

# **Modulhandbuch für den Studiengang / Module manual of the study programme: Master Mechanical Engineering**

Fachbereich Technik, Fachrichtung Maschinenbau /Department of  
Engineering, subject area Mechanical Engineering

Hochschule Trier  
Trier University of Applied Sciences

Version 01.01.WiSe2022

19.10.2022

## **Hinweis:**

**Die Form/Art der Prüfungen kann im Wintersemester 2022/2023  
vor dem Hintergrund der Auswirkungen der Corona-Pandemie  
durch den Beschluss des Prüfungsausschusses durch eine andere  
Form/Art ersetzt werden.**

## **Notice:**

**Against the background of the effects of the Corona pandemic the  
form/type of the examinations may be replaced by another  
form/type in the winter semester 2022/2023 by decision of the  
audit committee.**



# Inhaltsverzeichnis / Table of Contents

CAE/Project Management I (M) . . . . .	8
CAE/Project Management I (M) . . . . .	8
CAE/Project Management II (M) . . . . .	11
CAE/Project Management II (M) . . . . .	11
CAX-e . . . . .	14
CAX-e . . . . .	14
Competition and Innovation (M) . . . . .	16
Competition and Innovation (M) . . . . .	16
Economics (M) . . . . .	18
Economics (M) . . . . .	18
Energy-efficient vehicles (M) . . . . .	20
Energy-efficient vehicles (M) . . . . .	20
Ethics and compliance . . . . .	22
ethics and compliance . . . . .	22
Finite elements method (M) . . . . .	24
Finite elements method (M) . . . . .	24
Fluid mechanics (M) . . . . .	26
Fluid mechanics (M) . . . . .	26
Higher Machine Elements (M) . . . . .	28
Higher Machine Elements (M) . . . . .	28
Hydraulic systems engineering (M) . . . . .	30
Hydraulic systems engineering (M) . . . . .	30
Internal combustion engines I (M) . . . . .	32
Internal combustion engines I (M) . . . . .	32
Internal combustion engines II (M) . . . . .	34
Internal combustion engines II (M) . . . . .	34
International management (M) . . . . .	36
International management (M) . . . . .	36
Machine Tools and Production Equipment I (M) . . . . .	38
Machine Tools and Production Equipment I (M) . . . . .	38
Machine Tools and Production Equipment II (M) . . . . .	40
Machine Tools and Production Equipment II (M) . . . . .	40
Master thesis (M) . . . . .	42
Master thesis (M) . . . . .	42
Materials Management and Logistics (M) . . . . .	44
Materials Management and Logistics (M) . . . . .	44
Mathematics (M) . . . . .	46
Mathematics (M) . . . . .	46
Numerical mathematics (M) . . . . .	48
Numerical mathematics (M) . . . . .	48
Optical metrology (M) . . . . .	50
Optical metrology (M) . . . . .	50
Patent law (M) . . . . .	55
Patent law (M) . . . . .	55

Precision Machines (M) . . . . .	57
Precision Machines (M) . . . . .	57
Production engineering (M) . . . . .	59
Production engineering (M) . . . . .	59
Programming of ERP systems using SAP®-S/4HANA® . . . . .	61
Programming of ERP systems using SAP®-S 4HANA® . . . . .	61
Project work (M) . . . . .	63
Project work (M) . . . . .	63
Quality and Reliability I (M) . . . . .	65
Quality and Reliability I (M) . . . . .	65
Quality and Reliability II (M) . . . . .	67
Quality and Reliability II (M) . . . . .	67
Scientific methodology (M) . . . . .	69
Scientific methodology (M) . . . . .	69
Simulation of dynamic systems (M) . . . . .	71
Simulation of dynamic systems (M) . . . . .	71
Statistics MB (M) . . . . .	73
Statistics MB (M) . . . . .	73
Systems engineering (M) . . . . .	75
Systems engineering (M) . . . . .	75
Technical measurement (M) . . . . .	77
Technical measurement (M) . . . . .	77
Thermodynamics (M) . . . . .	84
Thermodynamics (M) . . . . .	84
Transportation systems (M) . . . . .	86
Transportation systems (M) . . . . .	86
Turbomachinery (M) . . . . .	88
Turbomachinery (M) . . . . .	88
Vehicle Drives and Chassis (M) . . . . .	90
Vehicle Drives and Chassis (M) . . . . .	90
Vehicle safety (M) . . . . .	92
Vehicle safety (M) . . . . .	92
Vibration engineering (M) . . . . .	94
Vibration engineering (M) . . . . .	94

## Hinweise und Anmerkungen zu den Modulbeschreibungen

Das Modulhandbuch basiert auf den derzeit aktuellen Prüfungsordnungen.

1. **Lehrveranstaltung:** Eine Lehrveranstaltung kann verschiedene Lehrformen, z.B. Vorlesungen (V), Übungen (Ü), Laborübungen (L), Seminare (S) usf. enthalten.
2. **Modul:** Falls mehrere Lehrveranstaltungen zum gleichen Modul gehören, tragen sie gemeinsame Modulbezeichnungen.
3. **Modulverantwortlicher:** Angaben zum Modulverantwortlichen
4. **Lehrende/Prüfende:** Falls eine Lehrveranstaltung von mehreren Lehrenden/Prüfenden angeboten wird, ist für jeden weiteren Lehrenden/Prüfenden eine eigene Zeile anzufügen.
5. **Studienabschnitt:** BA-Studium (Bachelor-Studium), MA-Studium (Master-Studium), Fernstudium, Aufbaustudium. Die Angabe dient auch zur Definition des Niveaus.
6. **Semester:** gemäß Studienplan für Wintersemesterbeginner. Sommersemesterbeginner sehen bitte in den Studienplan.
7. **Qualifizierungsziele:** kompakte Beschreibung
8. **Aufbauend auf:** Hier werden Module bezeichnet, die zur Belegung des Moduls empfohlen werden, jedoch nicht formal vorausgesetzt werden.
9. **Formale Voraussetzungen:** Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. Für Studierende der Bachelor-Studiengänge Maschinenbau, Wirtschaftsingenieurwesen, Sicherheitsingenieurwesen und der Dualen Bachelor-Studiengänge Maschinenbau (dual) und Wirtschaftsingenieurwesen (dual) gilt: Bezüglich der Zulassung zu Prüfungsleistungen ab dem 3. Semester ist die zugehörige Prüfungsordnung zu beachten.
10. **Prüfungsleistung:** Unter Prüfungsleistung sind die Prüfungsformen aufgeführt.
11. **Studienleistung:** Eine Studienleistung ist eine von einer/einem Prüfenden bewertete individuelle Leistung.
12. **SWS aufgeschlüsselt:** SWS nach Lehrform(en); (s. 1)
13. **ECTS:** European Credit Transfer System, 1 ECTS = 30 Arbeitsstunden
14. **Stellenwert der Note:** Als Stellenwert bezeichnet man den Anteil, mit dem die Note des Moduls in die Gesamtnote des Abschlusses eingeht.
15. **Selbststudium:** Zeit, die außerhalb der Präsenzveranstaltungen aufzubringen ist
16. **Kommentare:** bei Bedarf
17. **Bemerkungen:** bei Bedarf

**ECTS-Punkte:** Messen den Zeitaufwand der Studierenden einschließlich der häuslichen Arbeit für eine Lehrveranstaltung bzw. ein Modul im Gegensatz zu den üblichen SWS („contact hours“, die ein Maß für die Belastung der Lehrenden sind). Normale Semesterleistung: 30 ECTS-Punkte; unterstellte Arbeitsleistung bis zu 900 Std. pro Semester: 1 ECTS-Punkt entspricht also etwa 30 Stunden mittlerer Arbeitsaufwand eines Studierenden.

**Hinweis zu Modulen anderer Fachbereiche:** Bei den Modulen Ihres Studiengangs, die nicht in diesem Modulhandbuch aufgeführt sind, handelt es sich um Module aus anderen Fachbereichen. Die

Informationen zu fast allen interdisziplinären Modulen sind auf der Website des Fachbereichs Informatik zu finden. Informationen zum Modul ‚Brennstoffzellen- und Batterietechnik‘ sind auf der Website des Fachbereichs Umweltplanung / Umwelttechnik vermerkt. [Modulhandbuch des Fachbereich Informatik - Bachelor](#), [Modulhandbuch: Bachelor-Studiengänge Informatik nach PO 2016](#), [Modulhandbuch des Fachbereich Informatik - Master](#)

## Notes and comments on the module descriptions

The module manual is based on the current examination regulations.

1. **Course:** A course can contain different forms of teaching, e.g. lectures (V), exercises (Ü), laboratory performances (L), seminars (S), and so on.
2. **Module:** If several courses belong to the same module, they have common module names.
3. **Module coordinator:** Details of the person responsible for the module.
4. **Lecturer/Examiner:** If a course is offered by more than one lecturers/examiners, a separate line must be added for each additional lecturer/examiner.
5. **Level:** Bachelor course, master course, distance course, postgraduate course. The specification also serves to define the level.
6. **Course is given in semester:** According to the study plan for winter semester beginners. Summer semester beginners please refer to the study plan.
7. **Objectives:** compact description
8. **Based on:** Modules are designated here that are recommended for taking the module but are not formally required.
9. **Formal Prerequisites:** Prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances. For students of the bachelor programmes Mechanical Engineering, Industrial Engineering, Safety Engineering and the cooperative study programmes Mechanical Engineering (dual) and Industrial Engineering (dual) the following applies: Regarding the admission to examinations from the 3rd semester on, the respective examination regulations have to be observed.
10. **Exam performance:** The forms of examination are listed under exam performance.
11. **Study performance:** A study performance is an individual performance evaluated by an examiner.
12. **SWS categorisation of semester load:** SWS by teaching form(s); (s. 1)
13. **ECTS:** European Credit Transfer System, 1 ECTS = 30 working hours
14. **Final mark ration:** The ration value is the proportion with which the grade of the module is included in the overall grade of the degree.
15. **Self-study:** Time to be spent outside of the face-to-face studies.
16. **Comments:** if required
17. **Remarks:** if required

**ECTS points:** Measure the amount of time students spend on a course or module, including the work they do at home, in contrast to the usual SWS (“contact hours”, which are a measure for the load of the teachers). Normal semester performance: 30 ECTS points - assumed workload of up to 900 hours per semester. 1 ECTS point thus corresponds to about 30 hours of average workload of a student.

**Note on modules from other departments:** The modules of your study programme that are not listed in this module manual are modules from other departments. Information on almost all interdisciplinary modules can be found on the website of the Department of Computer Science. Information on the Module ‚Brennstoffzellen- und Batterietechnik‘ is on the website of the Department of Environmental Planning / Environmental Technology. [Module manual of the Department of Computer Sciences - Bachelor](#), [module manual: Bachelor-Studiengänge Informatik nach PO 2016](#), [module manual of the Department of Computer Sciences - Master](#)

Lehrveranstaltung <sup>1</sup> / Course	CAE/Project Management I (M)			
Modul <sup>2</sup> /Module	CAE/Project Management I (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [required module] Master Mechanical Engineering [required module] Master Mechanical Engineering AMB [required module] Master Mechanical Engineering FZT [required module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Michael	Schuth
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Michael	Schuth
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	Design / CAE /CAD, structures in the company, forms of project organization, project goals in their dependence, milestones and critical path, use of IT for project management of small and medium, practice oriented projects, project organization, phases of the project (concept phase, design phase, elaboration phase) in connection with presentations in PowerPoint, Cooperation and communication in the project, stress, - self, - time management, comparison of the models of time management, performance curve, the 8 biggest time killers, mind-mapping, directives (machine directives, product safety directive, (CE certification), risk analysis, cost responsibility in the project, basics of cost accounting for cost-effective projecting, magic triangle: Quality, time, costs, technical documentation, CAD in application, technical and economic project planning, integrating the Internet in projects, Office Professional in project application, patent research, costing procedures, component optimization, House of Quality, presentation techniques, advanced technical documentation, simultaneous engineering, extended project completion, handover of projects, coordinated project completion, project management closing			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	After successful completion of the module, the student will be able to design, schedule and manage innovation projects. He/she moves into the role of both the administrator and the project manager. A variety of software packages are used, such as MS-Project, Excel, Word, CATIA, FEM, simulation software etc. The student knows the project process according to the methods of classical project management with the help of CAE techniques.			
Aufbauend auf <sup>8</sup> / Based on	Design guidelines, CAD, FEM, machine elements, EDP, English knowledge			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			



Prüfungleistung <sup>10</sup> / Exam performance	Projektarbeit und Klausur / project paper and written exam
Studienleistung <sup>11</sup> / Study performance	Übungsleistung / exercise performance Voraussetzung zum Ablegen der Prüfungsleistung: ja Prerequisite for taking the exam performance: yes
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	none
Literatur/Literature	<ul style="list-style-type: none"> <li>• • C. N. Madu: House of Quality in a Minute, Fairfield (USA): Chi Publisher, 2000 Hoischen - TZ 32. Auflage Cornelsen-Verlag ISBN 3-464-48009-7</li>   <li>Technisches Zeichnen 23. Auflage Teubner-Verlag ISBN 3-519-36725-4</li>   <li>Einführung in die DIN-Normen 13. Auflage .. Teubner-Verlag ISBN 3-519-26301-7</li>   <li>Grundlagen der Konstruktionslehre Bildungsverlag E1NS ISBN 3- 427- 05303- 2</li>   <li>Tabellen Buch für Metalltechnik Handwerk und Technik           <ul style="list-style-type: none"> <li>• B. Wartman: The Certified Six Sigma Black Belt Primer</li> <li>• West Terre Haute (USA): Quality Council of Indiana, 2001</li> </ul> </li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	2 SWS Vorlesung, 2 SWS Seminar
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch (Vorlesung), Englisch (Übung) / German (lecture), English (exercise)
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually

Dauer des Moduls Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Literaturempfehlung: Schuth Leitlinie für das Anfertigen von Projekt-, Bachelor- und Masterarbeiten in den MINT-Fächern Mit Präsentationstechnik Shaker Verlag
Bemerkungen <sup>17</sup> / Comments	none

Lehrveranstaltung <sup>1</sup> / Course	CAE/Project Management II (M)			
Modul <sup>2</sup> /Module	CAE/Project Management II (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Michael	Schuth
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Michael	Schuth
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	3. Semester / 3rd semester			
Stoffinhalt/Contents	Design / CAE /CAD, structures in the company, forms of project organization, project goals in their dependence, milestones and critical path, use of IT for project management of small and medium, practiceoriented projects, project organization, phases of the project (concept phase, design phase, elaboration phase) in connection with presentations in PowerPoint, Cooperation and communication in the project, stress, - self, - time management, presentation of the models of time management, performance curve, the 8 biggest time killers, mind-mapping, guidelines (Machinery Directive, Product Safety Directive, CE certification) risk analysis, cost responsibility in the project, basics of cost accounting for cost-effective projecting, magic triangle: Quality, time, costs, technical documentation, CAD in application, technical and economic project planning, integrating the Internet in projects, Office Professional in project application, patent research, costing procedures, component optimization, House of Quality, presentation techniques, advanced technical documentation, simultaneous engineering, extended project completion, handover of projects, coordinated project completion, project management, project managementclosing			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	The students learn to design, schedule and manage innovation projects by means of case studies and independent project work with the help of extensive use of IT. A variety of software packages are used, such as MS Project, Excel, Word, CATIA, FEM, simulation software, etc. The students learn the project process according to the methods of the classic Project management with the help of CAE techniques.			
Aufbauend auf <sup>8</sup> / Based on	Design guidelines, CAD, FEM, machine elements, EDP, English knowledge			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungleistung <sup>10</sup> / Exam performance	Projektarbeit / project paper			

Studienleistung <sup>11</sup> / Study performance	keine / none Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	none
Literatur/Literature	<ul style="list-style-type: none"> <li>• • C. N. Madu: House of Quality in a Minute, Fairfield (USA): Chi Publisher, 2000 Hoischen - TZ 32. Auflage Cornelsen-Verlag ISBN 3-464-48009-7</li>   <li>Technisches Zeichnen 23. Auflage Teubner-Verlag ISBN 3-519-36725-4</li>   <li>Einführung in die DIN-Normen 13. Auflage Teubner-Verlag ISBN 3-519-26301-7</li>   <li>Grundlagen der Konstruktionslehre Bildungsverlag E1NS ISBN 3- 427- 05303- 2</li>   <li>Tabellen Buch für Metalltechnik Handwerk und Technik           <ul style="list-style-type: none"> <li>• B. Wartman: The Certified Six Sigma Black Belt Primer,</li> <li>• West Terre Haute (USA): Quality Council of Indiana, 2001</li> </ul> </li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Seminar
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch (Vorlesung), Englisch (Übung) / German (lecture), English (exercise)
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester

Kommentare <sup>16</sup> / Comments	Literaturempfehlung: Schuth Leitlinie für das Anfertigen von Projekt-, Bachelor- und Masterarbeiten in den MINT-Fachern mit Präsentationstechnik erschienen im Shaker Verlag
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	CAX-e			
Modul <sup>2</sup> /Module	CAX-e			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Karl	Hofmann-von Kap-herr
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Frau / Mrs.			wird vom Prüfungsausschuss festgelegt
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	1., 2. oder 3. Semester / 1st, 2nd or 3rd semester			
Stoffinhalt/Contents	<p>A CAX project can be supervised by all teachers in the department of engineering. Please ask them whether such a project can be offered in your desired subject and pay attention to the displays in the showcases and the information on the websites of the lecturers.</p> <p>In the CAX project, the students develop a solution for an engineering problem in mechanical and automotive engineering, e.g. with the help of computer-based CAX software or self-programmed software, and document their results scientific approach.</p>			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	<p>After successful completion of the module, the students are able to work independently on a development or research task in automotive engineering and mechanical engineering with the help of CAX techniques. For this purpose, the students successfully apply software-based CAX techniques, for example in conception, design, computational design, simulation, optimization or project management, and document this in a presentation of results.</p> <p>The independent development of computer-supported solutions to a current topic promotes the students independence and problem solving skills. By working on a practical problem, the student identifies with this task and is prepared for the challenges in later engineering work call prepared.</p>			
Aufbauend auf <sup>8</sup> / Based on	none			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungleistung <sup>10</sup> / Exam performance	Projektarbeit / project paper			

Studienleistung <sup>11</sup> / Study performance	keine / none Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	all
Literatur/Literature	<ul style="list-style-type: none"> <li>• • Michael Schuth: Leitlinie für das Anfertigen von Projekt-, Studien- und Diplomarbeiten im technischen Bereich mit Präsentationstechnik</li> </ul>
SWS gesamt/ Total semester load	0
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	150 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	
Turnus / Rhythm	
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	The project can also be worked on in a team if the tasks are appropriately extensive and the services are not assigned to individual employees. Students can be unambiguously assigned.
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	Competition and Innovation (M)			
Modul <sup>2</sup> /Module	Competition and Innovation (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [required module] Master Mechanical Engineering [required module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr. rer. nat.	Lars	Draack
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr. rer. nat.	Lars	Draack
	Herr / Mr.	Prof. Dr.-Ing.	Hartmut	Zoppke
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	Competition: Strategic management, strategic marketing, analysis of market forces, five forces model, influence of suppliers, fragmentation of markets, SWOT analyses, corporate social responsibility, internet as a market factor, first mover advantage, strategic issue management, crisis management, business ethics as part of competitive strategy, case study analyses. Innovation management: Basics of innovation and product management and strategic planning, generation and evaluation of product ideas, product conception (QFD, FMEA, Target Costing), product development (simultaneous engineering, virtual/rapid prototyping), lifecycle management, product development, product development, product development, product development, product development management, application of theory in case studies.			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	After completing the module, students will be able to apply basic competition models to entrepreneurial issues, analyze competitive situations of firms and evaluate corporate strategies with regard to their economic sustainability. Students will be able to assess the importance of innovation management for the success of a company and apply the essential tools in business practice. They can evaluate innovations and develop procedures for their realization develop			
Aufbauend auf <sup>8</sup> / Based on	Marketing, Industrial Economics			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			



Prüfungleistung <sup>10</sup> / Exam performance	Projektarbeit / project paper
Studienleistung <sup>11</sup> / Study performance	keine / none Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	None
Literatur/Literature	<ul style="list-style-type: none"> <li>• • Porter, Michael E.: Wettbewerbsstrategie: Methoden zur Analyse von Branchen und Konkurrenten,original: Competitive Strategy, 11. Aufl. 2008</li> <li>• Stern, T.; Jaberg, H.; Erfolgreiches Innovationsmanagement. Erfolgsfaktoren - Grundmuster - Fallbeispiele, Wiesbaden 2010</li> <li>• Gaubinger, K.; Werani, T.; Rabl, M.; Praxisorientiertes Innovations- und Produktmanagement , Wiesbaden 2009</li> <li>• Fisch, J.H.; Roß, J-M.; Fallstudien zum Innovationsmanagement, Wiesbaden 2009</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Keine/none
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	Economics (M)			
Modul <sup>2</sup> /Module	Economics (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Thomas	Bonart
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Thomas	Bonart
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	1. oder 2. Semester / 1st or 2nd semester			
Stoffinhalt/Contents	First Alternative: Participants work on a significant theoretical literature contribution in the field of economics public choice. You will be guided and professionally accompanied. Second Alternative: Current economic topics are discussed on the basis of newspaper articles. Participants develop theoretically sound short presentations on open questions.			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	After successful completion of the module, participants are able to work out economic theory content on their own. In one or more presentations they will be able to present the content argumentatively. critically and show the current relevance.			
Aufbauend auf <sup>8</sup> / Based on	Keine/none			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungleistung <sup>10</sup> / Exam performance	Präsentation / presentation			
Studienleistung <sup>11</sup> / Study performance	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmit- tel zur Erbringung der Prüfungsleistung / Ap- proved aid for the exam performance	None			
Literatur/Literature	<ul style="list-style-type: none"> <li>• To be arranged individually or researched by students.</li> </ul>			
SWS gesamt/ Total semester load	4			

SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Winter- und Sommersemester / winter and summer semester
Turnus / Rhythm	unregelmäßig / irregular
Dauer des Moduls Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Completion of a bachelor degree with substantial business content is helpful.
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	Energy-efficient vehicles (M)			
Modul <sup>2</sup> /Module	Energy-efficient vehicles (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Electrical Engineering [compulsory elective module] Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Hartmut	Zoppke
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Hartmut	Zoppke
	Herr / Mr.	Prof. Dr.	Hellmut	Hupe
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	<p>Expected developments in the global vehicle population, primary energy resources and CO2 emissions are presented. The results are based on a comparison of the current and future climate development, current and future legislation, and fuel costs.</p> <p>Comparison of different efficiency indicators. Influence of the design parameters of a vehicle on energy efficiency.</p> <p>Efficiency and emissions, energy chains: well-to-wheel and future fuel options, trends and potentials in powertrains Efficiency. Battery electric vehicles and hybrid drives, efficiency potential of auxiliary drives. Potentials for minimizing driving resistance and lightweight construction, influences of vehicle operation and driving style, predictive operating strategies and driver assistance systems, presentation and assessment of realized concepts and vehicles.</p>			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	<p>Upon successful completion of the module, students will know the importance of energy efficiency as well as reduction of CO2-emissions for future transport. They can evaluate the efficiency of vehicles and can assess the effectiveness of efficiency-improving measures in the different energy conversion processes along the chain from fuel production to driving.</p>			
Aufbauend auf <sup>8</sup> / Based on	Keine/none			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	<p>Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.</p>			
Prüfungleistung <sup>10</sup> / Exam performance	Klausur / written exam			
Studienleistung <sup>11</sup> / Study performance	<p>Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no</p>			

Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	None
Literatur/Literature	<ul style="list-style-type: none"> <li>• • Lecture notes with reference to extensive technical literature          - Hybridfahrzeuge - Ein alternatives Antriebssystem für die Zukunft " Hofmann, Peter, 2014, Springer-Verlag Wien, ISBN 978-3-7091- 1779-8</li> <li>• Handbuch Lithium-Ionen-Batterien          Korthauer, R., Springer-Verlag Berlin Heidelberg 2013, ISBN 978-3-642-30652-5/978-3-7091-1779-8</li> </ul>
SWS gesamt/ Total semester load	0
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	ethics and compliance			
Modul <sup>2</sup> /Module	Ethics and compliance			
Fachbereich/ Department	Technik, Fachrichtung Elektrotechnik /Department of Engineering, subject area Electrical Engineering			
Studiengang/ Degree Programme	Master Electrical Engineering [compulsory elective module] Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Jan Christoph	Otten
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Jan Christoph	Otten
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	3. Semester / 3rd semester			
Stoffinhalt/Contents	<ul style="list-style-type: none"> <li>• Foundations and development of ethics</li> <li>• Questions of ethics in technology or technical professions</li> <li>• Compliance as the application of ethics in technical and economic activities</li> <li>• Legal framework</li> <li>• Compliance systems in the company</li> <li>• Economic considerations</li> <li>• Compliance as a competitive advantage</li> </ul> The topics, with the exception of the basics, are taught using practical examples			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	After successful completion of the module, the students know the ethical issues of their actions and are able to evaluate processes on this basis. They understand how ethics influence the legal framework for the activities of engineers. They are familiar with management systems to ensure compliance and can assess their suitability for different scenarios.			
Aufbauend auf <sup>8</sup> / Based on	Keine/none			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Seminararbeit / seminar paper			
Studienleistung <sup>11</sup> / Study performance	keine / none Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			

Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	
Literatur/Literature	<ul style="list-style-type: none"> <li>• • Allgemeine Ethik, Friedo Ricken</li> <li>Handbuch Technikethik, Armin Grunwald / Melanie Simonidis Puschmann</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Seminar
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Finite elements method (M)			
Modul <sup>2</sup> /Module	Finite elements method (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [required module] Master Mechanical Engineering [required module] Master Mechanical Engineering AMB [required module] Master Mechanical Engineering FZT [required module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Alexander	Wohlers
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Alexander	Wohlers
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	Matrix algebra, principle of variation for the construction of FEM in continuum mechanics; mass matrices, vaporization matrices, modal analysis, transient and stationary excitation, nonlinearities, introduction to FEM simulation, creation of simulation models, analysis of FEM simulations			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	The students apply numerical FEM simulation methods on the basis of the theoretical fundamentals. They are able to calculate the dynamic behavior of complex structures based on the simulation, analyze and further develop.			
Aufbauend auf <sup>8</sup> / Based on	Knowledge of mathematics, engineering mechanics, module special engineering mechanics of the bachelor program			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Projektarbeit und Klausur / project paper and written exam			
Studienleistung <sup>11</sup> / Study performance	keine / none			
	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmit- tel zur Erbringung der Prüfungsleistung / Ap- proved aid for the exam performance	none			



Literatur/Literature	<ul style="list-style-type: none"> <li>• • Vorlesungsskript</li> <li>• U. Stelzmann/C. Groth/G. Muller: FEM für Praktiker, Band 2, Expert-Verlag</li> <li>• Bathe, K.-J.: Finite-Elemente-Methoden, Springer</li> <li>• Betten, J.: Finite Elemente für Ingenieure 1 und 2, Springer</li> <li>• Mattheck, C.: Design in der Natur, Rombach</li> <li>• Rust, W.: Nichtlineare Finite-Elemente-Berechnungen, Vieweg und Teubner</li> <li>• Schumacher, A.: Optimierung mechanischer Strukturen, Springer</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	3 SWS Vorlesung, 1 SWS Übung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Fluid mechanics (M)			
Modul <sup>2</sup> /Module	Fluid mechanics (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [required module] Master Mechanical Engineering AMB [required module] Master Mechanical Engineering FZT [required module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Sven	Koenig
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Sven	Koenig
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	Introduction to tensor calculus, basic equations of fluid mechanics in general form (differential and integral), vortex flows, potential flows, basic principles of turbulence mechanics and turbulence theory. dellization, introduction to the flow simulation			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	Upon successful completion of the module, students will be able to: <ul style="list-style-type: none"> <li>• To apply the basic equations of fluid mechanics in their general form to new applications and to simplify them accordingly.</li> <li>• Evaluate results of flow simulations.</li> <li>• The following table shows the results of the CFD simulations.</li> </ul>			
Aufbauend auf <sup>8</sup> / Based on	Mathematics (Master), Fluid Mechanics and Thermodynamics (Bachelor)			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Projektarbeit und Klausur / project paper and written exam			
Studienleistung <sup>11</sup> / Study performance	keine / none			
	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	Own collection of formulas (5 sheets written on both sides)			

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Vorlesungsunterlagen</li> <li>• Strömungslehre (Spurk, Springer Verlag)</li> <li>• Strömungslehre (Schade, de Gruyter Verlag)</li> <li>• Fluid Mechanics (White, Verlag: McGraw-Hill)</li> <li>• Numerische Strömungsmechanik (Ferziger/Peric, Springer Verlag)</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	3 SWS Vorlesung, 1 SWS Übung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Higher Machine Elements (M)			
Modul <sup>2</sup> /Module	Higher Machine Elements (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Heiko	Bossong
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Heiko	Bossong
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	Compensating couplings; switchable clutches; self-acting clutches ( overload clutch, centrifugal clutch, overrunning clutch), load distribution problems in moving systems (multi-motor drive; load distribution to several outputs); multi-stage transmissions; Optimization of the transmission ratio when coupling engine and driven machine; power matching; hydrodynamic sliding bearings (solid friction-mixed friction-fluid friction; computational description of fluid friction; viscosity and temperature; thermodynamic equilibrium); selfpressing roller gears and selfpressing roller gears tensioned belt drives; bolted connection under combined tension and shear force loading, motion screws			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	After successful completion of the module, students are able to understand, design, construct and dimension machine elements in complex interaction. In doing so, facts outside of classical mechanics (e.g. from of thermodynamics) are used.			
Aufbauend auf <sup>8</sup> / Based on	Fundamentals of statics, strength of materials, kinematics and kinetics; fundamentals of engineering mathematics; machine elements of the bachelor program.			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungleistung <sup>10</sup> / Exam performance	Klausur / written exam			
Studienleistung <sup>11</sup> / Study performance	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	will be announced in lecture			

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Hinzen, H.: Maschinenelemente 1 (4. Auflage); De Gruyter Oldenbourg, Berlin/Boston, 2017</li> <li>• Hinzen, H.: Maschinenelemente 2 (4. Auflage); De Gruyter Oldenbourg, Berlin/Boston, 2018</li> <li>• Hinzen, H.: Maschinenelemente 3 (2. Auflage); De Gruyter Oldenbourg, Berlin/Boston, 2020</li> <li>• ergänzende Aufgabensammlung auf den Internetseiten des De Gruyter Verlags</li> </ul>
SWS gesamt/ Total semester load	0
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	2 SWS Vorlesung, 2 SWS Übung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Hydraulic systems engineering (M)			
Modul <sup>2</sup> /Module	Hydraulic systems engineering (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Harald	Ortwig
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Harald	Ortwig
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	3. Semester / 3rd semester			
Stoffinhalt/Contents	<ul style="list-style-type: none"> <li>• Basics of hydraulic resistance controls</li> <li>• Steady valves</li> <li>• Variable displacement pumps</li> <li>• Hydromotors</li> <li>• Structure of the control chain of servo-hydraulic drives</li> <li>• Servo drive controls</li> <li>• Application examples: mechanical-hydraulic controls</li> <li>• electro-hydraulic controls</li> <li>• servo-hydraulic systems in vehicle construction</li> </ul>			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	<ul style="list-style-type: none"> <li>• After successful completion of the module, students understand the system-technical structure of hydraulic circuits.</li> <li>• After successful completion of the module, students will be able to apply modeling and simulation to hydraulic circuits.</li> <li>• After successful completion of the module, students will be able to analyze the basic hydraulic elements in terms of control engineering.</li> <li>• Upon successful completion of the module, students will be able to evaluate hydraulic controlled systems from a systems engineering point of view.</li> </ul>			
Aufbauend auf <sup>8</sup> / Based on	Knowledge of hydraulics, control engineering			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungleistung <sup>10</sup> / Exam performance	mündliche Prüfung / oral exam			
Studienleistung <sup>11</sup> / Study performance	keine / none Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			

Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	none
Literatur/Literature	<ul style="list-style-type: none"> <li>• • Hubertus Murrenhoff: Servohydraulik</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Internal combustion engines I (M)			
Modul <sup>2</sup> /Module	Internal combustion engines I (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [required module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Christoph	Heinrich
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Christoph	Heinrich
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	1. Semester / 1st semester			
Stoffinhalt/Contents	The following topics are covered in the VBM I lecture: Introduction (engine categories, two- and four-stroke processes, fuels and emissions), essential parameters, applied thermodynamics and operating procedures (ideal processes, perfect engine, real process, loss sharing), combustion and charge cycling, components and component groups, engine and engine dynamics, exhaust gas aftertreatment, and the use of the engine, charge			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	The students learn in depth the basics of combustion engines and their essential components as well as the influence of the operating mode with regard to pollutant formation and fuel consumption. After completing the module, they will be able to perform scientific calculations and estimations. On the basis of the results, they will be able to analyze and assess problems as well as to develop alternative solutions, design operating modes.			
Aufbauend auf <sup>8</sup> / Based on	Knowledge of thermodynamics, fluid mechanics and mechanics			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Klausur / written exam			
Studienleistung <sup>11</sup> / Study performance	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmit- tel zur Erbringung der Prüfungsleistung / Ap- proved aid for the exam performance	Written exam part 1: calculator; written exam part 2: additional written documents of all kinds.			



Literatur/Literature	<ul style="list-style-type: none"> <li>• Vorlesungsskript VBM I (Heinrich) und Klausurensammlung</li> <li>• Verbrennungsmotoren Lehrbuch (Merker, Schwarz, Stisch, Otto, Teubner Verlag)</li> <li>• Handbuch Verbrennungsmotoren (van Basshuysen, Schäfer, Springer Vieweg Verlag)</li> <li>• Grundlagen und Technologien des Ottomotors (Eichl seder, Kluting, Piok, Springer Verlag)</li> <li>• Aufladung von Verbrennungsmotoren (Pucher, Zinner, Springer Verlag)</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Keine/none
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	Internal combustion engines II (M)			
Modul <sup>2</sup> /Module	Internal combustion engines II (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Christoph	Heinrich
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Christoph	Heinrich
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	<p>This course builds on the lecture VBM I in connection with the continuing engine laboratory. In new learning forms (learning teams), the students are to work on and present scientific questions on selected, innovative topics of engine technology. Integrated in the course, the students have to participate in the engine laboratory. In this course, students are familiarized with modern engine testing methods. In particular, fuel consumption, power and exhaust gas measurements are to be carried out under variation of certain parameters. Furthermore, an introduction to the one-dimensional modeling is given to process simulation takes place.</p>			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	<p>After completion of the module, the students are able to analyze, evaluate and present scientific questions in the field of combustion engines. They know the essential measurement methods for power, consumption and exhaust gas measurements and are able to perform evaluations on their own. They are able to evaluate measurement results and to compare them with simulation results as well as to develop their own experiments for technical development issues. In this way, they improve their self-competence with regard to the development of technical solutions, here specifically using the example of the internal combustion engine. By working together in learning teams, the social competence is also improved tenfold further expanded.</p>			
Aufbauend auf <sup>8</sup> / Based on	Knowledge in VBM I, fluid mechanics and thermodynamics			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Projektarbeit und mündliche Prüfung / project paper and oral exam			
Studienleistung <sup>11</sup> / Study performance	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			

Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	Project work: any literature; oral examination: none
Literatur/Literature	<ul style="list-style-type: none"> <li>• • Verbrennungsmotoren Lehrbuch (Merker, Schwarz, Stisch, Otto, Teubner Verlag)</li> <li>• Handbuch Verbrennungsmotoren (van Basshuysen, Schäfer, Springer Vieweg Verlag)</li> <li>• Grundlagen und Technologien des Ottomotors (Eichlseder, Kluting, Piok, Springer Verlag)</li> <li>• Aufladung von Verbrennungsmotoren (Pucher, Zinner, Springer Verlag)</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	1 SWS Vorlesung, 1 SWS Labor, 2 SWS Seminar
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Keine/none
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	International management (M)			
Modul <sup>2</sup> /Module	International management (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [required module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module] Master Wirtschaftsingenieurwesen - SoSe 2027 [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Peter	Koenig
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Peter	Koenig
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	3. Semester / 3rd semester			
Stoffinhalt/Contents	Development and comparison of national milieus, development of cultural backgrounds and the impact on behavior in international trade relations, basics of international management, ways and necessary processes for the internationalization of companies and enterprises.			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	Students will be able to compare individual business practices of selected cultures and assess their reaction to their own behavior. They will be able to develop concepts for the internationalization of a company on the basis of international management.			
Aufbauend auf <sup>8</sup> / Based on	Marketing and Industrial Economics			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Klausur / written exam			
Studienleistung <sup>11</sup> / Study performance	keine / none			
	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	none			
Literatur/Literature	<ul style="list-style-type: none"> <li>• Vorlesungsunterlagen</li> <li>• Internationales Management Grundlagen, Strategien und Konzepte ISBN 978-3-658-16163-7</li> </ul>			

SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch und Englisch / German and English
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Machine Tools and Production Equipment I (M)			
Modul <sup>2</sup> /Module	Machine Tools and Production Equipment I (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [required module] Master Mechanical Engineering [required module] Master Mechanical Engineering AMB [required module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Karl	Hofmann-von Kap-herr
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Karl	Hofmann-von Kap-herr
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	1. Semester / 1st semester			
Stoffinhalt/Contents	<ul style="list-style-type: none"> <li>- Introduction to machine tools and production equipment</li> <li>- Frames, frame components, foundations</li> <li>- Geometric and thermal machine behavior</li> <li>- Slideways and plain bearings, hydrostatic, hydrodynamic and aerostatic plain bearings, magnetic bearings</li> <li>- Rolling guides and bearings, spindle bearing systems, seals, covers</li> <li>- Motors, feed drives</li> <li>- Gearboxes for machine tools and production equipment</li> <li>- Equipment and components of machine tools</li> <li>- Clamping of workpieces and clamping devices for machine tools</li> <li>- Machine acceptance, measurement and protective devices on machine tools</li> <li>- Noise behavior of machine tools and production equipment</li> <li>- Coordinate systems</li> <li>- Cutting machine tools with geometrically determined cutting edge: Fräsen</li> </ul>			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	After successful completion of the module, students will be able <ul style="list-style-type: none"> <li>- to describe the boundary conditions for the use of machine tools in the industrial environment.</li> <li>- recognize and compare the design, construction and basic types of machine tools.</li> <li>- derive the requirements for machine tools according to the situation.</li> <li>- Discuss basic machine tool types and basic production equipment types and evaluate them according to their intended use.</li> <li>- Select suitable machine tools for solving a manufacturing task.</li> <li>- Evaluate the use of machine tools and production equipment in the modern manufacturing process.</li> <li>- the use of machine tools and production equipment in production the following table shows the results of the evaluation and transfe to similar systems.</li> </ul>			

Aufbauend auf <sup>8</sup> / Based on	Keine/none
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.
Prüfungsleistung <sup>10</sup> / Exam performance	Klausur / written exam
Studienleistung <sup>11</sup> / Study performance	keine / none Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	None
Literatur/Literature	<ul style="list-style-type: none"> <li>• Vorlesungsunterlagen, Skript</li> <li>• Literaturempfehlung: Weck/Brecher, "Werkzeugmaschinen", Band 1-5 (in der Bibliothek mehrfach vorhanden)</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Keine/none
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	Machine Tools and Production Equipment II (M)			
Modul <sup>2</sup> /Module	Machine Tools and Production Equipment II (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [required module] Master Mechanical Engineering [required module] Master Mechanical Engineering AMB [required module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Karl	Hofmann-von Kap-herr
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Karl	Hofmann-von Kap-herr
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	<ul style="list-style-type: none"> <li>- Cutting machines with geometrically determined cutting edge: turning, drilling</li> <li>- Cutting machines with geometrically indeterminate cutting edge: grinding machines, honing and lapping machines</li> <li>- Colants and lubricants on machine tools</li> <li>- Forming machines, Cutting machine tools</li> <li>- Spark erosion machines, water jet cutting machines</li> <li>- Multi-machine systems, hybrid machine tool concepts</li> <li>- Measuring devices, transmission elements, position measuring systems and control systems</li> <li>- Acceptance of machine tools</li> <li>- Low-noise machine design</li> <li>- Systems for process monitoring</li> <li>- Numerical controls, NC programming</li> <li>- Robots and manipulators</li> <li>- Laser machine</li> </ul>			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	Upon successful completion of the module, students will be able to describe the boundary conditions for the use of machine tools in the industrial environment. <ul style="list-style-type: none"> <li>- recognize and compare the design, construction and basic types of machine tools.</li> <li>- derive the requirements for machine tools according to the situation.</li> <li>- Discuss basic machine tool types and basic production equipment types and evaluate them according to their intended use.</li> <li>- Select suitable machine tools for solving a manufacturing task.</li> <li>- Evaluate the use of machine tools and production equipment in the modern manufacturing process.</li> <li>- Evaluate the use of machine tools and production equipment in the production environment and to transfer to similar systems.</li> </ul>			



Aufbauend auf <sup>8</sup> / Based on	Machine tools 1
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.
Prüfungsleistung <sup>10</sup> / Exam performance	Klausur / written exam
Studienleistung <sup>11</sup> / Study performance	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	None
Literatur/Literature	<ul style="list-style-type: none"> <li>• Vorlesungsunterlagen, Skript</li> <li>• Literaturempfehlung: Weck/Brecher, "Werkzeugmaschinen", Band 1-5 (in der Bibliothek mehrfach vorhanden)</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Keine/none
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	Master thesis (M)			
Modul <sup>2</sup> /Module	Master thesis (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [required module] Master Mechanical Engineering [required module] Master Mechanical Engineering AMB [required module] Master Mechanical Engineering FZT [required module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr. rer. nat.	Lars	Draack
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Frau / Mrs.			wird vom Prüfungsausschuss festgelegt
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	4. Semester / 4th semester			
Stoffinhalt/Contents	Creating a research paper. Lecture			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	After successful completion of the module, students are able to independently analyze a scientific or research task. They plan the procedure for their scientific work. They are able to acquire the special knowledge required for the solution of the task. They are able to design technical-scientific solutions for the given task and to present them to an expert audience.			
Aufbauend auf <sup>8</sup> / Based on	project specific knowledge			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	term paper with colloquium (elaboration of Master topic)			
Studienleistung <sup>11</sup> / Study performance	keine / none			
	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmit- tel zur Erbringung der Prüfungsleistung / Ap- proved aid for the exam performance	all			
Literatur/Literature	<ul style="list-style-type: none"> <li>• • Michael Schuth: Leitlinie für das Anfertigen von Projekt-, Studien- und Diplomarbeiten im technischen Bereich mit Präsentationstechnik</li> </ul>			

SWS gesamt/ Total semester load	0
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	30 ECTS, 900 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	900 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Winter- und Sommersemester / winter and summer semester
Turnus / Rhythm	jedes Semester / each semester
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Materials Management and Logistics (M)			
Modul <sup>2</sup> /Module	Materials Management and Logistics (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [required module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Armin	Wittmann
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Armin	Wittmann
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	Competitive vertical integration and procurement Instruments of materials management, production planning and control Approaches to lead time reduction and supply chain management. Planning methods			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	Students will master the instruments of materials management and supply chain management, including logistics in virtual corporate networks. The students know the basics of strategic planning within materials management and internal logistics.			
Aufbauend auf <sup>8</sup> / Based on	Basic knowledge of business organization, operations research, cost accounting, manufacturing technology are required.			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Schriftliche Prüfung / written exam			
Studienleistung <sup>11</sup> / Study performance	Testat /certificate			
	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmit- tel zur Erbringung der Prüfungsleistung / Ap- proved aid for the exam performance	none			

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Härder, Jürgen Betriebswirtschaft für Ingenieure, 4. Auflage, Hanser Verlag, 2010</li> <li>• Corsten, Hans Produktionswirtschaft 11. Auflage, Oldenbourg Verlag, 2007</li> <li>• Homburg, Christian, Quantitative Betriebswirtschaftslehre, Gabler Verlag, 3. Auflage, 2000</li> <li>• Wiendahl, Hans-Peter, Betriebsorganisation, 6. Auflage, Hanser Verlag, 2008</li> <li>• Templemeier, Horst, Material-Logistik, 7. Auflage, Springer Verlag, 2008</li> <li>• Becker, Thorsten, Prozesse in der Produktion und Supply Chain, Springer-Verlag, 2008</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	For the successful participation in the excursion in the context of the lecture the students receive a test certificate at the end of the course.

Lehrveranstaltung <sup>1</sup> / Course	Mathematics (M)			
Modul <sup>2</sup> /Module	Mathematics (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [required module] Master Mechanical Engineering [required module] Master Mechanical Engineering AMB [required module] Master Mechanical Engineering FZT [required module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Uwe	Zimmermann
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Uwe	Zimmermann
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	1. Semester / 1st semester			
Stoffinhalt/Contents	Laplace transform, Fourier transform, multiple integrals, line or curve integrals, gradient of a vector field, integral theorems of Gauss and Stokes, error and compensation calculation			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	Students will be able to solve complex engineering problems posed by vector geometry, such as those encountered in of fluid mechanics, mathematically.			
Aufbauend auf <sup>8</sup> / Based on	Keine/none			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungleistung <sup>10</sup> / Exam performance	Klausur / written exam			
Studienleistung <sup>11</sup> / Study performance	keine / none			
	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmit- tel zur Erbringung der Prüfungsleistung / Ap- proved aid for the exam performance	None			
Literatur/Literature	<ul style="list-style-type: none"> <li>• • Papula: Mathematik für Ingenieure und Naturwissenschaftler Band 2 und 3</li> </ul>			
SWS gesamt/ Total semester load	4			
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	3 SWS Vorlesung, 1 SWS Übung			

ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Keine/none
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	Numerical mathematics (M)			
Modul <sup>2</sup> /Module	Numerical mathematics (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Uwe	Zimmermann
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Uwe	Zimmermann
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	3. Semester / 3rd semester			
Stoffinhalt/Contents	Zero determination (a) for an equation (Regula falsi, Newton), (b) systems of equations (Gauss-Seidel, Newton); numerical integration (with natural cubic splines) and approximation (linear and nonlinear); first-order differential equations (according to Euler and Adams Bashford) and partial differential equations with boundary values (difference methods, in addition case examples: externally excited bending of a rectangular plate).			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	Based on the basic mathematical knowledge, students can apply standard numerical methods (algorithms) to concrete, practical problems. The student will be able to apply and then solve tasks on his or her own.			
Aufbauend auf <sup>8</sup> / Based on	Basic mathematical knowledge			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Projektarbeit und mündliche Prüfung / project paper and oral exam			
Studienleistung <sup>11</sup> / Study performance	keine / none			
	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmit- tel zur Erbringung der Prüfungsleistung / Ap- proved aid for the exam performance	none			



Literatur/Literature	<ul style="list-style-type: none"> <li>• Burden, Douglas, Reynolds: Numerical Analysis, Prindle, Weber, Schmidt</li> <li>• Jordan-Engel, Reutter: Numerische Mathematik für Ingenieure, Hochschultaschenbücher</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	3 SWS Vorlesung, 1 SWS Übung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Optical metrology (M)			
Modul <sup>2</sup> /Module	Optical metrology (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Michael	Schuth
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Michael	Schuth
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			

Stoffinhalt/Contents	<ul style="list-style-type: none"> <li>15.1 Thermography           <ul style="list-style-type: none"> <li>15.1.1 Physical basics of infrared light</li> <li>15.1.2 The nature of thermal radiation</li> <li>15.1.3 Transmission path</li> <li>15.1.4 Optics for the thermal infrared</li> <li>15.1.5 Camera technology</li> <li>15.1.6 Application in the industry</li> <li>15.1.7 Projects carried out in the Laboratory for Optical Metrology</li> </ul> </li> <li>15.2 Pyrometry</li> <li>15.3 Fiber optic temperature measurement</li> <li>16. 3 D laser scanner           <ul style="list-style-type: none"> <li>16.1 Basic principle of triangulation               <ul style="list-style-type: none"> <li>16.1.1 Laser triangulation</li> </ul> </li> <li>16.2 Slime flight - condition</li> <li>16.3 Calculated determination from detector point to measuring point               <ul style="list-style-type: none"> <li>16.3.1 Influencing factors of laser triangulation</li> <li>16.3.2 Beam path of the laser</li> <li>16.3.3 Properties of the object surface</li> <li>16.3.4 Imaging error</li> <li>16.3.5 Detector and signal evaluation</li> <li>16.3.6 Atmospheric conditions</li> </ul> </li> <li>16.4 Various systems for digitization               <ul style="list-style-type: none"> <li>16.4.1 Point laser</li> <li>16.4.2 Line laser</li> </ul> </li> <li>16.5 Laser triangulation in running production</li> </ul> </li> <li>17. Strip projection           <ul style="list-style-type: none"> <li>17.1 Introduction</li> <li>17.2 Basics of fringe projection</li> <li>17.3 Foreword</li> <li>17.4 Coded light approach</li> <li>17.5 Calibration of the sensor</li> <li>17.6 Reference marks               <ul style="list-style-type: none"> <li>17.6.1 Reference mark assignment</li> <li>17.6.2 Ring coding</li> <li>17.6.3 Uncoded reference marks</li> <li>17.6.4 Automatic identification of uncoded circular areas</li> </ul> </li> <li>17.7 Transformation process               <ul style="list-style-type: none"> <li>17.7.1 Helmert transformation</li> <li>17.7.2 Spatial backward section for transformation</li> </ul> </li> <li>17.8 Further processing of the obtained data</li> <li>17.9 Application examples</li> </ul> </li> <li>18 Correlation           <ul style="list-style-type: none"> <li>1 Introduction</li> <li>2 Triangulation               <ul style="list-style-type: none"> <li>2.1 Camera</li> <li>2.2 Camera</li> <li>2.3 Determine the real point</li> <li>2.4 Real factors</li> </ul> </li> </ul> </li> </ul>
----------------------	--

Stoffinhalt/Contents	<ul style="list-style-type: none"> <li>2.5 Calibration</li> <li>3 Image correlation           <ul style="list-style-type: none"> <li>3.1 Image mapping based on gray values               <ul style="list-style-type: none"> <li>3.1.1 Gray value matrix</li> <li>3.1.2 Amplification factors</li> <li>3.1.3 Correlation (mathematical)</li> <li>3.1.4 Correlation of the images</li> <li>3.1.5 Example</li> </ul> </li> <li>3.2 Least squares method               <ul style="list-style-type: none"> <li>3.2.1 Extension of the cross correlation</li> <li>3.2.2 Compensation in m-direction</li> <li>3.2.3 Compensation in n-direction</li> <li>3.2.4 Advanced</li> </ul> </li> </ul> </li> <li>formula 4 theory and practice</li> <li>4.1 Triangulation</li> <li>4.2 Image correlation</li> <li>5 Q-400 correlation system           <ul style="list-style-type: none"> <li>5.1 Q-400               <ul style="list-style-type: none"> <li>5.1.1 Cameras</li> <li>5.1.2 Auxiliary devices</li> </ul> </li> <li>5.2 Istra 4D</li> <li>5.3 Measurement place</li> </ul> </li> <li>6 Measurement           <ul style="list-style-type: none"> <li>6.1 Sample preparation</li> <li>6.2 Calibration</li> <li>6.3 Measuring procedure               <ul style="list-style-type: none"> <li>6.3.1 Structure</li> <li>6.3.2 Data acquisition</li> </ul> </li> <li>6.3 Evaluation               <ul style="list-style-type: none"> <li>6.3.1 Deformation                   <ul style="list-style-type: none"> <li>6.3.1.1 Deformation - total</li> <li>6.3.1.2 Deformation in X direction</li> <li>6.3.1.3 Deformation in Y-direction</li> <li>6.3.1.3 Deformation in Z direction</li> </ul> </li> <li>6.3.2 Distortion (voltage)</li> </ul> </li> </ul> </li> <li>7 FEM analysis 74           <ul style="list-style-type: none"> <li>7.1 Boundary conditions               <ul style="list-style-type: none"> <li>7.1.1 Networking</li> <li>7.1.2 Storage</li> <li>7.1.3 Loads</li> </ul> </li> <li>7.2 Evaluation               <ul style="list-style-type: none"> <li>7.2.1 Deformation</li> </ul> </li> <li>7.3.2 Voltage 82</li> </ul> </li> <li>19. coordinate determination method           <ul style="list-style-type: none"> <li>19.1 Photogrammetry in its basic features</li> <li>19.2 Central projection               <ul style="list-style-type: none"> <li>19.2.1 Fields of application of photogrammetry</li> </ul> </li> </ul> </li> </ul>
----------------------	---

Stoffinhalt/Contents	20. Investigations of fluid flows 20.1 Laser Doppler Anemometry (LDA) 20.2 Laser 2Focus Anemometer (L2FA) 20.3 Laser Induced Fluorescence (LIF) 20.4 Surface Pattern Image Velocimetry (Surface Pattern Velocimetry) 20.5 Particle Image Velocimetry 20.6 Laser speckle anemometry 21. Measuring vibrations 21.1 Laser vibrometry 21.2 Other optical methods for measuring vibrations 22. Terahertz 22.1 Fundamentals of Terahertz Technology 21.2 THz radiation detection 21.3 Application of terahertz measurement technology 21.4 Terahertz gap 23. White light interferometry 23.1 Basics 23.2 Application of white light interferometry 23.2.1 Coharence radar 23.3 Measurement examples
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	The student learns the theoretical basics, the structure and function of optical measuring instruments and how to use them in the laboratory on selected objects. He will be able to judge which optical measuring method is best suited for which measuring task and will be able to evaluate the measurement results.
Aufbauend auf <sup>8</sup> / Based on	Basic physics lecture, mathematics
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.
Prüfungsleistung <sup>10</sup> / Exam performance	Projektarbeit / project paper
Studienleistung <sup>11</sup> / Study performance	keine / none Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	None

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Neumann/ Schröder: Bauelemente der Optik, Hanser Verlag, 1992, 6. Auflage, ISBN: 3-446-17036-7</li> <li>• Rajpal S. Sirohi, Fook Siong Chau: Optical Methods of Measurements Wholefield Techniques Inc., 1999 ISBN: 0-8247-6003-4</li> <li>• A.W. Koch, M.W. Rupprecht, O. Toedter, G. Häusler: Optische Messtechnik an technischen Oberflächen, Expert Verlag., 1998 ISBN: 3-8169-1372-5</li> <li>• Gottfried Schröder: Technische Optik, Vogel Verlag, 1990, 7. Auflage ISBN: 3-8023-067-x</li> <li>• Opt. MT - Literaturverzeichnis (ab Kapitel 15: Thermografie) Neumann/ Schröder Bauelemente der Optik Hanser Verlag., 1992, 6. Auflage ISBN: 3-446-17036-7 A.W. Koch, M.W. Rupprecht, O. Toedter, G. Häusler Optische Messtechnik an technischen Oberflächen Expert Verlag., 1998 ISBN: 3-8169-1372-5 Frank Bernhard Technische Temperaturmessung Springer Verlag ISBN: 3-540-62672-7 Gottfried Schröder Technische Optik Vogel Verlag, 1990, 7. Auflage ISBN: 3-8023-067-x Schuth, M. Aufbau und Anwendung der Shearographie als praxisger</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	2 SWS Vorlesung, 2 SWS Labor
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	OM overview - bibliography see last book entry
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Patent law (M)			
Modul <sup>2</sup> /Module	Patent law (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.		wechselnde	Patentanwälte
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.		wechselnde	Patentanwälte
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	Students will learn the basics of patent law and will be enabled to use patents as a tool for strategic know-how protection but also as a targeted source of information for stand of technology research and to use it.			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	Students will learn the basics of patent law and will be enabled to use patents as a tool for strategic know-how protection but also as a targeted source of information for stand of technology research and to use it.			
Aufbauend auf <sup>8</sup> / Based on	Keine/none			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Seminararbeit / seminar paper			
Studienleistung <sup>11</sup> / Study performance	keine / none Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	None			
Literatur/Literature	<ul style="list-style-type: none"> <li>• Vorlesungsunterlagen</li> <li>• Fachliteratur: in Abhängigkeit vom Dozenten</li> </ul>			
SWS gesamt/ Total semester load	2			
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	1 SWS Vorlesung, 1 SWS Übung			

ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	3 ECTS, 90 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	60 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Keine/none
Bemerkungen <sup>17</sup> / Comments	Keine/none



Lehrveranstaltung <sup>1</sup> / Course	Precision Machines (M)			
Modul <sup>2</sup> /Module	Precision Machines (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Heiko	Bossong
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Heiko	Bossong
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	3. Semester / 3rd semester			
Stoffinhalt/Contents	Gear trains with optimized involute gearing (profile shift, helical gearing); interaction of different stiffnesses as a multidimensional problem, deformations of machine tools, bearing deformations, tensioning of machine tool frames and bearings, friction (fixed friction, sliding friction, rolling friction), wear (wear approach for plain bearings with fixed friction); Slip (rolling friction slip, traction slip, slip of belt drives, slip transverse to the rolling friction direction),			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	After successful completion of the module, the students are able to understand, design, construct and dimension machines and their components that are to be operated as precisely as possible or are used for high-precision manufacturing. The course covers not only mechanics, but also control engineering, thermodynamics and tribology used.			
Aufbauend auf <sup>8</sup> / Based on	Fundamentals of statics, strength of materials, kinematics and kinetics; fundamentals of engineering mathematics; machine elements of the bachelor program.			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungleistung <sup>10</sup> / Exam performance	Klausur / written exam			
Studienleistung <sup>11</sup> / Study performance	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	will be announced in the lecture			

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Hinzen, H.: Maschinenelemente 1 (4. Auflage); De Gruyter Oldenbourg, Berlin/Boston, 2017</li> <li>• Hinzen, H.: Maschinenelemente 2 (4. Auflage); De Gruyter Oldenbourg, Berlin/Boston, 2018</li> <li>• Hinzen, H.: Maschinenelemente 3 (2. Auflage); De Gruyter Oldenbourg, Berlin/Boston, 2020</li> <li>• ergänzende Aufgabensammlung auf den Internetseiten des De Gruyter Verlags</li> </ul>
SWS gesamt/ Total semester load	0
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	3 SWS Vorlesung, 1 SWS Übung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Production engineering (M)			
Modul <sup>2</sup> /Module	Production engineering (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [required module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [required module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Armin	Wittmann
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Armin	Wittmann
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	3. Semester / 3rd semester			
Stoffinhalt/Contents	- Selected process sequences (SMD placement, assembly, test) - Planning and execution of manufacturing plants - Quality management tools (process FMEA, TQM, 7Q )			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	In addition to the choice of process and the process design of the industrial production process, the process flows and their integration into the overall enterprise are decisive for the competitiveness of the enterprise. Selected process flows, their optimal design, planning and execution of industrial plants are in the center of the approach. The aim is to present the technical challenges and to teach quality management methods to cope with them. The students understand the manufacturing processes of complex products, their dependence and the possibility to influence them preventively. They are able to apply the learned processes and methods to other manufacturing problems.			
Aufbauend auf <sup>8</sup> / Based on	Knowledge in the basics of manufacturing technology and enterprise management			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Schriftliche Prüfung / written exam			
Studienleistung <sup>11</sup> / Study performance	Laborleistung / laboratory performance Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	none			

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Aggteleky, Bela, Fabrikplanung, Hanser Verlag Munchen 1970</li> <li>• Grundig, Claus, Fabrikplanung, Hanser Verlag, 2009</li> <li>• Wittmann,A, Skript Fertigungstechnik II, Fertigung elektr. Bau- gruppen, Einfuhrung neuer Produkte, 2010</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	The module includes a total of 6 appointments in two different laboratories, in which the students can put into practice the theoretical knowledge they have acquired.(course work laboratory work).
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	Programming of ERP systems using SAP®-S 4HANA®			
Modul <sup>2</sup> /Module	Programming of ERP systems using SAP®-S/4HANA®			
Fachbereich/ Department	Technik, Fachrichtung Elektrotechnik /Department of Engineering, subject area Electrical Engineering			
Studiengang/ Degree Programme	Master Electrical Engineering [compulsory elective module] Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Fritz Nikolai	Rudolph
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Fritz Nikolai	Rudolph
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	1. oder 2. Semester / 1st or 2nd semester			
Stoffinhalt/Contents	- Quick start SAP-ERP MM and PP - The programming language ABAP, screens, internal tables, Open SQL©, data modeler, function blocks			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	After successful completion of the module, students will be able to operate the GUI. They have knowledge of object-oriented programming in ABAP Objects©, GUI programming, database programming and recursive programming. They can structure relational data models.			
Aufbauend auf <sup>8</sup> / Based on	None			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Seminararbeit und Referat / seminar paper and presentation			
Studienleistung <sup>11</sup> / Study performance	Hausarbeit / term paper Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance				

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Karl-Heinz Kühnhauser, Thorsten Franz; Einstieg in ABAP</li> <li>• Horst Keller, Sascha Krüger; ABAP Objects; ISBN 978-3-89842- 358-8</li> <li>• Andreas Blumenthal, Horst Keller; ABAP - Fortgeschrittene Techniken und Tools, Band 2; ISBN 978-3-8362-2072-9</li> <li>• Horst Keller, Wolf Hagen Thümmel; ABAP- Programmierichtlinien; ISBN 978-3-8362-2090-3</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Project work (M)			
Modul <sup>2</sup> /Module	Project work (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Mechanical Engineering [required module] Master Mechanical Engineering AMB [required module] Master Mechanical Engineering FZT [required module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr. rer. nat.	Lars	Draack
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Frau / Mrs.			wird vom Prüfungsausschuss festgelegt
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	3. Semester / 3rd semester			
Stoffinhalt/Contents	Preparation, implementation and management of development projects in automotive technology and mechanical engineering			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	The students are enabled to work independently on a development task in automotive engineering and mechanical engineering. This task may include market analysis, specification, conception, design, computational design, simulation, experimental optimization and/or homologation including project management and presentation of results, experimental research in a laboratory. The project can be worked on in a team, whereby teamwork and communication skills are trained. The students work out a solution for a complete development problem on their own. They apply learned problem solving and decision making methods and demonstrate their scientific knowledge approach.			
Aufbauend auf <sup>8</sup> / Based on	To participate in the project work, it is recommended that all modules, scheduled by the 3rd semester have been completed.			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Projektarbeit / project paper			
Studienleistung <sup>11</sup> / Study performance	keine / none Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	all			

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Michael Schuth: Leitlinie für das Anfertigen von Projekt-, Studien- und Diplomarbeiten im technischen Bereich mit Präsentationstechnik</li> </ul>
SWS gesamt/ Total semester load	0
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	10 ECTS, 300 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	300 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Keine/none
Bemerkungen <sup>17</sup> / Comments	Keine/none



Lehrveranstaltung <sup>1</sup> / Course	Quality and Reliability I (M)			
Modul <sup>2</sup> /Module	Quality and Reliability I (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [required module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Thomas	Bonart
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Thomas	Bonart
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	1. Semester / 1st semester			
Stoffinhalt/Contents	Concept of quality, questionnaire, ordinal data, contingency matrix, stochastic independence, rank correlation coefficient of qualitative data, conception of test statistics, standard normal distribution, Chi2 test, applications, forced switching experiment, test statistics, concept of reliability, assumption control, lifetime distributions, lifetime tests with complete and censored data, system function and reliability of technical systems, applications in access reliability analysis.			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	Upon successful completion of the module, the students have acquired the competence to apply the statistical methods of quality and reliability analysis and control in industrial practice. They are able to design and evaluate uncensored and censored lifetime tests and to make statements about the reliability of the tested component, assembly or product. You are able to determine the reliability of a technical system from the reliability of the individual components. They are able to create questionnaires for the measurement of quality or the perception of quality on their own, to evaluate them statistically and thus to answer practical questions in this field context to answer.			
Aufbauend auf <sup>8</sup> / Based on	Basics of mathematical statistics			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Klausur / written exam			
Studienleistung <sup>11</sup> / Study performance	keine / none Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			

Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	None
Literatur/Literature	<ul style="list-style-type: none"> <li>• • Bonart/Bär, Quantitative BWL Bd. III, 2020 bzw. Skript</li> <li>• Bertsche, Bernd/Lechner, Gisbert: Zuverlässigkeit im Fahrzeug und Maschinenbau, 2004</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Modulhandbuch/module manual Master Mechanical Engineering Fachbereich Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering Hochschule Trier/Trier University of Applied Sciences
---

Lehrveranstaltung <sup>1</sup> / Course	Quality and Reliability II (M)			
Modul <sup>2</sup> /Module	Quality and Reliability II (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [required module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Peter	Boehm
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Peter	Boehm
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	Basics and history of QM; quality philosophies; structure of a QM system; certification of a QM system; documentation of a QM system; quality policy and objectives; Q elements and their meaning; representative of the top management; Theories of motivation; Q-costs; Error prevention methods; Quality audits; Q-techniques; Product safety and product liability; Further QM verification levels; Business game Q-Key; Set-up and execution of scenarios (e.g. certification audit).(e.g. certification audit); Self-preparation of standards as well as presentations in seminar form; Planning game; Quality management; Quality assurance. board game based on a production flow.			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	After successful completion of the module, students will be able to apply basic working methods and tools of modern quality management. The students are familiar with the essential requirements of a quality management system, its tasks as well as the connections with certification systems.			
Aufbauend auf <sup>8</sup> / Based on	Keine/none			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Schriftliche Prüfung / written exam			
Studienleistung <sup>11</sup> / Study performance	keine / none Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	None			

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Masing: Handbuch Qualitätsmanagement</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	3 SWS Vorlesung, 1 SWS Übung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Scientific methodology (M)			
Modul <sup>2</sup> /Module	Scientific methodology (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Mechanical Engineering [required module] Master Mechanical Engineering AMB [required module] Master Mechanical Engineering FZT [required module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Christoph	Heinrich
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Christoph	Heinrich
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	1. Semester / 1st semester			
Stoffinhalt/Contents	The basics and rules of scientific work are taught and trained. Instructions are given on how to conduct literature, state of the art and patent searches including the use of stock and online libraries as well as data bank searches. In addition, the procedure for conducting experimental research will be presented and the preparation of scientific papers will be discussed publications and presentations.			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	After successful completion of the module, students will be able to apply the basics of scientific work and master the necessary tools. They are able to research, analyze and evaluate the state of the art on a given topic and cite it correctly in their own scientific work. They gain confidence in the preparation of scientific publications and the presentation of research results. They are trained in critical thinking and questioning of already published findings.			
Aufbauend auf <sup>8</sup> / Based on	Keine/none			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Hausarbeit und mündliche Prüfung / term paper and oral exam			
Studienleistung <sup>11</sup> / Study performance	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	Any literature			

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Vorlesungsunterlagen</li> <li>• Hering, H.; Hering, L.: Technische Berichte, Springer Vieweg Verlag, 7. Auflage, (erhältlich als E-Book über die Bibliothek der Hochschule Trier)</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	2 SWS Vorlesung, 2 SWS Seminar
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Keine/none
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	Simulation of dynamic systems (M)			
Modul <sup>2</sup> /Module	Simulation of dynamic systems (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Uwe	Zimmermann
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Uwe	Zimmermann
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	3. Semester / 3rd semester			
Stoffinhalt/Contents	Matlab/Simulink; examples of simulations			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	Building on the fundamental knowledge of engineering, students will be able to use software to design dynamic systems Simulate			
Aufbauend auf <sup>8</sup> / Based on	building on the basic knowledge of engineering sciences			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Projektarbeit / project paper			
Studienleistung <sup>11</sup> / Study performance	keine / none Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	None			

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Franklin, Powell: Digital Control of Dynamic Systems; Addison Wesley Publishing Company;</li> <li>• Föllinger, O.: Regelungstechnik, Huthig Buch Verlag, Heidelberg; ö</li> <li>• Mann, Schiffelgen, Froriep: Einführung in die Regelungstechnik; Carl Hanser Verlag, Munchen Wien;</li>   <li>• Rake, H.: Regelungstechnik A und Ergänzungen (Regelungstechnik B); Vorlesungsumdruck 14. Auflage</li> <li>• Rake, H.: Regelungstechnik A und Ergänzungen (Regelungstechnik B); Vorlesungsumdruck 14. Auflage, 1990 Institut für Regelungstechnik, RWTH Aachen;</li> <li>• Richard C. Dorf / Robert H. Bishop: Moderne Regelungssysteme, Pearson Studium</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	2 SWS Vorlesung, 2 SWS Übung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None



Lehrveranstaltung <sup>1</sup> / Course	Statistics MB (M)			
Modul <sup>2</sup> /Module	Statistics MB (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Thomas	Bonart
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Thomas	Bonart
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	1. oder 2. Semester / 1st or 2nd semester			
Stoffinhalt/Contents	Expected value, variance, covariance, correlation coefficient, linear and nonlinear regression, coefficient of determination, stochastics, distribution functions, test statistics, applications in the field of quality and accessibility and reliability			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	Upon successful completion of the module, participants will be able to solve practical decision-making problems of the industrial enterprise using statistical methods and solve them.			
Aufbauend auf <sup>8</sup> / Based on	Keine/none			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Klausur / written exam			
Studienleistung <sup>11</sup> / Study performance	keine / none			
	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	None			
Literatur/Literature	<ul style="list-style-type: none"> <li>• • Bonart/Bär, Quantitative BWL Bd. I, 2018</li> </ul>			
SWS gesamt/ Total semester load	4			
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung			

ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Systems engineering (M)			
Modul <sup>2</sup> /Module	Systems engineering (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [required module] Master Mechanical Engineering AMB [required module] Master Mechanical Engineering FZT [required module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Uwe	Zimmermann
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Uwe	Zimmermann
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	Device technology, control loop structures, control design with the Bode diagram, root locus curves, z-transformation, quasi-continuous controller design, digital controller design, closed-loop control. stand room, Kalman filter			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	Building on the knowledge Control engineering students will be able to the students more complex processes of the control engineering such as e.g. Root locus method for stability investigations, Apply state space control, etc.			
Aufbauend auf <sup>8</sup> / Based on	Higher Mathematics; Control Engineering I (compulsory module of the Bachelorstudiengang mechanical engineering)			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Klausur / written exam			
Studienleistung <sup>11</sup> / Study performance	keine / none Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	None			

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Vorlesungsumdruck</li> <li>• Franklin, Powell: Digital Control of Dynamic Systems; Addison Wesley Publishing Company</li> <li>• Föllinger, O.: Regelungstechnik, Huthig Buch Verlag, Heidelberg</li> <li>• Mann, Schifflgen, Froiep: Einführung in die Regelungstechnik; Carl Hanser Verlag, Munchen Wien</li> <li>• Rake, H.: Regelungstechnik A und Ergänzungen (Regelungstechnik B); Vorlesungsumdruck 14. Auflage 1990, Institut für Regelungstechnik, RWTH Aachen</li> <li>• Richard C. Dorf / Robert H. Bishop: Moderne Regelungssysteme, Pearson Studium</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Keine/none
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	Technical measurement (M)			
Modul <sup>2</sup> /Module	Technical measurement (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [required module] Master Mechanical Engineering AMB [required module] Master Mechanical Engineering FZT [required module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Michael	Schuth
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Michael	Schuth
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	1. Semester / 1st semester			

Stoffinhalt/Contents	<ul style="list-style-type: none"> <li>0.1 Interferometry</li> <li>0.2 Thermography</li> <li>0.3 Strip projection</li> <li>0.4 Voltage optics</li> <li>0.5 Shearography</li> <li>0.6 Correlation</li> <li>0.7 Holography</li> <li>0.8 Light microscopy</li> <li>0.9 Method for the investigation of fluid flows           <ul style="list-style-type: none"> <li>0.9.1 Laser Doppler Anemometry</li> <li>0.9.2 Laser 2Focus Anemometry</li> <li>0.9.3 Surface Pattern Image Velocimetry</li> <li>0.9.4 Particle Image Velocimetry</li> </ul> </li> <li>0.10 Terahertz</li> <li>0.11 3D laser scanning</li> <li>0.12 Laser vibrometry</li> <li>0.13 White light interferometry</li> <li>1. Light and optics           <ul style="list-style-type: none"> <li>1.1 Properties of light</li> <li>1.2 The wave-particle duality of light</li> <li>1.3 Diffraction</li> <li>1.4 Reflection</li> <li>1.5 Refraction</li> <li>1.6 Total reflection</li> </ul> </li> <li>2. Polarization           <ul style="list-style-type: none"> <li>2.1 Polarization types               <ul style="list-style-type: none"> <li>2.1.1 Linear polarized light</li> <li>2.1.2 Non-polarized light</li> <li>2.1.3 Circular and elliptical polarized light</li> <li>2.1.4 Calculation basis</li> </ul> </li> <li>2.2 Polarizers               <ul style="list-style-type: none"> <li>2.2.1 Polarization by dichroism</li> <li>2.2.2 Polarization by birefringence</li> <li>2.2.3 Polarization by reflection</li> <li>2.2.4 Polarization by scattering</li> </ul> </li> </ul> </li> <li>3. Optical components           <ul style="list-style-type: none"> <li>3.1 Lenses               <ul style="list-style-type: none"> <li>3.1.1 Imaging error</li> </ul> </li> <li>3.2 Mirror</li> <li>3.3 Prisms               <ul style="list-style-type: none"> <li>3.3.1 Reflection prisms</li> <li>3.3.2 Reversing prisms and reversing systems</li> </ul> </li> <li>3.4 Beam splitter               <ul style="list-style-type: none"> <li>3.4.1 Geometric beam splitter</li> </ul> </li> </ul> </li> <li>0.1 Interferometry</li> <li>0.2 Thermography</li> <li>0.3 Strip projection</li> <li>0.4 Voltage optics</li> </ul>
----------------------	--

Stoffinhalt/Contents	<ul style="list-style-type: none"> <li>0.5 Shearography</li> <li>0.6 Correlation</li> <li>0.7 Holography</li> <li>0.8 Light microscopy</li> <li>0.9 Method for the investigation of fluid flows</li> <li>0.9.1 Laser Doppler Anemometry</li> <li>0.9.2 Laser 2Focus Anemometry</li> <li>0.9.3 Surface Pattern Image Velocimetry</li> <li>0.9.4 Particle Image Velocimetry</li> <li>0.10 Terahertz</li> <li>0.11 3D laser scanning</li> <li>0.12 Laser vibrometry</li> <li>0.13 White light interferometry</li> <li>1. Light and optics</li> <li>1.1 Properties of light</li> <li>1.2 The wave-particle duality of light</li> <li>1.3 Diffraction</li> <li>1.4 Reflection</li> <li>1.5 Refraction</li> <li>1.6 Total reflection</li> <li>2. Polarization</li> <li>2.1 Polarization types</li> <li>2.1.1 Linear polarized light</li> <li>2.1.2 Non-polarized light</li> <li>2.1.3 Circular and elliptical polarized light</li> <li>2.1.4 Calculation basis</li> <li>2.2 Polarizers</li> <li>2.2.1 Polarization by dichroism</li> <li>2.2.2 Polarization by birefringence</li> <li>2.2.3 Polarization by reflection</li> <li>2.2.4 Polarization by scattering</li> <li>3. Optical components</li> <li>3.1 Lenses</li> <li>3.1.1 Imaging error</li> <li>3.2 Mirror</li> <li>3.3 Prisms</li> <li>3.3.1 Reflection prisms</li> <li>3.3.2 Reversing prisms and reversing systems</li> <li>3.4 Beam splitter</li> <li>3.4.1 Geometric beam splitter</li> <li>3.4.2 Physical beam splitter</li> <li>3.4.3 Periodic beam splitter<sup>7</sup></li> <li>3.5 Grasping optical components</li> <li>3.5.1 Frame types</li> <li>3.5.3 Centering optics</li> <li>3.6 Glaser images</li> <li>3.7 Fiberglass</li> <li>3.7.1 Types fibers</li> </ul>
----------------------	---

Stoffinhalt/Contents	<ul style="list-style-type: none"> <li>3.7.2 Fiber optic cable guiding</li> <li>4 Introduction to Laser Technology</li> <li>4.1 Basics of Laser Technology</li> <li>4.1.1 Interference and beating</li> <li>4.2 Coherence</li> <li>4.2.1 Measurement of the temporal coherence</li> <li>4.2.2 Measurement of the spatial coherence</li> <li>5. The laser</li> <li>5.1 The laser principle</li> <li>5.2 Excitation forms</li> <li>5.3 Interaction of photons and atoms</li> <li>5.3.1 Shock 1. type</li> <li>5.3.2 Shock 2. type</li> <li>5.3.3 Absorption of a photon</li> <li>5.3.4 Ionization of an atom</li> <li>5.3.5 Metastable states</li> <li>5.3.6 Spontaneous emission of photons</li> <li>5.3.7 Induced emission of a photon</li> <li>6. Lasers and laser systems</li> <li>6.1 Operating principle</li> <li>6.2 Structure</li> <li>6.3 Active medium</li> <li>6.3.1 Solid state laser</li> <li>6.3.2 Gas laser</li> <li>6.3.3 Semiconductor laser</li> <li>6.3.4 Fluid laser</li> <li>6.3.5 Dye laser</li> <li>6.4 Free-electron laser</li> <li>6.5 The resonator</li> <li>6.6 The energy supply (excitation)</li> <li>6.6.1 Gas discharge (electrical excitation)</li> <li>6.6.2 Light sources</li> <li>6.6.3 Chemical</li> <li>6.7 Operating modes</li> <li>6.8 Various laser</li> <li>6.8.1 The He-Ne laser</li> <li>6.8.2 The argon laser</li> <li>6.8.3 The ruby laser</li> <li>6.8.4 The Nd:YAG laser (neodymium in yttrium aluminum garnet)</li> <li>6.8.5 The laser diode</li> <li>6.8.6 The titanium sapphire laser</li> <li>6.9 TEM modes</li> <li>6.9 Properties and application possibilities</li> <li>6.10 State of current research</li> <li>6.11 State of the art</li> <li>6.11.1 Laser in the industry</li> <li>6.11.2 Laser in research and science</li> </ul>
----------------------	---



Stoffinhalt/Contents	<ul style="list-style-type: none"> <li>6.11.3 Laser in communication</li> <li>6.11.4 Laser in medicine</li> <li>6.11.5 Lasers in military and space technology</li> <li>6.12 Application examples</li> <li>7. General information on area-wide testing and measuring methods</li> <li>8. Basics of the interferometric measurement technique</li> <li>9. Holography           <ul style="list-style-type: none"> <li>9.1 The principle of holography</li> <li>9.2 Holographic interferometry</li> <li>9.3 Application examples</li> </ul> </li> <li>10. Basics of Speckle Measurement 1</li> <li>11. Shearography           <ul style="list-style-type: none"> <li>11.1 Basics of the optical structure of shearography</li> <li>11.2 Mechanics of shearography</li> <li>11.3 Structure and mode of action of various shear elements</li> <li>11.4 Importance of illumination and observation direction for shearogram evaluation</li> <li>11.5 Determination of the out-of-plane strain</li> <li>11.6 Real-Time Shearography</li> <li>11.7 Application of Shearography in Quality Assurance and Component Optimization</li> <li>11.8 Determination of in-plane strain by means of shearography</li> <li>11.9 Theoretical consideration of a topped tension rod</li> <li>11.10 Setup and method for pure in-plane strain measurement</li> <li>11.11 Determination of the pure in-plane strain on different models</li> <li>11.12 Pure in-plane strain measurement on the topped tension rod</li> <li>11.13 Out-of-plane tilt measurement in different shear directions</li> <li>11.14 General overview of the shearographic measurement parameters</li> <li>11.15 Measuring ranges of shearography</li> <li>11.16 Applications of shearography               <ul style="list-style-type: none"> <li>11.16.1 Automatic inspection equipment</li> <li>11.16.2 Portable testing systems</li> </ul> </li> </ul> </li> <li>12. computer-aided recording and evaluation of shearograms (ESPSI, TV-shearography)           <ul style="list-style-type: none"> <li>12.1 Digital image processing of interference images</li> <li>12.2 Combined phase shift and shear device</li> </ul> </li> <li>13. Computer-aided recording and evaluation of holograms (ESPI, TV holography)           <ul style="list-style-type: none"> <li>13.1 Speckle Interferometry</li> <li>13.2 TV holography system concept</li> <li>13.4 Examples               <ul style="list-style-type: none"> <li>13.4.1 In-plane deformation measurement</li> <li>13.4.2 Out-of-plane deformation measurement using the example of a gas spring ball cup</li> <li>13.4.3 Out-of-plane deformation measurement</li> <li>13.4.4 Comparison of out-of-plane ESPI and ESPSI</li> <li>13.4.5 Industrial ESPI measuring device</li> </ul> </li> </ul> </li> <li>14. Stress optical methods</li> </ul>
----------------------	--

Stoffinhalt/Contents	14.1 Voltage optics 14.1.1 Isochromats and isoclinics 14.1.2 Separation of isochromats and isoclinics 14.1.3 Mechanical basics 14.1.4 The basic stress-optical equation 14.1.5 Experimental setup at the FH Trier 14.1.6 Test evaluation 14.2 PhotoStress process 14.2.1 Physical basics
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	After successful completion of the module, the students are able to solve simple practical problems on their own due to their newly acquired theoretical knowledge in physical measurement technology. The lecture material is supplemented by experiments in the laboratory in small groups. The student is able to determine the appropriate measurement procedure for the respective task. He knows the application areas and the restrictions of the respective measurement methods
Aufbauend auf <sup>8</sup> / Based on	Basic course physics, measurement technology
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.
Prüfungsleistung <sup>10</sup> / Exam performance	Klausur / written exam
Studienleistung <sup>11</sup> / Study performance	keine / none Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	None

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Neumann/ Schröder: Bauelemente der Optik, Hanser Verlag., 1992, 6. Auflage, ISBN: 3-446-17036-7</li> <li>• Rajpal S. Sirohi, Fook Siong Chau: Optical Methods of Measurements Wholefield Techniques Inc., 1999 ISBN: 0-8247-6003-4</li> <li>• A.W. Koch, M.W. Rupprecht, O. Toedter, G. Häusler: Optische Messtechnik an technischen Oberflächen, Expert Verlag., 1998 ISBN: 3-8169-1372-5</li> <li>• Gottfried Schröder: Technische Optik, Vogel Verlag, 1990, 7. Auflage ISBN: 3-8023-067-x</li> <li>• Neumann/ Schröder Bauelemente der Optik Hanser Verlag., 1992, 6. Auflage ISBN: 3-446-17036-7</li> <li>• Rajpal S. Sirohi, Fook Siong Chau Optical Methods of Measurements - Wholefield Techniques Marcel Dekker, Inc., 1999 ISBN: 0-8247-6003-4</li> <li>• A.W. Koch, M.W. Rupprecht, O. Toedter, G. Häusler Optische Messtechnik an technischen Oberflächen Expert Verlag., 1998 ISBN: 3-8169-1372-5</li> <li>• Pramod K. Rastogi Optical Measurement Techniques and Applications Artech House, Inc., 1997 ISBN: 0-89006-516-0</li> <li>• Gottfried Schröder Technische Optik</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	3 SWS Vorlesung, 1 SWS Übung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Overview TM - Bibliography see last book entry
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Thermodynamics (M)			
Modul <sup>2</sup> /Module	Thermodynamics (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [required module] Master Mechanical Engineering AMB [required module] Master Mechanical Engineering FZT [required module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Christoph	Heinrich
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Christoph	Heinrich
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	Exergy and anergy, exergetic efficiency, real power plant processes, gas mixtures, mixing processes of humid air, h,x-diagram (Mollier), straight line of mixtures, combustion, determination of calorific value, irreversibility of combustion processes, heat transfer: Three dimensional heat conduction, heat transfer (free and forced convection), heat transfer coefficients, heat radiation (absorption, reflection, heat transfer, Transmission)			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	After completion of the module, the students are able to solve thermodynamic problems from the mentioned topics analytically on their own, if necessary with the help of relevant literature. Furthermore, they are able to analyze real processes with respect to their exergetic efficiency. Furthermore, they are able to classify real processes with respect to their irreversibility and to optimize the process sequences.			
Aufbauend auf <sup>8</sup> / Based on	Mathematics and Thermodynamics (Bachelor)			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Klausur / written exam			
Studienleistung <sup>11</sup> / Study performance	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	Written documents of any kind, h,s-diagram for water vapor; water vapor chart; h,x-diagram for humid air; calculator			

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Vorlesungsskript Thermodynamik (Heinrich) und Klausuren-sammlung</li> <li>• Technische Thermodynamik (Cerbe, Wilhelms, Hanser Verlag)</li> <li>• Thermodynamik (Baehr, Springer Verlag)</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Keine/none
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	Transportation systems (M)			
Modul <sup>2</sup> /Module	Transportation systems (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Hartmut	Zoppke
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Hartmut	Zoppke
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	3. Semester / 3rd semester			
Stoffinhalt/Contents	Current and future developments in the various modes of passenger transport are discussed. Solutions to ensure future-oriented and environmentally compatible mobility will be presented. The seminar will be linked with current research work on the development of energy efficient vehicles for passenger transport as well as with the development of new vehicles with research on psychological influences in traffic.			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	After successful completion of the module, students will be familiar with different passenger transport systems and their elements as well as the significance and current developments of the different types of transport. They will be able to assess the effects and consequences of traffic for different future development scenarios on the basis of concrete examples. In the context of the preparation of a seminar paper, they have gained experience in the description, assessment and solution of a concrete problem in the field of passenger transport. They are able to process the knowledge gained in a new context and evaluate it in the context of a question. Furthermore, they can present and discuss their own theses in the group and defend.			
Aufbauend auf <sup>8</sup> / Based on	Keine/none			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Hausarbeit und mündliche Prüfung / term paper and oral exam			
Studienleistung <sup>11</sup> / Study performance	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			

Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	None
Literatur/Literature	<ul style="list-style-type: none"> <li>• • Seminarunterlagen mit zahlreichen Bezügen zu aktuellen Publikationen</li> </ul>
SWS gesamt/ Total semester load	0
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Seminar
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	
Kommentare <sup>16</sup> / Comments	Keine/none
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	Turbomachinery (M)			
Modul <sup>2</sup> /Module	Turbomachinery (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [compulsory elective module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Sven	Koenig
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Sven	Koenig
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	Fundamentals of thermodynamics and flow theory for turbomachinery, hydrofoil and cascade flow, description of flow and energy conversion in the impeller, stage theory of turbomachinery, losses and efficiencies, description of operating behavior by Characteristics, design of turbomachinery			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	Upon successful completion of the module, students will be able to: <ul style="list-style-type: none"> <li>• Turbomachinery in terms of fluid mechanics and thermodynamics.</li> <li>• turbomachinery in terms of their performance in the entire map range.</li> <li>• Develop concepts to meet customer requirements for turbo machines.</li> </ul>			
Aufbauend auf <sup>8</sup> / Based on	Knowledge of fluid mechanics and thermodynamics			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	mündliche Prüfung / oral exam			
Studienleistung <sup>11</sup> / Study performance	keine / none			
	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmit- tel zur Erbringung der Prüfungsleistung / Ap- proved aid for the exam performance	None			



Literatur/Literature	<ul style="list-style-type: none"> <li>• • Vorlesungsunterlagen</li> <li>• Thermische Strömungsmaschinen I (Traupel, Springer)</li> <li>• Turbomachinery Flow Physics and Dynamic Performance (Schoebi, Springer)</li> <li>• Compressor Aerodynamics (Cumpsty, Krieger)</li> <li>• Strömungsmaschinen (Sigloch, Hanser)</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	Keine/none
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	Vehicle Drives and Chassis (M)			
Modul <sup>2</sup> /Module	Vehicle Drives and Chassis (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [required module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Hartmut	Zoppke
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Hartmut	Zoppke
	Herr / Mr.	Prof. Dr.-Ing.	Peter	Koenig
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	2. Semester / 2nd semester			
Stoffinhalt/Contents	<p>Vehicle Drives: The focus is on the design, calculation and optimization of the service life of powertrain components, in particular vehicle clutches and power split transmissions based on planetary gear differentials, and on the solution of vibration problems. Furthermore, innovation trends in powertrain components and braking systems are discussed.</p> <p>Landing gear: Safety and comfort of active chassis based on optimized passive chassis as well as objectives of vehicle control systems are presented; sensors, signal analysis, signal output, actuators, active chassis, semi-active suspension and damping, ABS, ESP, market examples and driving tests</p>			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	<p>Vehicle Drives</p> <p>The students are able to independently analyze problems in drive trains of passenger cars and develop solutions. Based on specific tasks, they learn about targetoriented product innovations and are able to evaluate them.</p> <p>Chassis</p> <p>After successful completion of the module, students will be familiar with the mechanical relationships of statics and vibration technology in vehicle chassis and will be able to translate this knowledge into design measures. They are able to make independent conceptual decisions for the design of a motor vehicle chassis involving semiactive and active components and systems.</p>			
Aufbauend auf <sup>8</sup> / Based on	Keine/none			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungleistung <sup>10</sup> / Exam performance	Klausur / written exam			

Studienleistung <sup>11</sup> / Study performance	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no
Zugelassene Hilfsmittel zur Erbringung der Prüfungsleistung / Approved aid for the exam performance	none
Literatur/Literature	<ul style="list-style-type: none"> <li>• • Naunheimer, Lechner: Fahrzeuggetriebe</li> <li>• Kirchner: Leistungsübertragung in Fahrzeuggetrieben</li> <li>• Looman: Zahnradgetriebe</li> <li>• Klement: Fahrzeuggetriebe</li> <li>• Beitzel. (2000). Fahrwerktechnik Grundlagen</li> <li>• Isermann. (2006). Fahrdynamikregelung. Vieweg-Verlag</li> <li>• Matschinsky. (1998). Radführungen der Straßenfahrzeuge Springer-Verlag</li> <li>• Wallentowitz. (2004). Dynamik der Kraftfahrzeuge. RWTH Aachen</li> <li>• Woernle. (2006). Skriptum zur Vorlesung Fahrmechanik. Uni Rostock</li> </ul>
SWS gesamt/ Total semester load	0
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Sommersemester / summer semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls Duration of module	
Kommentare <sup>16</sup> / Comments	Keine/none
Bemerkungen <sup>17</sup> / Comments	Keine/none

Lehrveranstaltung <sup>1</sup> / Course	Vehicle safety (M)			
Modul <sup>2</sup> /Module	Vehicle safety (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [compulsory elective module] Master Mechanical Engineering [compulsory elective module] Master Mechanical Engineering AMB [compulsory elective module] Master Mechanical Engineering FZT [required module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Peter	Koenig
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.-Ing.	Peter	Koenig
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	3. Semester / 3rd semester			
Stoffinhalt/Contents	Medical and biomechanical principles of injuries in accidents, accident research, statistical accident data collection, explanation of legal requirements and current consumer protection tests. Crash configurations (front, side, rear), foot restraint, RCAR. Design and development of car bodies and restraint systems, belts, airbags, sensors, introduction to crash simulations, and optimization of restraint systems, execution of crash tests of a crash test, introduction to the test technique			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	The students can describe the basics of biomechanics, the load limits of humans and the current crash test dummies. They can summarize and compare the current legal requirements for the passive safety of vehicles and the contents of consumer protection tests (NCAPs) and can design measures to improve vehicle safety for each of these. The students are able to independently optimize an existing car restraint system concept in the simulation and to develop target-oriented determine system parameters.			
Aufbauend auf <sup>8</sup> / Based on	Automotive engineering modules of the bachelor's program			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungleistung <sup>10</sup> / Exam performance	Projektarbeit und Klausur / project paper and written exam			
Studienleistung <sup>11</sup> / Study performance	Übungsleistung / exercise performance Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmit- tel zur Erbringung der Prüfungleistung / Ap- proved aid for the exam performance	none			

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Vorlesungsskript</li> <li>• Passive Sicherheit von Kraftfahrzeugen, Florian Kramer</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	4 SWS Vorlesung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch und Englisch / German and English
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None

Lehrveranstaltung <sup>1</sup> / Course	Vibration engineering (M)			
Modul <sup>2</sup> /Module	Vibration engineering (M)			
Fachbereich/ Department	Technik, Fachrichtung Maschinenbau /Department of Engineering, subject area Mechanical Engineering			
Studiengang/ Degree Programme	Master Industrial Engineering [required module] Master Mechanical Engineering [required module] Master Mechanical Engineering AMB [required module] Master Mechanical Engineering FZT [required module]			
Modulverantwortliche/r <sup>3</sup> / Module coordinator	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Alexander	Wohlers
Lehrende/r <sup>3</sup> / Lecturer	Anrede address	Titel title	Vorname First name	Nachname Last name
	Herr / Mr.	Prof. Dr.	Alexander	Wohlers
Studienabschnitt <sup>5</sup> / Level	Master-Studium / master course			
Wird gehört im Semester <sup>6</sup> / Course is given in semester	1. Semester / 1st semester			
Stoffinhalt/Contents	Lightweight construction, Vibrations at Lightweight design, rotor dynamics; Dämpfungsformulierung, modal analysis, dynamic response of Structures, torsional and bending vibrations in drive trains.			
Lern- und Qualifizierungsziele <sup>7</sup> / Objectives	Based on the fundamentals of structural dynamics incl. machine and rotor dynamics, the Students calculate components from the point of view of dynamic response. They develop measures to improve the dynamic properties and can find alternative solutions and evaluate them.			
Aufbauend auf <sup>8</sup> / Based on	Knowledge of mathematics and technical mechanics			
Formale Voraussetzungen <sup>9</sup> / Formal prerequisites	Voraussetzung für die Vergabe von ECTS-Punkten ist das erfolgreiche Bestehen der aufgeführten Prüfungs- und Studienleistungen. / The prerequisite for the award of ECTS credits is the successful completion of the listed exam and study performances.			
Prüfungsleistung <sup>10</sup> / Exam performance	Klausur / written exam			
Studienleistung <sup>11</sup> / Study performance	keine / none			
	Voraussetzung zum Ablegen der Prüfungsleistung: nein Prerequisite for taking the exam performance: no			
Zugelassene Hilfsmit- tel zur Erbringung der Prüfungsleistung / Ap- proved aid for the exam performance	None			

Literatur/Literature	<ul style="list-style-type: none"> <li>• • Vorlesungsumdruck</li> <li>• Horst Irretier "Grundlagen der Schwingungstechnik 1" Vieweg Verlag</li> <li>• Horst Irretier "Grundlagen der Schwingungstechnik 2" Vieweg Verlag</li> <li>• Michael Wahle "Grundlagen der Maschinen- und Strukturdynamik" Wissenschaftsverlag Mainz - Aachen</li> </ul>
SWS gesamt/ Total semester load	4
SWS aufgeschlüsselt <sup>12</sup> / Categorization of semester load	3 SWS Vorlesung, 1 SWS Übung
ECTS-Punkte <sup>13</sup> / ECTS-credits, Workload	5 ECTS, 150 Stunden/hours
Stellenwert der Note <sup>14</sup> / Final mark ration	Berechnung der Gesamtnote gemäß Prüfungsordnung. Calculation of the overall grade according to the examination regulations.
Selbststudium <sup>15</sup> / Self-study	90 Stunden/hours
Unterrichtssprache / Language of Instruction	Deutsch / German
Angeboten im / Offered in	Wintersemester / winter semester
Turnus / Rhythm	jährlich / annually
Dauer des Moduls / Duration of module	1 Semester / semester
Kommentare <sup>16</sup> / Comments	None
Bemerkungen <sup>17</sup> / Comments	None