materials Technology I	L(2,5)+E(1)	5	3.5
		40h in course, 110h self-study		
2	Materials Technology II	L(2,5)+E(1)	5	3.5
		40h in course, 110h self-study		

2 Language of the course

English

3 Content

The module provides deeper knowledge of metallic and inorganic materials. Technically important materials such as special metallic and high-temperature materials, refractory metals, noble metals, and high temperature alloys as well as ceramic materials will be investigated and discussed. Their specific manufacturing processes, properties, and fields of application, with a particular emphasis on the construction of gas and airplane turbines, are explained. In addition, the characteristics and applications of glass, binders, refractory materials, and biomimetic materials are explained. Another focus of this course is the detailed investigation of alloy formations (phase concepts) of technically interesting materials and deepening the understanding concerning the mechanical behavior with a special focus on fracture mechanics and failure mechanisms. Additionally, methods and strategies for the selection of construction materials are introduced as well as details of such selection processes.

4 Competence

After successfully completing this module, students have a far-reaching knowledge of metallic and inorganic materials, their characteristic properties, and application areas. They will have obtained a deeper understanding of materials, especially concerning the mechanical potential of different materials. Furthermore, they will have improved their skills to evaluate the capability of construction materials with an interdisciplinary approach and to choose corresponding specifications according to specific requirements.

5 Examination

Written exam

6 Form of the Examination and Ratings

☐ Module examination	☒ Partial performances (two partial performances)

7 Prerequisites

None

8 Module Type and Usability of the Module

Compulsory module

9 Representative of the Module	**Responsible Faculty**
Prof. Dr.-Ing. Dipl.-Wirt.Ing. Wolfgang Tillmann	Faculty of Mechanical Engineering (7)

Module 3: Forming Technology (MMT)

Master Program: Manufacturing Technology (MMT)

Cycle	**Duration**	**Section of Study**	**Credits**	**Workload**
annual	2 semesters	1st/2nd semester	10	300 h

1 Module Structure

No.	**Element/Course**	**Type**	**Credits**	**SWS**
1	Forming Technology I	L(2,5)+E(1)	5	3.5
		40h in course, 110h self-study		
2	Forming Technology II	L(2,5)+E(1)	5	3.5
		40h in course, 110h self-study		

2 Language of the course

English

3 Content

This module provides an advanced knowledge of the fundamentals of forming technology and the corresponding forming machines and processes. In addition, theoretical fundamentals with special emphasis on analytical and finite element methods are discussed.
The first part of the module deals with bulk forming processes. After providing the basics of metal forming related to the materials, the theory of plasticity, the material characterization and the analytical methods, example applications like rolling, forging, cold forging, bar extrusion, and shear forming are shown and further knowledge concerning forming machines and energy saving are given.
The second part of the module deals with sheet metal forming processes. First the fundamentals of sheet metal forming are treated, then some applications like bending, deep drawing, roll forming, incremental forming, hydroforming, hot sheet metal forming, impulse forming, and cutting and joining by forming are discussed in detail.

4 Competence

With the successful participation in the module, students have a broad understanding of the processes of metal forming and related machinery and tools. The students are able to identify special problems of metal forming technology, treat them and offer solutions. They possess a broad understanding of components, measurement and control systems, and automation techniques. The lecture, the accompanying essays, project work, exercises, live experiments, and laboratory visits extend students' analytical thinking, communication and team-work skills.

5 Examination

After each element there is a mandatory test in the form of a written exam work. The test lasts 120 minutes in each case.

6 Form of the Examination and Ratings

☐ Module examination	☒ Partial performances (two partial performances)

7 Prerequisites

None

8 Module Type and Usability of the Module

Compulsory module

9 Representative of the Module	**Responsible Faculty**
Prof. Dr.-Ing. Dr.-Ing. E.h. A. Erman Tekkaya	Faculty of Mechanical Engineering (7)

Module 4: Automation and Robotics

Master Program: Manufacturing Technology (MMT)

Cycle	**Duration**	**Section of Study**	**Credits**	**Workload**
annual	2 semesters	1st/2nd semester	10	300 h

1 Module Structure

No.	Element/Course	Type	Credits	SWS
1	Fundamentals of Robotics	L(2,5)+E(1)	5	3.5
		60h in course, 90h self-study		
2	Automation and Handling Systems	L(2,5)+E(1)	5	3.5
		45h in course, 105h self-study		

2 Language of the course

English

3 Content

The module is intended to impart knowledge in the field of automation and robotics. The first semester focuses on the robot as one key element of flexible automation and production engineering. In detailed topics such as robot kinematics, hardware components of robots, robot control, motion control and path planning especially in robot based handling und manufacturing tasks, programming of robots (online/offline) as well as the reachable accuracy of robot based movements and processes will be discussed in lectures and practical exercises. The second semester is basically split up into two main topics: It starts with an introduction to non-robot components and machines that are important for the implementation of automated production systems. Discussed topics are among other things basic hardware components, simple handling machines and supporting peripheral devices as well as industrial control systems (PLC). The second part focuses on the term “system”. On the basis of practical examples, the interaction of the individual components of automated systems and respective robot systems will be systematically analyzed. Based on the results of the analysis, a systematic approach to the planning and implementation of automated systems is imparted.

4 Competence

After a successful completion of the module, students have acquired knowledge about how to design, program, use and operate an robot based production cell or line as well as automated manufacturing facility without any robot. This knowledge enables the students to analyze a broad range of tasks inside the area of automation and robotics, to structure the tasks and to solve the task in a systematic way.

5 Examination

The exam consists of two written tests (60 min), one for each element of the module

6 Form of the Examination and Ratings

☐ Module examination	☒ Partial performances

7 Prerequisites

None

8 Module Type and Usability of the Module

Elective module

9

Representative of the Module	**Responsible Faculty**
PD Dr.-Ing. Jobst Bickendorf	Faculty of Mechanical Engineering (7)

Module 5: Simulation Methods in Solid Mechanics

Master Program: Manufacturing Technology (MMT)

Cycle	**Duration**	**Section of Study**	**Credits**	**Workload**
annual	2 semesters	1st/2nd semester	10	300 h

1 Module Structure

No.	Element/Course	Type	Credits	SWS
1	Introduction to Finite Element Method I (FEM I)	L(2)+E(1)+P(0,5)	5	3.5
		40h in course, 110h self-study		
2	Introduction to Finite Element Method II (FEM II)	L(2)+E(1)+P(0,5)	5	3.5
		40h in course, 110h self-study		

2 Language of the course

English

3 Content

A detailed insight into machining processes is the most important precondition to understand their principle working mechanisms and hence to use this knowledge for their planning and optimization. For this reason, modeling and simulation approaches able to derive predictions for different process values are in the focus of this lecture. Today such process simulation systems are subject to research on the one hand but they are applied in industry to a certain extend as well, which is mainly driven by the availability of low cost computational power. This lecture deals with the modeling and simulation of machining processes (mainly turning and milling), focusing on the processes themselves. Starting with a definition and classification of different modeling methods such as analytical, empirical, Finite-Element-based and geometrical-physical, these methods are explained successively. Their working principles are outlined but also restrictions and boundary conditions are discussed. Also one or two systems are presented in live demonstrations.

4 Competence

The students get an overview of different existing modeling concepts for the simulation of machining processes. They have knowledge about the working principles of these models and of the implementation of some of the models in software tools as well. With this knowledge, they are enabled to choose appropriate modeling concepts for the simulation of machining processes, with respect to accuracy, efficiency and reliability. In addition, they can assess the validity of calculated simulation results.

5 Examination

Nr. 1: Generation of a FE program for linear problems at small strains
Nr. 2: Generation of a FE program for non-linear problems at small strains
Includes for each part: Program generation, report writing, oral or written exam

6 Form of the Examination and Ratings

☐ Module examination	☒ Partial performances (two partial performances)

7 Prerequisites

Strength of materials, engineering mathematics especially numerical methods

8 Module Type and Usability of the Module

Elective module

9 Representative of the Module	**Responsible Faculty**
Prof. Dr.-Ing. Andreas Menzel	Faculty of Mechanical Engineering (7)

Module 8: Advanced Simulation Techniques in Metal Forming

Master Program: Manufacturing Technology (MMT)

Cycle	**Duration**	**Section of Study**	**Credits**	**Workload**
annual	1 semester	2nd semester	5	150 h

1 Module Structure

No.	**Element/Course**	**Type**	**Credits**	**SWS**
1	Advanced Simulation Techniques in Metal Forming	L(2,5)+E(1)	5	3.5
		40h in course, 110h self-study		

2 Language of the course

English

3 Content

Relevant aspects for the analysis of forming processes with the finite element method (FEM) are introduced. The different physical sources of non-linearity, such as the material behavior, finite deformations, and boundary conditions, are discussed. The theoretical background of suitable numerical methods for the solution of non-linear partial differential equations is presented. The aim here is to raise the students´ awareness of the underlying physics and numerical methods when they use commercial FEM codes for process simulation. The students learn to apply the theoretical concepts in the exercise, in which forming processes are analyzed using commercial FEM code. Concepts that are covered in particular are explicit and implicit time integration, changing boundary conditions as well as rigid-plastic and elastic-plastic material behavior.

4 Competence

Students acquire advanced knowledge of the FEM for the simulation of forming processes. They are able to generate a model of a forming process, perform calculations with this model, and, finally, do a critical evaluation of the calculation results. Method competence is acquired by learning structured thinking and reducing problems to smaller subproblems, which are easier to solve. Moreover, students learn to present results of their simulations.

5 Examination

Written exam, simulation project

6 Form of the Examination and Ratings

☒ Module examination	☐ Partial performances

7 Prerequisites

Basic knowledge of FEM (MMT module 5 or equivalent recommended);
Knowledge of strength of materials or introduction to continuum mechanics

8 Module Type and Usability of the Module

Elective module

9 Representative of the Module

Prof. Dr.-Ing. Dr.-Ing. E.h. A. Erman Tekkaya

Responsible Faculty

Faculty of Mechanical Engineering (7)

Module 9: Measurement Engineering

Master Program: Manufacturing Technology (MMT)

Cycle	**Duration**	**Section of Study**	**Credits**	**Workload**
annual	1 semester	1st semester	5	150 h

1 Module Structure

No.	**Element/Course**	**Type**	**Credits**	**SWS**
1	Measurement Engineering	L(2,5)+E(1)	5	3.5
		40h in course, 110h self-study		

2 Language of the course

English

3 Content

This course introduces students to the measurement chain in anymanufacturing process by illustrating the path of the measurement signal stepwise from recording to measuring the variable. The course conveys basic concepts and principles of measurement engineering, from measurement methods and sensors in different production fields to data processing by statistical analysis of the measured output to design of experiments. Then the metrology concepts in production measurement technology are treated followed by the application of learned techniques in materials and component testing.
Data acquisition and control is an integral part of the course. In interactive lessons, students learn to use the visual programming environment LabVIEW to visualize, create, and code engineering measurement systems. Finally, students are introduced to statistical techniques used in test planning, analysis, and optimization of engineering systems.

4 Competence

Students master basic theoretical and mathematical concepts for process and product optimized selection of appropriate measurement methods and transducers, of measurement in manufacturing and in materials and component testing, of data acquisition and processing and for statistical analysis and design of experiments. Students are able to identify specific problems and possible solutions to deal with this offer. Accompanying exercises expand the students´ competencies by improving their analytical thinking, communication, and team skills. Furthermore, they are prepared for further self-studies.

5 Examination

Written or oral exam

6 Form of the Examination and Ratings

☒ Module examination	☐ Partial performances

7 Prerequisites

None

8 Module Type and Usability of the Module

Elective module

9 Representative of the Module	**Responsible Faculty**
Prof. Dr.-Ing. Frank Walther	Faculty of Mechanical Engineering (7)

Module 10: Fatigue Behaviour

Master Program: Manufacturing Technology (MMT)

Cycle	**Duration**	**Section of Study**	**Credits**	**Workload**
annual	1 semester	2nd semester	5	150 h

1 Module Structure

No.	**Element/Course**	**Type**	**Credits**	**SWS**
1	Fatigue Behaviour	L(2,5)+E(1)	5	3.5
		40h in course, 110h self-study		

2 Language of the course

English

3 Content

In addition to materials science aspects of fatigue behaviour of metals, the standard of knowledge on relationship between microscopic structure and macroscopic properties is imparted. The characterization of fatigue behaviour is performed by mechanical, thermal, electrical and magnetic measurement techniques and transducers. Current fatigue damage accumulation hypothesis and life time calculation approaches are presented. All the stages of fatigue life - crack initiation, crack propagation and final failure - are dealt with the corresponding mechanisms.
To understand and correlate the mathematical models in material fatigue and experimental studies, finite element simulations are introduced. Abaqus and nCode programmes are used for understanding of classical fatigue models and promotes to develop the application-oriented models. Tutorials are designed to simulate fatigue life of different industrial components.

4 Competence

Students gain assessment competence for the independent selection of engineering materials on the basis of given component requirements as well as for the targeted use of introduced methods for material characterization. Students´ cross-disciplinary thinking in overall contexts is encouraged and students are able to identify specific problems and possible solutions to deal with this offer. Through accompanying exercises students expand their analytical skills and develop teamwork and communication skills as well as are prepared for further self-studies.

5 Examination

Written or oral exam

6 Form of the Examination and Ratings	
☒ Module examination	☐ Partial performances

7 Prerequisites

None

8 Module Type and Usability of the Module

Elective module

9 Representative of the Module	**Responsible Faculty**
Prof. Dr.-Ing. Frank Walther	Faculty of Mechanical Engineering (7)

Module 11: Laboratory Work (MMT)

Master Program: Manufacturing Technology (MMT)

Cycle	**Duration**	**Section of Study**	**Credits**	**Workload**
annual	1 semester	3rd semester	10	300 h

1 Module Structure

No.	Element/Course	Type	Credits	SWS
1	Laboratory Work	P(7)	10	7

2 Language of the course

English

3 Content

The laboratory work specifically involves experimental research work. The specific objectives are defined by the chairs where the laboratory work is performed. The laboratory work is done in groups. Before the actual laboratory work, the experiments need to be prepared. This means that students have to make sure they have an adequate knowledge of the theoretical foundations and practical implementation of the experiment. Students can choose freely the chair or chairs and discipline for their laboratory work, depending on availability. The experimental contents are provided by the individual chairs.

4 Competence

Students acquire practical skills by doing hands-on experiments. Furthermore, they gain technical and method competence by performing theoretical and independent experiment preparation.

5 Examination

Written or oral exam, written report, presentation and discussion.
The type of the exams is announced at the beginning of the respective element.
The module may be completed with a single course worth 10 CP or a combination of several single courses each worth less than 10 CP. The grade of the module is calculated by using the credit point weighted average of the single courses. Even though the total credit points of the single courses may be higher than 10, the module will only be counted as 10 credit points.

6 Form of the Examination and Ratings

☐ Module examination	☐ Partial performances

7 Prerequisites

None

8 Module Type and Usability of the Module

Compulsory module

9 Representative of the Module	**Responsible Faculty**
Dependent on the examiner	Faculty of Mechanical Engineering (7)

Module 12: Scientific Project Work (MMT)

Master Program: Manufacturing Technology (MMT)

Cycle	Duration	Section of Study	Credits	Workload
annual	1 semester	3rd semester	10	300 h

1 Module Structure

No.	Element/Course	Type	Credits	SWS
1	Scientific Project Work + Oral Presentation		10	7

2 Language of the course

English

3 Content

The Scientific Project involves a study-accompanying homework in the scope of 10 CP in a team work format. Each team member has to prepare an independent part proving their individual performance for evaluation by the examiner. Within four weeks after the submission of the homework, each student has to show the results by giving a presentation. Scientific Project Works are offered by the Faculty.

4 Competence

By preparing a scientific project work and doing an oral presentation, students acquire the competence to do scientific work and to apply scientific knowledge as well as gain technical and method competence. Furthermore, by working in intercultural teams, students acquire teamwork skills, presentation competence, etc., which promote the social and intercultural skills, i.e., professional key skills.

5 Examination

Written exam, presentation, assignment, seminar, or oral exam. The type of the exams is announced at the beginning of the respective element.
The module may be completed with a single course worth 10 CP or a combination of several single courses each worth less than 10 CP. The grade of the module is calculated by using the credit point weighted average of the single courses. Even though the total credit points of the single courses may be higher than 10, the module will only be counted as 10 credit points.

6 Form of the Examination and Ratings

☐ Module examination	☐ Partial performances

7 Prerequisites

None

8 Module Type and Usability of the Module

Compulsory module

9 Representative of the Module	Responsible Faculty
Dependent on the examiner	Faculty of Mechanical Engineering (7)

Module 13: Interdisciplinary Qualification (MMT)

Master Program: Manufacturing Technology (MMT)

Cycle	Duration	Section of Study	Credits	Workload
annual	1 semester	3rd semester	10	300 h

1 Module Structure

No.	Element/Course	Type	Credits	SWS
1	Interdisciplinary Qualification		10	

2 Language of the course

English, other languages if offered

3 Content

The module „Interdisciplinary Qualification (non-technical elective course) can be offered by any academic unit of TU Dortmund University and must meet the following requirements:

- The content must be non-technical.
- The module is completed with 10 CP and may be composed of one single course or severals courses of different departments. The module is therefore completed either with partial performances or a module exam.

A variety of courses are offered at TU Dortmund University, some of which are listed below:

- Culture and Technology
- Scientific Writing
- Teambuilding
- Business & Legal English Today
- Business English Today I & II
- Technical English
- German as a Foreign Language

4 Competence

Completing elective modules from the social sciences, humanities, or economics range allows students to be introduced to and become familiar with methods applied in other disciplines of science. In this way, students improve their language, social, and intercultural as well as diversity skills.

5 Examination

Written exam, presentation, assignment, seminar, or oral exam. The type of the exams will be announced at the beginning of the elected element.
The module may be completed with a single course worth 10 CP or a combination of several single courses each worth less than 10 CP. The grade of the module is calculated by using the credit point weighted average of the single courses. Even though the total credit points of the single courses may be higher than 10, the module will only be counted as 10 credit points.

6 Form of the Examination and Ratings

☐ Module examination	☐ Partial performances

7 Prerequisites

None

8 Module Type and Usability of the Module

Compulsory module

9 Representative of the Module

Dependent on the examiner

Responsible Faculty

Faculty of Mechanical Engineering (7)

Module 14: Master´s Thesis

Master Program: Manufacturing Technology (MMT)

Cycle	**Duration**	**Section of Study**	**Credits**	**Workload**
annual	1 semester	4th semester	30	900 h

1 Module Structure

No.	**Element/Course**	**Type**	**Credits**	**SWS**
1	Master´s Thesis with oral Presentation		30	2

2 Language of the course

English

3 Content

The master‘s thesis is a scientific work that concludes the master program. It aims to demonstrate that the candidate is able to solve a problem independently within a period of one semester by applying scientific methods.

4 Competence

By completing the master‘s thesis, students demonstrate their ability to perform a scientific work independently, to apply scientific knowledge, to solve engineering problems, and to perform a final oral presentation. Not only technical but also method competence shall be acquired. By preparing and performing the oral presentation, students also develop key skills in decision making, taking responsibility and having self-confidence.

5 Examination

Master’s thesis (80%) and presentation (20%)

6 Form of the Examination and Ratings

☒ Module examination	☐ Partial performances

7 Prerequisites

In order to start the master’s thesis, the students must have at least 80 ECTS credit points.

8 Module Type and Usability of the Module

Compulsory module

9 Representative of the Module	**Responsible Faculty**
Dependent on the instructor	Faculty of Mechanical Engineering (7)

Module17: Machining Process Simulation

Master Program: Manufacturing Technology (MMT)

Cycle	**Duration**	**Section of Study**	**Credits**	**Workload**
annual	1 semester	1st semester	5	150 h

1 Module Structure

No.	**Element/Course**	**Type**	**Credits**	**SWS**
1	Machining Process Simulation	L(2,5)+E(1)	5	3.5
		40h in course, 110h self-study		

2 Language of the course

English

3 Content

A detailed insight into machining processes is the most important precondition to understand their principle working mechanisms and, hence, to use this knowledge for their planning and optimization. For this reason, modeling and simulation approaches which are capable of deriving predictions for different process values are in the focus of this lecture. Today such process simulation systems are subject to research on the one hand but they are applied in industry to a certain extend as well, which is mainly driven by the availability of low cost computational power. This lecture deals with the modeling and simulation of machining processes (mainly turning and milling), focusing on the processes themselves. Starting with a definition and classification of different modeling methods such as analytical, empirical, finite-element-based and geometrical-physical, these methods are explained successively. Their working principles are outlined, but also restrictions and boundary conditions are discussed. Also, one or two systems are presented in live demonstrations.

4 Competence

The students get an overview of different existing modeling concepts for the simulation of machining processes. They have knowledge about the working principles of these models and of the realization of some of the models in software tools as well. With this knowledge, they are enabled to choose appropriate modeling concepts for the simulation of machining processes, with respect to accuracy, efficiency and reliability. In addition, they can assess the validity calculated simulation results.

5 Examination

Written exam

6 Form of the Examination and Ratings	
☒ Module examination	☐ Partial performances

7 Prerequisites

None

8 Module Type and Usability of the Module

Elective module

9 Representative of the Module	**Responsible Faculty**
Priv.-Doz. Dr.-Ing. Dipl.-Inform. Andreas Zabel	Faculty of Mechanical Engineering (7)

Module 18: High Dynamic Testing of Materials				
Master Program: Manufacturing Technology (MMT)				
Cycle annual	**Duration** 1 semester	**Section of Study** 1st semester	**Credits** 5	**Workload** 150 h

1	**Module Structure**			
	No.	**Element/Course**	**Type**	**Credits**
	1	High Dynamic Testing of Materials	L(2,5)+E(1)	5
			40h in course, 110h self-study	
2	**Language of the course**			
	English			
3	**Content**			
	This lecture gives an overview of the methods in testing the macroscopic materials behavior under high dynamic loading. Creep and quasistatic tests are dealt with to complete the field of uniaxial tests. In the field of dynamic testing, the focus is on the Hopkinson bar technique, which is widely in use in different variations. Elastic waves play a major role in dynamic testing of materials. The generation and propagation are fundamentally discussed. Shock waves are also dealt with because they are applied in some dynamic material tests as well as in metal forming. The physics of materials behavior and the correct analytical description are also part of the lecture.			
4	**Competence**			
	The lecture provides students with a detailed knowledge of the dynamic testing principles, the limits of the methods, and the differences to quasistatic testing. Furthermore, students gain an understanding of the basic micro mechanisms as a function of the strain rate and learn to decide autonomously on a test method.			
5	**Examination**			
	Written or oral exam			
6	**Form of the Examination and Ratings**			
	☒ Module examination		☐ Partial performances	
7	**Prerequisites**			
	None			
8	**Module Type and Usability of the Module**			
	Elective module			
9	**Representative of the Module**		**Responsible Faculty**	
	Dr. Erhardt Lach		Faculty of Mechanical Engineering (7)	

Module 19: Plastics Processing Technology (MMT)

Master Program: Manufacturing Technology (MMT)

Cycle	Duration	Section of Study	Credits	Workload
annual	1 semester	2nd semester	5	150 h

1 Module Structure

No.	Element/Course	Type	Credits
1	Plastics Processing Technology	L(2,5)+E(1)	5
		40h in course, 110h self-study	

2 Language of the course

English

3 Content

The first part provides important mechanical, thermal, and rheological properties of thermoplastics that are relevant to plastics processing techniques. Afterwards, important plastics processing technologies are explained. The focus will be on injection moulding, extrusion, thermoforming, blow moulding, and welding. Finally an introduction to the design of tools for plastics processing is given.

4 Competence

Completing this module, attendees are able to decide which material properties are important with regard to processing of plastic materials. The attendees are also able to calculate mechanical, thermal, and rheological properties of tools by using analytical methods. They know the possibilities, efforts, and limitations of these methods and can decide under which circumstances which method is advantageous. Furthermore, the attendees have a broad overview of the most important plastics processing technologies. They can decide which process is suitable for which plastic part and what the specific features of the processes are.

5 Examination

Written or oral exam

6 Form of the Examination and Ratings

☒ Module examination	☐ Partial performances

7 Prerequisites

Mathematics up to simple integrals and partial differential equations.

8 Module Type and Usability of the Module

Elective module

9 Representative of the Module

Univ.-Prof. Dr.-Ing. Markus Stommel

Responsible Faculty

Faculty of Mechanical Engineering (7)

Module 20: Topics in Manufacturing Technology				
Master Program: Manufacturing Technology (MMT)				
Cycle annual	**Duration** 1 or 2 semester(s)	**Section of Study** 1st/2nd semester	**Credits** 5 or 10	**Workload** 150 h or 300 h

1	Module Structure			
	No.	**Element/Course**	**Type**	**Credits**
	1	Topics in Manufacturing Technology		5 or 10

2	Language of the course
	English or German

3	Content
	In the module „Topics in Manufacturing Technology“, any course offered by any department/university can be taken if the following requirements are fulfilled: • The content must be manufacturing technology. • Prior written approval of suitability of a course by the MMT Coordination is required for • crediting. • The module can be composed of different courses of different universities/departments. • The module can only be completed with 5 CP or 10 CP.

4	Competence
	Students acquire in-depth and advanced knowledge in one or several further fields of manufacturing technology according to their individual preferences.

5	Examination
	Written exam, presentation, assignment, seminar, or oral exam. The type of exam is usually announced at the beginning of the elected element. The grade of the module is calculated by using the credit-point weighted average of the single courses. So, even though the total of the credit points of the single courses may amount to more than 5 or 10, the module will only be credited with 5 CP or 10 CP, respectively.

6	Form of the Examination and Ratings	
	☐ Module examination	☐ Partial performances

7	Prerequisites
	None

8	Module Type and Usability of the Module
	Elective module

9	Representative of the Module	Responsible Faculty
	Dependent on the examiner	Faculty of Mechanical Engineering (7)