AMTLICHE BEKANNTMACHUNG RWTH AACHEN UNIVERSITY

NUMMER 2013/045 **SEITEN** 1 - 35 **DATUM** 06.06.2013 **REDAKTION** Sylvia Glaser

3. Ordnung

zur Änderung der Prüfungsordnung

für den Masterstudiengang Automotive Engineering

der Rheinisch-Westfälischen Technischen Hochschule Aachen

vom 03.06.2013

Aufgrund der §§ 2 Abs. 4, 64 des Gesetzes über die Hochschulen des Landes Nordrhein-Westfalen (Hochschulgesetz – HG) vom 31. Oktober 2006 (GV. NRW S. 474), zuletzt geändert durch Artikel 1 des Gesetzes zur Änderung des Hochschulgesetzes und des Kunsthochschulgesetzes vom 18.12.2012 (GV. NRW. S. 669), hat die Rheinisch-Westfälische Technische Hochschule Aachen (RWTH) folgende Prüfungsordnung erlassen:

HERAUSGEGEBEN IM AUFTRAGE DES REKTORS VON DER ABTEILUNG 1.1 DES DEZERNATES 1.0 DER RWTH AACHEN
Templergraben 55, 52056 Aachen | Tel. +49 241 80-99087 | Fax. +49 241 80-92664 | akad@zhv.rwth-aachen.de

HERAUSGEGEBEN IM AUFTRAGE DES REKTORS VON DER ABTEILUNG 1.1 DES DEZERNATES 1.0 DER RWTH AACHEN
Templergraben 55, 52056 Aachen | Tel. +49 241 80-99087 | Fax. +49 241 80-92664 | akad@zhv.rwth-aachen.de

Artikel I

Die Prüfungsordnung für den Masterstudiengang Automotive Engineering der Rheinisch-Westfälischen Technischen Hochschule Aachen vom 02.10.2006 (Amtliche Bekanntmachung der RWTH Aachen, Nr. 1125) wird wie folgt geändert:

1. § 26 wird wie folgt geändert:

§ 26 Inkrafttreten und Veröffentlichung; Abs. 3-8 werden neu eingefügt.

(3) Diese Prüfungsordnung findet auf alle Studierenden Anwendung, die sich ab dem Wintersemester 2007 erstmalig für den Masterstudiengang Automotive Engineering an der RWTH Aachen eingeschrieben haben. Änderungen im Studienverlaufsplan bzw. im Modulkatalog gelten ab dem Zeitpunkt des Inkrafttretens der jeweiligen Änderungsordnung, mit der die Änderungen vorgenommen wurden.

(4) Module die vor dem Wintersemester 2009, vor dem Sommersemester 2012 bzw. vor dem Sommersemester 2013 begonnen wurden, können nach der jeweils zuvor geltenden Fassung zu Ende geführt werden.

(5) Einschreibungen in den Masterstudiengang Automotive Engineering waren letztmalig im Wintersemester 2011/12 möglich.

(6) Prüfungen werden letztmalig im Sommersemester 2014 durchgeführt.

(7) Die Masterarbeit sowie sämtliche Prüfungen einschließlich der Wiederholungen müssen bis spätestens zum Ende des Sommersemesters 2014 erfolgreich absolviert sein.

(8) Nach Ablauf des Sommersemesters 2014 ist ein Studienabschluss im Masterstudiengang Automotive Engineering nicht mehr möglich. Ausnahmen regelt der Prüfungsausschuss.

2. Der Modulkatalog wird durch die beiliegende Fassung ersetzt.

3. Der Studienverlaufsplan wird durch die beiligende Fassung ersetzt.

Artikel II

Diese Ordnung tritt zum Wintersemester 2012/13 in Kraft und wird in den Amtlichen Bekanntmachungen der RWTH veröffentlicht.

Ausgefertigt aufgrund des Beschlusses des Fakultätsrates der Fakultät für Maschinenwesen vom 9. April 2013.

Der Rektor
der Rheinisch-Westfälischen
Technischen Hochschule Aachen

Aachen, den 03.06.2013

gez. Schmachtenberg
Univ.-Prof. Dr.-Ing. E. Schmachtenberg

HERAUSGEGEBEN IM AUFTRAGE DES REKTORS VON DER ABTEILUNG 1.1 DES DEZERNATES 1.0 DER RWTH AACHEN
Templergraben 55, 52056 Aachen | Tel. +49 241 80-99087 | Fax. +49 241 80-92664 | akad@zhv.rwth-aachen.de

Anlage 1

Modulkatalog

Dieser Modulkatalog gibt den aktuellen Stand gemäß dem Tag der Beschlussfassung der Prüfungsordnung wieder, nachfolgende Änderungen, die sich nicht auf die Prüfungsformen beziehen, werden unter dem Link www.maschinenbau.rwth-aachen.de bekannt gegeben.

Modul: Automotive Engineering I & II

MODUL TITEL: Automotive Engineering I & II

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
1	2	12	8	2	WS	Englisch

INHALTLICHE ANGABEN

Inhalt

Automotive Engineering I:

- Introduction
- Traffic System Motor Vehicle
- Power and Energy Demand
- Wheel Resistance
- Power and Energy Demand
- Aerodynamic Drag
- Power and Energy Demand
- Resistance due to Gradients
- Acceleration Resistance
- Overall Resistance
- Powertrain
- Energy Accumulators
- Propulsion Units (Engines)
- Comparison of Propulsion Units
- Speed Converters (Clutches)
- Powertrain
- Torque converters (transmission)
- Differential (Transfer Gearbox)
- Brakes
- Vehicle Dynamics
- Driving Performance
- Drivetrain Layouts
- Driving Limits

Automotive Engineering II:

- demands on suspension systems
- road excitations
- vertical tire characteristics
- body springs
- body springs
- shock absorbers
- seats
- influence of vertical excitations on the human body
- single mass suspension model
- double mass suspension model
- parametric study of suspension properties
- single track suspension model
- two-track suspension model
- roll springing
- stabalizer and compensating spring
- influence of torsional weakness on suspension properties
- demands on lateral dynamics and vehicle behavior
- lateral tire characteristics
- dynamic lateral tire characteristics
- single track vehicle model
- analysis of stationary vehicle behavior
- analysis of dynamic vehicle behavior
- four wheel vehicle model
- dynamic wheel load distribution
- changes in wheel position due to camber and toe angle

Lernziele

Automotive Engineering I:

The emphasis of the lecture is the longitudinal dynamic of vehicles. The students should understand the functional charateristics of different components of the vehicle longitudinal dynamic and be able to assess these components concerning operating behaviour, economics and influence on environment.

Automotive Engineering II:

The first part of the lecture is vertical vehicle dynamic. Students are supposed to understand the requirements on the components of the suspension system and should be able to calculate the vehicle vertical dynamics using different suspension models.

The driving stability (lateral dynamic) is discussed in the second part of the lecture. Students will gain understanding of tyres and steering system and should be able to analyse the influence of different vehicle parameters on the driving stability.

• parametric study of inluences on lateral vehicle dynamics • influence of longitudinal on lateral vehicle dynamics • steering systems • kinematics of wheel suspensions • elastokinematics of wheel suspensions • requirements to be met by wheel suspensions • examples of wheel suspension types	
Voraussetzungen	**Benotung**
Automotive Engineering I für Automotive II	

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Automotive Engineering I & II	2x120	12	0
Vorlesung Automotive Engineering I	0	0	2
Übung Automotive Engineering I	0	0	1
Vorlesung Automotive Engineering II	0	0	2
Übung Automotive Engineering II	0	0	2
Praktikum Automotive Engineering II	0	0	1

Modul: Automotive Engineering III

MODUL TITEL: Automotive Engineering III

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
3	1	6	4	2	WS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
• Demands on the Automobile Engineer • The Environment of the Automobile Industry • Introduction into vehicle safety • Accident Analysis • Lighting Equipment • View and Control Conception • Air Conditioning, Glass • Practical Course: Driver Assistance • Systems for Driver Assistance – Introduction • Systems for Driver Assistance - Sensors and Actuators • Systems for Driver Assistance – Applications • Longitudinal and Transverse Dynamics Control • Biomechanics • Pedestrian Protection • Restraint Systems • Pre-Crash / Post-Crash • Demands on System Integrity	During the course student gain an understanding for safety related vehicle systems. The theoretical considerations of these systems in the lecture are discussed in practical exercises with realistic examples of modern vehicle technology.
Voraussetzungen	**Benotung**
Automovtive Engineering I Automotive Engineering II	

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Automotive Engineering III	120	6	0
Vorlesung Automotive Engineering III	0	0	2
Übung Automotive Engineering III	0	0	2

Modul: Internal Combustion Engine Fundamentals

MODUL TITEL: Internal Combustion Engine Fundamentals

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
1	1	5	3	2	WS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
• Introduction • Kinematics and forces of combustion engines • Thermodynamic fundamentals • Characteristic numbers of combustion engines • Spark-Ignition Engines • Compression-Ignition Engines • Emission formation and exhaust gas aftertreatment	• The students are able to systematically analyze the various principles of fuel conversion and the main requirements of combustion engines. • They are capable to transfer the basic thermodynamic fundamental calculation procedures to the related combustion process by means of ideal models of engine cycles. • With these fundamentals the students are capable to calculate and evaluate the various efficiencies and important characteristic numbers of internal combustion engines. • The students are able to systematically differentiate the various combustion engines by the different combustion systems with its particular heat release, the ignition process and the kinematics of valve train and crank train and to relate them to current engine developments. • Due to the increasing environmental pollution the students are given the ability to comprehend the emission formation and to find best suited solutions for the exhaust gas after treatment for different types of engines. Not with respect to the subject (e.g. Team work, Presentation, Project Management, etc.):
Voraussetzungen	**Benotung**

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Internal Combustion Engine Fundamentals	120	5	0
Vorlesung Internal Combustion Engine Fundamentals	0	0	2
Übung Internal Combustion Engine Fundamentals	0	0	1

Modul: Production Management A

MODUL TITEL: Production Management A

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
3	1	5	4	2	WS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
• Technology Management I • Technology Management II • Product Planning & Engineering • Variant Management • Process Planning • Planning for Manufacture & Assembly • Operations Management • Materials Management • Lean Production - Production Systems • Production Strategies • Buisness Modelling • Process Modelling • The Industrial History: From Taylorism To Virtual Factory	Markets and manufacturing conditions are frequently changing. This imposes the necessity of long-range and intensive planning in enterprises of the manufacturing industry, as only early accommodation of actual conditions guarantees competitiveness. Students will gain knowledge which topics have to be considered in this context and how the gained knowledge can be transferred to daily business of a company. For the purposes of manufacturing engineering, Students know the following tasks that have to be carried out: • Elaboration and application of planning methods. • Analysis of problems in all enterprise domains which are involved in the manufacturing process. • Demonstration of possibilities for rationalisation and automation. • Elaboration of rationalisation methods and tools. These tasks are elucidated concerning the manufacturing domains design, operations planning and scheduling, production and assembly as well as the superior domains cost accounting, E.D.P., overall organisation etc. Students will be able to understand the problems of producing companies and will find solutions best suited for the investigated subject.
Voraussetzungen	**Benotung**

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungsdauer (Minuten)	CP	SWS
Prüfung Production Management A	120	5	0
Vorlesung Production Management A	0	0	2
Übung Production Management A	0	0	2

Modul: Quality Management

MODUL TITEL: Quality Management

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
3	1	5	4	2	WS	Englisch

INHALTLICHE ANGABEN

Inhalt

- Introduction:
- Deming Chain, Target-Management, Continues Improvement etc.
- Quality Programs:
- Total Quality management, EFQM-Model, Six Sigma etc.
- Quality Management Methods:
- Documentation of Quality Management Systems, Auditing and Certification, Quality Management and Norm etc.
- Quality and Economics:
- Controlling of Quality, Quality Cost Accounting, Cost Categories, Target Costing, Balanced Scorecard etc.
- Quality Management During Field Operations:
- Analyses of Field Data, Weibull-Analyses, Isochron-Diagram, MIS-Diagram etc.
- Quality Management in the Production:
- Statistical Process Control, 5S, Value Stream Mapping etc.
- Quality Management in the Early Phases - Focus Product:
- Kano-Model, Quality Function Deployment, House of Quality, TRIZ etc.
- Quality Management in the Early Phases - Focus Process:
- Design for Six Sigma, Fault Tree Analyses, Failure-Mode- and Effects-Analyses, Risk Management etc.
- Quality Management in the Early Phases - Focus Faults and Defects:
- Ishikawa-Diagram, Process and Product Optimisation, Design of Experiments etc.
- Quality Management in the Procurement:
- Procurement Strategies, Supplier selection, Incoming Inspection, Accepted Quality Level, Inspection and Release of the First Sample etc.
- Quality and Information:
- Quality Control Loops, Quality Daten Basis und Product Data Basis, IT-Systems in Enterprises (ERP, PPS, BDE, MDE),Computer Aided Quality Management, CAx-Techniques (CAQ; CAD; CAE; CAP), Relation of Quality- and Knowledge Management etc.
- Quality Management in Service Industries:
- Service Engineering, Service Level Agreement, Service Blueprinting, ServQual, Vignette Technique, Service FMEA, Conjoint Analyses etc.
- Case Study KAIZEN:
- Damages and failures on gear wheels and suitable test methods for the analysis of gear stages etc.
- Quality and Law:
- (only German Law and in German language) etc.

Lernziele

Considering the growing importance of quality assurance in industrial production, the lecture of "Quality Management" was initiated at the Faculty of Production Engineering. Quality issues of industrial applications and necessary underlying theories are emphasised in this lecture. The core of this lecture lies thus in the organisation of quality systems and quality management methods. A broader perspective can also be given via discussions about more advanced topics such as quality planning, quality costs and quality legal questions.

• Practical Computer Training: Continuous Improvement, Value Added and Waste, Optimizing the Production Process etc	
Voraussetzungen	**Benotung**

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	**Prüfungs-dauer (Minuten)**	**CP**	**SWS**
Prüfung Quality Management	120	5	0
Vorlesung Quality Management	0	0	2
Übung Quality Management	0	0	2

Modul: Machine Design Process

MODUL TITEL: Machine Design Process I

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
1	1	6	4	2	WS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
• Introduction, general process of engineering design • Setting up a list of requirements • Methods of identifying requirements • Purpose of a technical system • Steps of conceptual design • General methods of finding solutions, discussing methods • Functional interrelationalship and function structure • Empirical heuristic methods for finding solutions • Systematic enlargement of solution fields • Evaluation and selection of solutions • Methods of evaluation • Preliminary embodiment design • Basic rules of embodiment design, simple and clear • Basic rules of embodiment design, safety • Direct safety, indirect safety, warnings and material aspects • Principles of embodiment design I • Principle of force transmission and division of tasks • Principles of embodiment design II • Principle of self-help, stability, bi-stability and fault-free design • Design for X I (allow for expansion, creep, relaxation and ease of assembly) • Design for X II (Ease of measurement, inspection, maintenance and recycling, minimising risks) • Design for X III (selection of production procedure, overall layout) • Design for X IV (Ease of manufacturing)	- This course is targeted at engineers or engineering graduates in the field of product development and design to systematically execute a given design task to develop a competitive product. - Classification: systemic (transfer = application of theory for practice)
Voraussetzungen	**Benotung**

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Machine Design Process	150	6	0
Vorlesung Machine Design Process	0	0	2
Übung Machine Design Process	0	0	2

Modul: Tribology

MODUL TITEL: Tribology

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
1	1	6	4	2	WS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
• Basics of Tribology: • The Tribosystem in general and its analysis, its wear and friction processes and their test methods, also reasonable test and substitute systems • Interactions between base and contact Bodies: • Contact processes and geometries, material strain, Hertzian theory, contact mechanics • Interactions between base and contact Bodies: • Frictional processes and the results and influence on the tribosystem, wear processes and methods to avoid wear and losses • Properties of base and contact Bodies: • Tribomaterials and the analysis of technical surfaces, roughness, hardness definitions and test methods • Properties of base and contact Bodies: • Coating types and methods and their technical application, systematical methods and examples for the correct choice of material • Properties of intermediate medium: • Basic properties, dependencies and test methods for the viscosity • Properties of intermediate medium: • Classification, properties and application examples for different lubricants (oils, greases and solid lubricants) • Bascis of hydrodynamics and elastohydrodynamics: • Fundamentals and principles of flow mechanisms, derivation of Navier-Stokes and Reynolds equations and continuity equation • Bascis of hydrodynamics and elastohydrodynamics: • Application of the hydrodynamic equations regarding the calculation of bearings, Basics of the elastohydrodynamics • Tribosystem Journal Bearings: • Functionality and calculation of *hydrodynamic* axial and radial journal bearings, different occurring damages and failures and the choice of suitable lubricants • Tribosystem Journal Bearings: • Functionality and calculation of *hydrostatic* axial and radial journal bearings, different occurring damages and failures and the choice of suitable lubricants • Tribosystem gear wheels: • Lubricants and materials for gears and their influence and application, application of the EHD-theory for gear stages • Tribosystem gear wheels: • Damages and failures on gear wheels and suitable test methods for the analysis of gear stages • Tribosystem roller bearings: • Design, materials, friction and lubrication of roller bearings, damages and failures and test methods for the analysis of roller bearings	The students are able to find and localize and systematically analyze tribo systems in general mechanical systems. They are theoretically capable of choosing and applying different suitable measuring- and test systems for journal bearings, roller bearings and gear wheels and they are capable of estimating the quality of the Tribosystem according to the test results and to optimize it with the background knowledge of a considerably large action catalogue. The students know the basic theories of hydrodynamics and of elastic material deformations and are able to use them in the calculation and analysis of tribological issues in a reasonable way.

• <u>Tribosystem seals:</u> • Different types and designs, specialties and application of different seals and materials for seals	
Voraussetzungen	**Benotung**
• Machine Elements • Mechanics • Advanced Mathematics	

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Tribology	120	6	0
Vorlesung Tribology	0	0	2
Übung Tribology	0	0	2

Modul: Dynamics of Machines II

MODUL TITEL: Dynamics of Machines II

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
2	1	5	4	2	SS	Englisch

INHALTLICHE ANGABEN

Inhalt

- Introduction
- Basic Principles and Plane Motion of Rigid Bodies
- Dynamic Force Analysis of Plane Mechanisms with Rigid Links: Graphical Technique
- Dynamic Force Analysis of Plane Mechanisms with Rigid Links: Analytical Approach
- Dynamic Motion Analysis of Plane Mechanisms with Rigid Links
    - Systems without Friction
    - Systems with Friction
- Dynamics of Slider-Crank Mechanism
- Analytical Expressions for Kinematic Parameters
- Dynamical Equivalence of Connecting Rod
- Turning Moment in Single Cylinder Engines
- Dynamics of Mechanisms Considering Link Elasticity
- Balancing of Inertial Forces and Moments for Single Slider Reciprocating Machines
    - Determination of Inertial Forces
    - Balancing of Inertia Forces
    - Determination of Inertial Moments
    - Balancing of Inertial Moments
- Balancing of Inertial Forces and Moments for Multi Slider Reciprocating Machines (In-Line Configuration)
    - Inertia Forces by Analytical Approach
    - Inertia Forces by Graphical Approach
    - Analysis of Inertial Moments
- Balancing of Inertial Forces and Moments for Multi Slider Reciprocating Machines (V and Radial Configuration)
    - Inertial Forces in V-Configuration
    - Inertial Forces in Radial Configuration
- Balancing of Planar Linkages
- Power Smoothening in Machines
- Power balance
- Power balancing in the field of piston engines
- Equations of Motion
    - External Forces and Moment
    - Kinetic Energy
    - Potential Energy
- General Solution of Equation of Motion
- Solution of Equation of Motion for Constant Inertia
- Solution of Equation of Motion for Constant Speed
- Solution of Equation of Motion for Specified Instantaneous Speed and Acceleration
- Solution of Equation of Motion for Constant Energy
- Fluctuation of Angular Velocity
- Non uniformity factor
- Control of Speed Fluctuation by Flywheels
- Determination of Flywheel Inertia (graphical approach)
- Determination of Flywheel Inertia (analytical approach)
- Wittenbauer's Method of Flywheel Analysis

Lernziele

The students have the ability of describing mathematically any mechanical system with its inherent physical effects like balancing inertial forces and torques, and power smoothing especially of piston engines.

The students have the ability to perform an analysis of the motion behaviour and dynamics of rigid bodies. They are able to evaluate the impact of the different model parameters on inertial forces and to derive measures for the improvement of balancing and power smoothing.

Voraussetzungen	Benotung

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Dynamics of Machines II	120	5	0
Vorlesung Dynamics of Machines II	0	0	2
Übung Dynamics of Machines II	0	0	2

Modul: Fundamentals of Lightweight Design

MODUL TITEL: Fundamentals of Lightweight Design

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
1	1	4	3	2	WS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
• Introduction to Lightweight Design • Motivation, Definitions, Concepts • Special Aspects of Light Structures • Materials used in Lightweight Design • Basic equations of Continuum Mechanics • Idealization of structures • Equilibrium conditions • Statically determined support of 2-dim and 3-dim structures • Determination of external and internal forces • 2-dim and 3-dim truss type structures • General equations • Design concepts • Beams loaded in bending and shear • General equations • Differential equation of shear rigid beams • Matrix formulations: transfer matrix, stiffness matrix • Shear flexible beam • Matrix formulation • Shear deformation • Shear flow in thin walled beams • Open cross section • Closed cross section • Shear center • Plastic bending • Combined normal and bending load • Torsion of beams (st. Venants Torsion) • Solid sections • Closed thin walled sections • Open thin walled sections • Bending Torsion • Introduction to shear panel theory • Open and closed section beams • 2-dim shear panel structures • rectangular, parallelogram, trapezoidal and general 4node panels • 3-dim shear panel structures	The students are able to realize special aspects of thin-walled lightweight structures and to design them properly. They know methods to design structures at the beginning and are thus able to find sufficient solutions. Further, they achieve knowledge, allowing to check the correctness of results of numerical simulation software.
Voraussetzungen	**Benotung**
Continuum Mechanics	

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Fundamentals of Lightweight Design	120	4	0
Vorlesung Fundamentals of Lightweight Design	0	0	2
Übung Fundamentals of Lightweight Design	0	0	1

Modul: Industrial Engineering, Ergonomics and Work Organisation

MODUL TITEL: Industrial Engineering, Ergonomics and Work Organisation

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
1	1	5	4	2	WS	Englisch

INHALTLICHE ANGABEN

Inhalt

Work as a Scientific Field of Research
- Fundamentals of industrial engineering
- Trends and challenges in the field of industrial engineering

Industrial Organization and Work Organization
- Basics and classification of industrial organization and work organization in modern industries
- Basics and modelling options of structure organization and process organization
- Principles of function and object oriented order processing
- traditional industrial organizations and trends
- Methods for activity planning and scheduling

Work Organization within Direct and Indirect Departments
- The phenomenon “organization”
- Characteristics of direct and indirect departments
- Types of work organization in direct and indirect departments

Work and Time Study I
- The operational purpose of time data
- REFA types of activities and REFA types of times
- Methods for the determination of time data
- The REFA Stop Watch Time Study method and the work sampling method

Work and Time Study II
- The basic principles of the sequence-analytic time modelling (predetermined motion-time systems)
- Basics and application of MTM („Methods Time Measurement“)

Ergonomic Design and Usability Engineering
- Design criteria and requirements of ergonomic design
- Anthropometric design
- Methods for the analysis of movement-, sight- and reaching-areas
- Computer aided design and evaluation aids

Computer and Office Work
- Conventional and modern components of a computer workstation
- Overview of display technologies
- Aspects of work psychology
- Risk assessment for computer work stations
- Office concepts

Ergonomic Work Place Design in Production Areas
- Different types of physical and muscular work
- Factors influencing spine damage
- Methods for assessing the danger of spine damage at work places
- Physiological principles of work place design

Occupational Risk Prevention (ORP)
- Effects of occupational safety for the company and national economy
- Terms of safety science
- Technical, organizational and personal measures of occupational risk prevention

Work Ecology - Noise and Hazardous Substances
- Physical and psychological measurement categories of sound
- Noise induced hearing damages

Lernziele

The students know the essentials of work science covering technical, organizational and personnel aspects. Based on this knowledge the students are able to interpret respective work situations, predict consequences and future work system states. The students are able to independently scrutinize and discuss the proposed methods and theories and judge their applicability. By using the methods students are able to analyse work systems according to various practical problems. Furthermore, the students are able to apply the theoretical models, methodologies and practical techniques to problem solution and work system design in modern enterprises.

• Organizational and personal noise control • Taxonomy and effects of hazardous substances Work Ecology II - Illumination • Physical and physiological basics of illumination • Effects of lighting on work performance and health • Measurement of light • Relevance of illumination for workplace design. Remuneration and Motivation • Forms of remuneration • Relationship between remuneration and motivation • Approaches to job evaluation Interorganizational Cooperation and Suitable Information Technological (IT) Support • Basic terms of network technology • Software tools for the support of coordination, cooperation, and communication • Effects of the technology on enterprises and employees • Forms of organizations and conditions suitable for the use of network technology	
Voraussetzungen	**Benotung**

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	**Prüfungs-dauer (Minuten)**	**CP**	**SWS**
Prüfung Industrial Engineering, Ergonomics and Work Organisation	120	5	0
Vorlesung Industrial Engineering, Ergonomics and Work Organisation	0	0	2
Übung Industrial Engineering, Ergonomics and Work Organisation	0	0	2

Modul: Internal Combustion Engines I

MODUL TITEL: Internal Combustion Engines I

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
2	1	5	4	2	SS	Englisch

INHALTLICHE ANGABEN

Inhalt

- Introduction
- Fuels

Classification, manufacturing processes, chemical structure and physical properties of fuels based on mineral oil

Energy reserves, consumption and energy industry

- Alternative fuels based on coal, natural gas and non-fossil sources of energy
- Energy flow in the combustion engine process

Open cycle simulation

Energy balance and definition of losses

- Heat flow in combustion engines

Mechanisms of heat transfer

Calculation methods of heat transfer coefficients in the combustion chamber, conduction and heat transfer to the coolant

Temperatures and thermal stresses of engine components

- Layout of combustion engines

Rules of geometrical, mechanical and thermal similari
ty

Indices and mechanical power limits

Engine base data, typical plan of an engine development process

- Forces and moments in engines

Gas forces and inertia forces, excitation by forces in crank drive mechanism

Engine balancing

Torsional vibration of crankshafts

- Engine components

Requirements on crankshaft, connecting rod, piston, crank-case, cylinder head and liner

Materials, concepts and specific design features

Cooling and lubrication systems

Lernziele

The students are able to systematically analyze the various types of fuels as energy resources. They are capable to transfer the basic thermodynamic fundamental calculation procedures to the related combustion process by means of ideal models of engine cycles and simulations. The students are capable to systematically apply calculation methods of heat transfer, heat conduction and thermal stresses based on the principal mechanisms of heat flux. They are able to assess similarity rules and indices to transfer this knowledge in order to layout engines and to estimate mechanical power limits. The students are also capable to determine forces and moments in engines resulting from crank drive mechanism and are able to assess the requirement of engine components as well as the layout of the cooling and lubrication systems with subsequent components.

Voraussetzungen

- Internal Combustion Engine Fundamentals
- Thermodynamics
- Fluid Dynamics
- Machine Dynamics

Benotung

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN			
Titel	**Prüfungs-dauer (Minuten)**	**CP**	**SWS**
Prüfung Internal Combustion Engines I	120	5	0
Vorlesung Internal Combustion Engines I	0	0	2
Übung Internal Combustion Engines I	0	0	2

Modul: Internal Combustion Engines II

MODUL TITEL: Internal Combustion Engines II

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
3	1	5	4	2	WS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
• Introduction • Load exchange and valve train • Supercharging • Heat flow in combustion engines • Mixture preparation for gasoline and Diesel engines • Exhaust emissions • Engine Acoustics	• By the end of this lecture the students are able to systematically analyze the load exchange of the different types of combustion engines (4-stroke engine, rotary engine, 2-stroke engine). • They are capable to comprehend the basic physical mechanisms of the load exchange, such as wave effects, and to relate its influence on constructive characteristics by the acoustic theory. Given this ability the students are ready to asses the tasks, types and dynamic effects of valve trains and recommendations for construction. • They are able to differentiate between the different methods of supercharging as well as mixture formation, e.g. port fuel injection and direct injection of gasoline engines as well as direct injection of Diesel engines, and to relate them to their influences on performance and efficiency. • Due to the increasing environmental pollution the students are given the ability to comprehend the emission formation and to find best suited solutions for controlling measures and exhaust gas after treatment for different types of engines.

Voraussetzungen	Benotung
• Internal Combustion Engine Fundamentals • Thermodynamics • Fluid Dynamics • Machine Dynamics	

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Internal Combustion Engines II	120	5	0
Vorlesung Internal Combustion Engines II	0	0	2
Übung Internal Combustion Engines II	0	0	2

Modul: Laser Technique II (Process)

MODUL TITEL: Laser Technique II (Process)

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
2	1	5	4	2	SS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
Die Vorlesungsreihe Anwendungen der Lasertechnik (Lasertechnik II) beginnt mit einer Charakterisierung des Laserstrahls als Werkzeug in der Fertigungstechnik und gibt einen Überblick über die Anwendungsmöglichkeiten des Werkzeugs Laserstrahl im Bereich der Fertigungs- und Messtechnik (Vorlesung 1). In den Vorlesungen 2 und 3 werden die wesentlichen physikalischen Phänomene, die der Materialbearbeitung mit Laserstrahlung zugrunde liegen, dargestellt. Die Vorlesungen 4 bis 8 widmen sich den Laseranwendungen aus dem Bereich der Fertigungstechnik. Hier finden sich sowohl bereits in die breite industrielle Praxis eingeführte Anwendungen wie das Bohren, Schneiden und Schweißen mit Laserstrahlung, als auch neue Anwendungen wie das Laserstrahlgenerieren oder das Reinigen mit Laserstrahlung. Die Darstellung wird durch zahlreiche konkrete Anwendungs- und Systembeispiele ergänzt. Vorlesung 9 behandelt die Prozessüberwachung und -regelung von Bearbeitungsprozessen mit Laserstrahlung. Vorlesung 10 gibt einen Überblick über wichtige Verfahren der Lasermesstechnik. In Vorlesung 11 werden Anwendungen von Ultrakurzpulsstrahlung vorgestellt. Die Vorlesung richtet sich an Studierende der Fachrichtung Maschinenbau und Physik (als nichtphysikalisches Nebenfach), für die jeweils eigene Übungen angeboten werden. Die Veranstaltung kann unabhängig von der Vorlesung Laserstrahlquellen (Lasertechnik I) gehört werden. (http://www.llt.rwth-aachen.de/de/116489.html)	
Voraussetzungen	**Benotung**

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Laser Technique II (Process)	120	5	0
Vorlesung Laser Technique II (Process)	0	0	2
Übung Laser Technique II (Process)	0	0	2

Modul: Manufacturing Technology I & II

MODUL TITEL: Manufacturing Technology I & II

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
1	2	10	8	2	WS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
• Introduction to manufacturing technology • Measuring and testing in manufacturing technology • Principles of machining with geometrically defined cutting edges • Cutting materials and cutting tools • Cutting materials, tools and lubricants • Cutting criteria • Manufacturing processes with geom. defined edges • Applications of processes with defined cutting edge • Principles of cutting with undefined cutting edges • Grinding tools and grinding wheel preparation • Processes and application examples (grinding) • EDM • ECM and Rapid Prototyping (RP) • Casting • Powder Metallurgy • Bulk Forming I • Bulk Forming II • Sheet Metal Forming I • Sheet Metal Forming II • Process Design • Fine Blanking • Manufacturing Sequences and Process Design	The students possess comprehensive knowledge of the cutting technologies with geometrically defined and undefined cutting edges, electro discharge and electro-chemical machining and rapid prototyping. Beside the fundamental principles of the techniques the student are familiar with the parameters taking influence on the process design and can derive measures for a process optimization. Furthermore the students are able to solve problems concerning the field of measuring and testing of produced parts The students possess comprehensive knowledge of forming (casting and powder metallurgy) and reforming (bulk forming, sheet metal forming and blanking) processes. Beside the fundamental principles of the elasto-plastic material behaviour the student are familiar with the parameters taking influence on the process design and can derive measures for a process optimization. Furthermore the students are able to design process chains for complex parts.
Voraussetzungen	**Benotung**

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Manufacturing Technology I & II	2*90	10	0
Vorlesung Manufacturing Technology I	0	0	2
Übung Manufacturing Technology I	0	0	2
Vorlesung Manufacturing Technology II	0	0	2
Übung Manufacturing Technology II	0	0	2

Modul: Mechatronic Systems

MODUL TITEL: Mechatronic Systems

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
2	1	5	4	2	SS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
• Introduction • Sensors I • Sensors II • Analog Signal Processing • Digital Signal Processing • Signal Output, Bus Systems, EMC • Fluidic Actuators • Electric Actuators • Modelling, Simulation • Power Supply • Vehicle Systems, System Integrity • Rail Vehicle Systems • S22L	In this lecture, the difference between conventional systems and mechatronic systems are introduced. Students should also learn about Interdisciplinary knowledge of mechanics, eletronics and computer science.
Voraussetzungen	**Benotung**

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Mechatronic Systems	120	5	0
Vorlesung Mechatronic Systems	0	0	2
Übung Mechatronic Systems	0	0	2

Modul: Structural Design of Vehicles

MODUL TITEL: Structural Design of Vehicles

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
2	1	4	3	2	SS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
• Vehicle structures • Platforms, Modules • Package • Aerodynamics and design • Structural stiffness and natural frequencies • Manufacturing and joining techniques • Lightweight measures • Structural design features of vehicle bodies • Endurance strength • Functional- and endurance testing • FEM-Analysis of body structures • Basics, optimization calculation, crash calculation • Introduction into passive safety • Energy absorption and deformation • Frontal impact, side impact • Other test configurations, pedestrian safety • Measurment Techniques	Emphasis of the lecture is the conception of vehcle body and superstucture including the connecting points for components. Students will gain knowledge about different body concepts and materials used as well as methods of lightweight design. Furthermore, passive safety of vehicles is also introduced on the basis of accident analysis and biomechanical charateristics of the human body.
Voraussetzungen	**Benotung**

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Structural Design of Vehicles	120	4	0
Vorlesung Structural Design of Vehicles	0	0	2
Übung Structural Design of Vehicles	0	0	1

Modul: Alternative and Electrified Vehicle Propulsion Systems

MODUL TITEL: Alternative and Electrified Vehicle Propulsion Systems

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
2	1	4	3	2	SS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
• Introduction • Alternative drive systems • Alternative fuels • Variable transmissions and power split drive train • Regenerative drives • Drive concepts • Control Strategies	• After having successfully passed this lecture the student is able to systematically analyze alternative concepts for vehicle power trains. • He/she are theoretically capable to comprehend the different purposes of alternative drive systems, such as unconventional types of combus-tion engines with the consideration of alternative fuels (alcohol, natural gas, hydrogen), gas turbines, Stirling engines and fuel cells as well as electric drives. • Furthermore, the student has the ability to link the knowledge about alternative power trains to the different types of variable transmissions and power split drive trains. • The main skill of the student is the transfer of basic calcu-lation procedures of power train efficiencies. • He/she is able to assess regenerative drives e.g. electric, flywheel and hybrid drives. • The student is able to find the most suitable control strat-egies (intgrated engine-transmission management) ac-cording to the various drive concepts.
Voraussetzungen	**Benotung**
• Internal Combustion Engine Fundamentals • Internal Combustion Engines I + II • Automotive Engineering I • Thermodynamics	

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Alternative and Electrified Vehicle Propulsion Systems	120	4	0
Vorlesung Alternative and Electrified Vehicle Propulsion Systems	0	0	2
Übung Alternative and Electrified Vehicle Propulsion Systems	0	0	1

Modul: Welding and Joining Technologies

MODUL TITEL: Welding and Joining Technologies

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
2	1	5	4	2	SS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
• Introduction • Gas Fusion Welding • Manual Metal Arc Welding • Submerged Arc Welding • TIG Welding • Plasma Welding • MIG Welding • Electro Gas Welding • Electro Slag Welding • Narrow Gap Welding • Pressure Welding, • Resistance Welding • Electron Beam Welding • Laser Beam Welding • Special Processes • Surfacing • Shape Welding • Thermal Cutting • Mechanisation • Automation • Robots • Sensor Technology	Welding is an interdisciplinary technology. All fields of industrial manufacturing require the joining of individual parts to functional groups. Many welding and cutting technologies are applicable for this purpose. After having participated in this course, the student is acquainted with the main welding technologies. The student is capable to select the suitable welding technologies for a welding task and to substantiate the selection by specifying the advantages and the disadvantages of the individual methods.
Voraussetzungen	**Benotung**
• English	

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Welding and Joining Technologies	120	5	0
Vorlesung Welding and Joining Technologies	0	0	2
Übung Welding and Joining Technologies	0	0	2

Modul: Vehicle Acoustics

MODUL TITEL: Vehicle Acoustics

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
2	1	5	4	2	SS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
• Basics of Acoustics • Audiology, Measuring (airborne) sound • Measuring (structure-borne) sound and vibrations • Legislation, Accelerated pass-by noise measurement procedure (ISO 362) • Engine noise • Noise and vibrations of drivetrain components • Vibrations of vehicle drivetrains • Road/tyre noise (part 1) • Road/tyre noise (part 2) • Noise and vibrations of brake systems • Power steering noise • Vehicle body noise and vibration (part 1) • Vehicle body noise and vibration (part 2) • Psychoacoustics, Sound engineering	Participants gain in-depth knowledge of all relevant parts within the field of vehicle acoustics, both in theory and practise. The course is accompanied by exercises comprising comprehensive examples.
Voraussetzungen	**Benotung**
• Automotive Engineering I	

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung Vehicle Acoustics	120	5	0
Vorlesung Vehicle Acoustics	0	0	2
Übung Vehicle Acoustics	0	0	2

Modul: Control Engineering

MODUL TITEL: Control Engineering

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
1	1	4	3	2	WS	Englisch

INHALTLICHE ANGABEN

Inhalt	Lernziele
Significance of control theory, examples of biological and biomedical control loops, functional diagrams, linearization, set up and solving of differential equations, stability, features in time domain of dynamical systems, Laplace transform, transfer function, frequency response, functional diagram algebra, features in frequency domain of dynamical systems, bode diagram, Nyquist plot, Linear control loop elements, principle and goals of controller design, algebraic stability criteria, steady state analysis and transient performance of a control loop, controller setting rules, Nyquist stability criterion, phase margin, gain margin, controller design in bode diagram.	Enable students to • analyze dynamical, biological and biomedical systems and identify the relevant causalities • employ different mathematical descriptions of dynamical systems • solve differential equations by means of Laplace transform • obtain, interpret and employ the frequency response of dynamical systems • know, recognize and classify the most common linear control loop elements • assess of the stability of dynamical systems using different methods know about the effects of feedback and apply different methods to set up feedback elements (controllers) such that predefined control goals are met
Voraussetzungen	**Benotung**
Basic knowledge in mathematics as defined in the examination regulations.	Oral or written exam

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungsdauer (Minuten)	CP	SWS
Prüfung Control Engineering	90	3	0
Vorlesung Control Engineering	0	0	1
Übung Control Engineering	0	0	1

Modul: German Language Course

MODUL TITEL: German Language Course

ALLGEMEINE ANGABEN

Fachsemester	Dauer	Kreditpunkte	SWS	Häufigkeit	Turnus Start	Sprache
1	1	6	4	1	WS	Deutsch

INHALTLICHE ANGABEN

Inhalt	Lernziele
• Kennen lernen • Sich vorstellen • Stadterkundungen • Orientierung in der Stadt • Techniken: Wörter lernen und behalten • Lebensmittel einkaufen • Telefonkommunikation • Techniken: Systematisch Grammatik lernen • Kalender, Feste • Feiertage • Lernen und Vergessen • Lernpsychologie • Deutschsprachige Zeitungen • Lesegewohnheiten • Andere Länder, andere Sitten • Interkulturelle Erfahrungen • Medien • Geografische Deutschlandkunde • Erfindungen und Fortschritt • Zwischen den Kulturen • Umweltschutz/Umweltprobleme • Das Projekt Europa • Arbeitsmarkt Deutschland • Bewerbungen • Lebensläufe	-Deutschkurse vermitteln grundlegendes Wissen über die deutsche Kultur und Landeskunde; - Deutschkurse befähigen zur sprachlichen Bewältigung der Alltagskommunikation im universitären Umwelt (Wohnheim, Mensa, usw,); - Deutschkurse bieten Voraussetzungen für kulturell angemessene Bewerbungsunterlagen für Praktika (Lebenslauf, Bewerbungsschreiben); - Deutschkurse vermitteln Einsichten in kulturelle Gegebenheiten an deutschen Hochschulen
Voraussetzungen	**Benotung**

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN

Titel	Prüfungs-dauer (Minuten)	CP	SWS
Prüfung		6	0
Vorlesung und Übung	0	0	4

Modul: Industrial Internship

MODUL TITEL: Industrial Internship						
ALLGEMEINE ANGABEN						
Fachsemester	**Dauer**	**Kreditpunkte**	**SWS**	**Häufigkeit**	**Turnus Start**	**Sprache**
4	9 Wochen	9				Englisch

INHALTLICHE ANGABEN	
Inhalt	**Lernziele**
Siehe Richtlinien für die berufspraktische Tätigkeit	Siehe Richtlinien für die berufspraktische Tätigkeit
Voraussetzungen	**Benotung**
	keine

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN			
Titel	**Prüfungs-dauer (Minuten)**	**CP**	**SWS**
Bericht, Kolloquium	30	9	0

Modul: Mini Thesis

MODUL TITEL: Mini Thesis						
ALLGEMEINE ANGABEN						
Fachsemester	**Dauer**	**Kreditpunkte**	**SWS**	**Häufigkeit**	**Turnus Start**	**Sprache**
3	9 Wochen	9				Englisch

INHALTLICHE ANGABEN	
Inhalt	**Lernziele**
Wissenschaftliche abgeschlossene Arbeit, die unter Anleitung angefertigt wird. Die Studierenden erarbeiten mit den Betreuern eine Gliederung, legen die zur Erfüllung der Aufgabe notwendigen Teilaufgaben und Hilfsmittel und den voraussichtlich erforderlichen Zeitbedarf fest.	Die Studierenden erlernen die Herangehensweise und Abarbeitung von wissenschaftlichen Themenstellungen, deren Dokumentation und schriftlichen Darstellung unter intensiver Anleitung. Sie Erlernen die Methodik des systematischen, wissenschaftlichen Arbeitens.
Voraussetzungen	**Benotung**

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN			
Titel	**Prüfungs-dauer (Minuten)**	**CP**	**SWS**
Mini Thesis	0	9	0

Modul: Master Thesis

MODUL TITEL: Master Thesis						
ALLGEMEINE ANGABEN						
Fachsemester	**Dauer**	**Kreditpunkte**	**SWS**	**Häufigkeit**	**Turnus Start**	**Sprache**
4	20 Wochen	20				Englisch

INHALTLICHE ANGABEN	
Inhalt	**Lernziele**
Wissenschaftliche abgeschlossene Arbeit, die zeigen soll, dass die Studierenden in der Lage sind, ein Problem aus einem in Beziehung zu ihrem stehenden Fach in begrenzter Frist selbstständig nach wissenschaftlichen Methoden zu bearbeiten.	Die Studierenden erlernen die selbstständige Herangehensweise und Abarbeitung von wissenschaftlichen Themenstellungen, deren Dokumentation und schriftlichen Darstellung in einer in begrenzter Frist. Sie Erlernen das systematische, wissenschaftlichen Arbeiten.
Voraussetzungen	**Benotung**

LEHRFORMEN / VERANSTALTUNGEN & ZUGEHÖRIGE PRÜFUNGEN			
Titel	**Prüfungs-dauer (Minuten)**	**CP**	**SWS**
Master Thesis	30	20	0
Master Thesis Kolloquium	15	0	0

Anlage 2

Studienverlaufsplan

Modul	CP	WS			SS			WS			SS			SWS
		L	E	P	L	E	P	L	E	P	L	E	P	
Compulsory Courses														
Automotive Engineering I & II	12	2	1		2	2	1							8
Automotive Engineering III	6							2	2					4
Internal Combustion Engine Fundamentals	5	2	1											3
Production Management A	5							2	2					4
Quality Management	5							2	2					4
Machine Design Process	6	2	2											4
Tribology	6	2	2											4
Total Compulsory Courses	**45**													**31**
Elective Courses	**31 CP are to be taken**													
Dynamics of Machines II	5				2	2								4
Fundamentals of Light Weight Design	4	2	1											3
Industrial Engineering, Ergonomics and Work Organisation	5	2	2											4
Internal Combustion Engines I	5				2	2								4
Internal Combustion Engines II	5							2	2					4
Laser Technique II (Process)	5				2	2								4
Manufacturing Technology I & II	10	2	2		2	2								8
Mechatronic Systems	5				2	2								4
Structural Design of Vehicles	4				2	1								3
Alternative and Electrified Vehicle Propulsion Systems	4				2	1								3
Welding and Joining Technologies	5				2	2								4
Vehicle Acoustics	5				2	2								4
Control Engineering	4	2	1											3
Total Elective Courses	**31**													**52 ***
German Language Course	6	2	2											4
Industrial Internship	9								9 weeks					
Mini Thesis	9								260 h					
Master Thesis	20								4 months					
Total	**120**													**87 ***

* Total SWS depend on modules selected

CP = Credit Points / SS = Summer Semester / WS = Winter Semester
L = Lecture / E = Excersise / SWS = Weekly Semester Hours (Semesterwochenstunden)

HERAUSGEGEBEN IM AUFTRAGE DES REKTORS VON DER ABTEILUNG 1.1 DES DEZERNATES 1.0 DER RWTH AACHEN
Templergraben 55, 52056 Aachen | Tel. +49 241 80-99087 | Fax. +49 241 80-92664 | akad@zhv.rwth-aachen.de